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Table of contents

<table>
<thead>
<tr>
<th>Foreword</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter Adekunle, Cliton Aigbavboa, Opeyemi Akinradewo</td>
<td>Intervention of Biomimicry for Sustainable Construction: The Use of Bio-Concrete</td>
</tr>
<tr>
<td>Malik I. Alamayreh, Ali Alahmer, Subhi M. Bazlamit, Mai Bani Younes</td>
<td>Energy Analysis and Refrigerant Replacement in Pre-Cooling Concrete System in Massive Concrete Structures</td>
</tr>
<tr>
<td>Rami Alawneh, Ismael Jannoud, Hesham Rabayah, Farid E Mohamed Ghazali</td>
<td>Prioritizing Risks in Sustainable Building Projects Using Analytical Hierarchy Process and Relative Importance Index</td>
</tr>
<tr>
<td>Ehsan Bakhtiarizadeh, Wajiha M. Shahzad, Mani Poshdar, James O.B. Rotimi</td>
<td>Applicability of Blockchain Technology in New Zealand's Prefabricated Construction Industry: A Potential Solution</td>
</tr>
<tr>
<td>Ewa Chodakowska, Joanicjusz Nazarko</td>
<td>Practical Use of Collaborative Robots in Packing Tasks</td>
</tr>
<tr>
<td>Sandiso Cosa, Edoghogho Ogbeifun, Jar-Harm C Pretorius</td>
<td>Managing Inter-Departmental Project Delivery to Enhance Customers’ Satisfaction</td>
</tr>
<tr>
<td>Mirosława Czerniawska, Joanna Szydło</td>
<td>Traditionalism, Modernism, Postmodernism – Worldview Analysis in the Context of Values</td>
</tr>
<tr>
<td>Marek Ćwiklicki, David M. Herold, Jasmin Mikl, Kamila Pilch</td>
<td>The Attitude-Behaviour Gap in Young Adults’ Sustainable Consumption</td>
</tr>
<tr>
<td>Łukasz Dragun</td>
<td>Process Dynamics of a Large European Project on the Basis of Information Activity in Social Media</td>
</tr>
<tr>
<td>Joanna Ejdys, Aleksandra Gulc</td>
<td>Factors Influencing the Intention to Use Assistive Technologies by Older Adults</td>
</tr>
<tr>
<td>Mathusha Francis, Thanuja Ramachandra</td>
<td>Investigating the Readiness Towards Practicing Dispute Avoidance Strategies in Sri Lankan Construction Industry</td>
</tr>
<tr>
<td>Bartłomiej Gladysz, Krzysztof Krystosiak, Krzysztof Ejsmont, Aldona Kluczek, Aleksander Buczacki</td>
<td>Sustainable Printing 4.0 – Insights from the Survey in Poland</td>
</tr>
<tr>
<td>Ewa Glińska, Halina Kirluk, Katarzyna Anna Kuźmicz, Ewa Rollnik-Sadówka, Urszula Ryciuk</td>
<td>Directions of Mobility Improvement in Remote Areas Attractive to Tourists</td>
</tr>
<tr>
<td>Alicja Gudanowska, Anna Kononiuk</td>
<td>Futures – Future Laboratories for Professional and Personal Development</td>
</tr>
<tr>
<td>Małgorzata Gulewicz, Katarzyna Halicka</td>
<td>Agile and Hybrid Management Methodologies in R&amp;D Projects</td>
</tr>
<tr>
<td>Sameera Gunathilake, Thanuja Ramachandra, Dilakshi Madushika</td>
<td>Carbon Footprint Analysis Through an Input-Output Table for Construction Activities of Sri Lanka</td>
</tr>
<tr>
<td>Nick Hadjinicolou, Mohamad Kader, Ibrahim Abdallah</td>
<td>Strategic Innovation, Foresight and the Deployment of Project Portfolio Management under Mid-Range Planning Conditions in Medium-Sized Firms</td>
</tr>
<tr>
<td>Katarzyna Halicka, Dariusz Surel</td>
<td>Gerontechnology – New Opportunities in the Service of the Elderly</td>
</tr>
<tr>
<td>Title</td>
<td>Authors</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Smart City in the Context of Aging Society</td>
<td>Katarzyna Halicka a, Dariusz Surel</td>
</tr>
<tr>
<td>Digital Transformation of Traditional Safety Shoes Manufacturer in</td>
<td>Nuchjarin Intalar, Kwanchanok Chumnumporn, Chawalit Jeenanunta, Apinun Tunpan</td>
</tr>
<tr>
<td>Thailand: A Development of Production Tracking</td>
<td></td>
</tr>
<tr>
<td>Optimization of Structural Parameters of the Industry by the</td>
<td>Svitlana Ishchuk, Luybomyr Sozanskyy, Ryszard Pukala</td>
</tr>
<tr>
<td>Criterion of Product Innovation</td>
<td></td>
</tr>
<tr>
<td>Barriers to Implementation of Business Process Governance Mechanisms</td>
<td>Arkadiusz Jurczuk</td>
</tr>
<tr>
<td>Resilient Manufacturing: Case Studies in Thai Automotive Industries</td>
<td>Najavadh Kaeo-Tad, Chawalit Jeenanunta, Kwanchanok Chumnumporn, Thanapatra Nitisahakul, Vararat</td>
</tr>
<tr>
<td>during COVID-19 Pandemic</td>
<td>Sanprasert</td>
</tr>
<tr>
<td>The Impact of COVID-19 PANDEMIC on Logistic Firms and their Resilience</td>
<td>Sun Ketudat, Chawalit Jeenanunta</td>
</tr>
<tr>
<td>Case Studies in Thailand</td>
<td></td>
</tr>
<tr>
<td>Determinants of the Selection of Optimization Methods in Planning</td>
<td>Mateusz Kikolski</td>
</tr>
<tr>
<td>the Layout of Workstations</td>
<td></td>
</tr>
<tr>
<td>Application of Lean Ideas in Architectural Design</td>
<td>Chien-Ho Ko</td>
</tr>
<tr>
<td>The Impact of Foresight Maturity on Organisational Ambidexterity</td>
<td>Anna Kononiuk</td>
</tr>
<tr>
<td>The Application of the Modified SERVQUAL Model for the Diagnosis of</td>
<td>Anna Kononiuk, Alicja E. Gudanowska</td>
</tr>
<tr>
<td>the Educational Offerings in the Field of Career Guidance Training:</td>
<td></td>
</tr>
<tr>
<td>Industry 4.0 Challenges</td>
<td>Robertas Kontrimovičius, Leonas Ustinovičius</td>
</tr>
<tr>
<td>Creation of the Mathematical Model Prototype to Optimize the Planning</td>
<td></td>
</tr>
<tr>
<td>the Planning of Construction Site, Using BIM and Engineering Geological Cross Sections</td>
<td></td>
</tr>
<tr>
<td>Multi-Criteria Analysis in Technology Selection Problems – Systematic</td>
<td>Justyna Kozłowska</td>
</tr>
<tr>
<td>Literature Review Results</td>
<td></td>
</tr>
<tr>
<td>Awareness of the Prevention through Design (PtD) Concept among Design</td>
<td>Rimmon Labadan, Kriengsak Panuwatwanich, Sho Takahashi</td>
</tr>
<tr>
<td>Engineers in the Philippines</td>
<td></td>
</tr>
<tr>
<td>Industry 4.0 – Alternative Approaches to Efficient Implementation in</td>
<td>Joanna Labedzka</td>
</tr>
<tr>
<td>SMEs</td>
<td></td>
</tr>
<tr>
<td>Uncertainty and Foreknowledge of Emerging Technologies in the Context</td>
<td>Andrzej Magruk</td>
</tr>
<tr>
<td>of Fourth Industrial Revolution</td>
<td></td>
</tr>
<tr>
<td>Realizing the Objectives of Infrastructure Master Plan: The Role of</td>
<td>I. Masunungure, Edoghogho Ogbeifun, Jan Harm C Pretorius</td>
</tr>
<tr>
<td>Internal Operatives</td>
<td></td>
</tr>
<tr>
<td>Partial Replacement of Cement with Rice Husk Ash in Concrete</td>
<td>Franco Muley, Natasha Muwila, Chipozya Kosta Tembo, Alice Lungu</td>
</tr>
<tr>
<td>Production: A Cost Benefit Exploratory Analysis for Low-Income</td>
<td></td>
</tr>
<tr>
<td>Communities</td>
<td>Joanicjusz Nazarko, Ewa Chodakowska, Lukasz Nazarko</td>
</tr>
<tr>
<td>Modelling and Monitoring the State of Transition Towards the Circular</td>
<td></td>
</tr>
<tr>
<td>Economy in the European Union</td>
<td></td>
</tr>
</tbody>
</table>
Lukasz Nazarko  
Responsible Innovation in Polish Enterprises  

Edoghoho Ogbeifun, Jan-Harm C Pretorius  
Delays in the Execution of Construction Projects are Beyond Adequate Funding  

Abdeen Omer  
Design and Operation of Low Energy Consumption Passive Human Comfort Solutions  

Babatunde Omoniyi Odedairo  
Personnel Utilisation in Project Management Office: A Real-World Application  

Antonis Panas, Maria Kalogiannaki, John-Paris Pantouvakis  
Comparative Assessment of Deterministic Methodologies for Estimating Excavation Productivity  

Elilvani Periyannan, Thanuja Ramachandra, Dilakshi Madushika  
Significant Green Retrofit Technologies: A Perspective of Sustainability Pillars  

Eugeniusz Piechoczek, Jan Kaźmierczak  

Beata Poteralska  
Support for the Development of Technological Innovations at an R&D Organisation  

Beata Poteralska, Marzena Walasik  
Technology Commercialisation Processes at R&D Organisations  

Rusl Abu Qalbin, Hesham Rabayah  
Assessment of Construction Risks in Projects Funded by External Sources in Jordan during the COVID-19 Pandemic  

Safwan M. Al-Qawabah, Adnan I. O. Zaid, Mahmoud El-Banna  
Effect of Zirconium Addition on the Wear Resistance of Aluminum Grain Refined by Ti-B: A Three Dimensional Presentation  

José Daniel Rodrigues Terra, Fernando Tobal Bersanetti, José Alberto Quintanilha  
Challenges and Barriers to Connect Manufacturing Continuous Improvement Processes to Industry 4.0 Paradigms  

Urszula Ryciuk  
Ambidextrous Governance Impact on Supply Chain Performance – Buyer and Supplier Perspective  

Ibrahim Sabry  
Exercising Hybrid Statistical Tools GA-ANN and GA-ANFIS to Optimize Underwater Friction Stir Welding Process Parameters for Tensile Strength Improvement  

Ibrahim Sabry  
Extended EDAS and VIKOR Method for Fuzzy Multi-Criteria Decision-Making: An Application to Underwater Friction Stir Welding  

Janindu Samaranayake, Thanuja Ramachandra, Dilakshi Madushika  
Significant Factors Affecting the Life Cycle Cost Elements of a Building  

Björn Sautter  
Thinking and Shaping Industrie 4.0 Ecosystems for Sustainable and Resilient Futures  

Nabeel Abu Shaban, Ibrahim Abu Alshaikh, Nabil Beithou  
Exact Solution of a Variable Temperature Plate in a Porous Medium
Shilpi Sharma
Multidimensional Aspects of Risk-Taking in Entrepreneurs: A Global Study

Julia Siderska
The Adoption of Robotic Process Automation Technology to Ensure Business Processes during the COVID-19 Pandemic

Dariusz Siemieniako, Paweł Kaliszewski
What Can We Learn from Critical Incident Technique in Investigating the Factors of Power Dynamics in Dyadic Business-to-Business Relationships?

Theodora Spyropoulou, Antonis Panas, John-Paris Pantouvakis
Formulation of Change Management Model for Achieving Business Excellence in Large Organizations

Danuta Szpilko, Ewa Glińska
Foresight as a Tool for Participatory City Management. Evidence from Poland

Katarzyna Szum
IoT-Based Smart Cities: a Bibliometric Analysis and Literature Review

Elżbieta Szymańska, Zofia Koloszko-Chomentowska, Krzysztof Stepaniuk
Innovative Mobility Solutions in Baltic Sea Region Rural Areas

Wanit Treeranurat, Suthathip Suanmali
Determination of Blackspots by Using Accident Equivalent Number and Upper Control Limit on Rural Roads of Thailand

Anon Na Thalang, Thanwadee Chinda
Inventory Management of the Air Conditioner Industry Utilizing the System Dynamics Modelling Approach

Pilada Wangphanich, Nattapong Kongprasert
An Innovative Design Approach to Meet the Customer Requirements: A Case Study of Charcoal Briquettes Packaging

Cezary Winkowski
Factors Determining the Development of Printing Technologies in Poland in Long-Term Perspective

Warit Wipulanusat, Kriengsak Panuwatwanich, Rodney A. Stewart, Jirapon Sunkpho, Poomporn Thamsatitdej
Towards Achieving Engineers’ Career Satisfaction in the Australian Public Sector: Integrated Structural Equation Modeling and Bayesian Networks Approach

Berco Venter, Sams Pufkani Ngobeni, Hendri du Plessis
Factors Influencing the Adoption of Building Information Modelling (BIM) in the South African Construction Built Environment (CBE), from a Quantity Surveying Perspective

Patryk Zwierzyński
Analysis of Simulation of Different Forms of Production Organization

Agnieszka Żyra, Sebastian Skoczypiec
Selected Aspects of Inconel Alloy Green EDM Machining Development
Foreword

On behalf of the Scientific Committee and the Organising Committee, we are pleased to welcome you to the 11th Conference on Engineering, Project and Production Management hosted by the Faculty of Engineering Management, Bialystok University of Technology. The interdisciplinary nature of the conference provides an excellent opportunity to present knowledge at the interface of social sciences and industrial engineering. The thematic scope of the conference is mainly devoted to logistics and supply chains, technology and production management, foresight and innovation management, entrepreneurship, industrial engineering and construction industry. The conference has a multidisciplinary character, as engineering, project and production engineering can be approached from many perspectives. “The Book of Abstracts” comprises 69 abstracts – presented in an alphabetical order – that have been carefully selected on the basis of a peer review process. The articles present both the theoretical and practical aspects of the main concepts related to the thematic scope of the conference. The authors of this year’s conference have carried out theoretical discussions, empirical studies, data analyses, case studies, and demonstrated industrial practices, with particular emphasis on the construction industry.

On behalf of the conference hosts, we would like to express our gratitude to the Conference Chairs, members of the Scientific Committee, members of the Organising Committee, the Keynote Speakers and all the Authors for their effort and willingness to take part in the 11th Conference on Engineering, Project and Production Management. We hope that this particular conference will foster exchange of new ideas and promote new contacts between researchers interested in engineering, project and production management. We hope that these two days of the conference will be full of scientific debate and networking.

Editors of the Book of Abstracts – EPPM 2021

Anna Kononiuk, Andrzej Magruk, Dorota Leończuk
Intervention of Biomimicry for Sustainable Construction:
The Use of Bio-Concrete

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Abstract

Biomimicry construction is defined as the science and art of solving human’s construction difficulties through emulating best biological propositions of nature. The benefits of biomimicry includes environmental and aesthetic factors. The use of materials such as bio-concrete increases environmental impacts exponentially. One of the major benefits of bio-concrete is that it is self-healing and it increases the effectiveness of any project design. Sustainable construction implies the use of materials that can be renewed and recycled, as well as the reduction of waste and energy consumption during construction of new buildings. To examine this intervention, this study employs a systematic literature review and site observation of how the use of bio-concrete can be adopted for the construction of buildings in the construction industry. Findings from this study revealed that biomimicry has helped to aid the development of sustainable construction. The use of bio-concrete which is a by-product of biomimicry will enable buildings to last for decades and also reduce maintenance cost. The usage of bio-concrete will also reduce concrete negative impact on the environment. The study concluded that the cost of producing bio-concrete is lesser than that of traditional abiotic reinforced concrete. By using bio-concrete for construction, assurance of a healthy environment is achievable.

Keywords: biomimicry, bio-concrete, bacteria, self-healing, sustainability, environment.

References

Energy Analysis and Refrigerant Replacement in Pre-Cooling Concrete System in Massive Concrete Structures

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Abstract

Several methods are developed to cool the mass concrete structures in order to improve the integrity of structures and to reduce the impact of the cement hydration which is the responsible for thermal cracking of concrete. This work focusses on the design of the cooling systems, initial investment, the impact of the alternative refrigerants on the performance of the cooling system and the design of aggregate bed cooler. In massive concrete structures like dams, cooling can be accomplished by cooling aggregates using cooled air from an air conditioning duct system or by using chilled water. The energy efficiency of aggregate bed cooler employed to evaluate the energy performance as a function of the particles size, time and temperature. The experimental analysis shows the relation between the coefficient of performance COP as a function of the evaporator temperature, cooling capacity and refrigerant mass flow rate. The experimental results used in verification of a numerical model developed using EES software. The performance of the vapor compression of the cooling systems was compared using alternative refrigerants namely R22, R32, and R410a at different operating conditions. This study revealed that the coefficient of performance of R22 refrigerant is more than R32 and R410A, while the cooling capacity for R32 is the most superior.

Keywords: design cooling massive concrete system, energy efficiency of aggregate cooling system, refrigerant replacement, initial investment.

References

Prioritizing Risks in Sustainable Building Projects using Analytical Hierarchy Process and Relative Importance Index

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Abstract

Sustainable building projects are riskier than conventional construction projects. This research aims to identify and analyse risks associated with sustainable building projects to assist project participants in managing these risks effectively. Risks related to sustainable construction projects were identified through a review of the literature. Questionnaire surveys were conducted using the analytic hierarchy process (AHP) and the Relative Importance Index (RII) methodologies. Risks were assessed according to their severity and likelihood of occurrence. After that, the identified risks were prioritized based on their severity. The proposed framework is robust to prioritize risks affecting sustainability in building construction projects, which helps increase sustainability due to the high uncertainty surrounding sustainability-related risks.

Keywords: sustainable building, risks, Analytical Hierarchy Process, Relative Importance Index, construction project.

References


Applicability of Blockchain Technology in New Zealand’s Prefabricated Construction Industry: A Potential Solution

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Abstract

Different industries are modernising their systems and introducing innovations to their management practices. However, the construction industry is recognised for its lack of technological systems on which the success of this sector is deemed to be heavily dependent. Previous studies have focused on enhancing the off-site construction supply chain. However, studies on the importance and utilisation of technology in this sub-sector are scarce, predominantly where the efficiency of off-site supply chain management is stalled as a consequence of the slow implementation of technology. Thus, this article employs an exploratory approach by providing insight into the applicability of blockchain technology in New Zealand’s off-site construction and demonstrates the benefits associated with the adoption of this technology. Literature review was used to identify stakeholders’ interrelationships in different stages of prefabrication projects. Then, a pilot interview from industry experts followed by a questionnaire survey was used to determine the involvement of stakeholders in different phases and the benefits that blockchain technology can bring to this industry. The results indicate that using blockchain as a secure information management system could improve the integration of prefabrication supply systems by producing a collaborative atmosphere amongst the organisations involved.

Keywords: prefabrication, supply chain, blockchain, information integration, New Zealand.

References

Practical Use of Collaborative Robots in Packing Tasks

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Abstract

Implementation of robotic solutions has affected practically every area of human activity, improving efficiency, bringing higher quality and repeatability, as well as economic benefits by lower production costs. According to World Robotics 2020 – Service Robots report, the market value of logistics robots sold or leased rose from 0.9 to 1.9 billion U.S. dollars in 2019, and it is predicted to reach 7.5 in 2023. Robotic solutions in logistics systems in manufacturing and non-manufacturing environments are mainly automated guided vehicles (AGVs), Autonomous Mobile Robots (AMR), cargo handling, personal transportation. Collaborative robots are designed for direct interaction with a human. In logistics, their main applications are pick and place activities, palletizing and assembling tasks, support for AGV/AMR. The paper presents the possibilities of using collaborative robots in packaging and palletizing operations. Collaborative robotic systems have great potential to improve the productivity of palletizing operations. The article describes the process, algorithm, and program for a demonstration system developed with the use of the UR3 robot. A set of experiments is designed and performed to investigate the assumed scenarios and use cases of packing rules and the performance of the proposed models. The aim is to examine and review the potential of collaborative robots in the process of packaging finished parts.

Keywords: collaborative robot, robot, cobot, programming, packing, palletizing, Universal Robots (UR).

References

Managing Inter-Departmental Project Delivery to Enhance Customers’ Satisfaction

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Abstract

The National Department of Public Works and Infrastructure (NDPWI) has the mandate from parliament to provide accommodation and other infrastructure to some public service departments. Each department communicate with NDPWI about their infrastructure requirements. However, between project briefing and actual delivery of the infrastructure takes considerable length of time. Therefore, it became imperative to evaluate the causes of delay and proffer solutions to enhance customers’ satisfaction. The multiple sites case study method of qualitative research was adopted. The participants were officers in the rank of deputy directors and above, from three regional office of NDPWI in Bloemfontein, Cape Town and Kimberley, and the professional service department at the headquarter, in Pretoria. The Delphi technique was used as instrument for data collection and complemented with a focus group session. The findings revealed that NDPWI, as service provider, contributed the highest number factors responsible for the delays in project execution. Some of these factors include poor planning by project execution team (PET), ineffective monitoring of projects and over centralization of decision-making process. The theoretical contribution of this research is that efforts aimed at ameliorating the negative effects of delays in the execution of infrastructure development projects should embrace the concept of decentralisation of project governance, which could encourage semi-autonomy and innovation. NDPWI need to undertake skills audit, implement strategic employments in areas of deficiencies, be committed to continuous professional development and practice the concept of decentralisation of project governance. Therefore, this research recommended that the project manager should be adequately resourced and empowered, to effectively coordinate the PET members, in the delivery of projects on schedule.

Keywords: causes of delay, customers’ satisfaction, Delphi technique, participants, project execution team.

Reference

Traditionalism, Modernism, Postmodernism – Worldview Analysis in the Context of Values

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Abstract

This study aims to diagnose three worldviews, namely traditionalism, modernism and postmodernism (all of them relate to the stages of Western culture described by Bauman) and value systems (referring to the Rokeach theory). The constructs were measured according to the Borowiak Questionnaire "How do you view yourself and the world around you?" and the Rokeach Value Survey (RVS). The research was conducted on a sample of 368 Polish students. The authors sought answers to the question of which values – collectivist or individualistic – are associated with the indicated worldviews. It appeared that a worldview and values (giving a desired direction in life) are linked in the following manner: a traditionalist worldview is correlated with collectivist values, modernist and postmodernist worldviews – with individualist values (although these values do not overlap).

Keywords: traditional, modern, post-modern worldview, values, the Rokeach Value Survey (RVS).

References

The Attitude-Behaviour Gap in Young Adults' Sustainable Consumption

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Abstract

Numerous research indicate an urgent need for broadening theoretical explanations of consumer’ intentions to adopt pro-environmental behaviours and consumption. Understanding sustainable consumption is crucial not only for companies transitioning towards Circular Business Model, but also for customers, who take into account social issues and are concerned about the environment. At the same time, emerging body of evidence suggests the value-action gap (what consumers think – how they behave) in the purchasing behaviour. Hence, there is a need for a multidimensional analysis of the factors affecting the green buying decisions of consumers. In this contribution we investigate the Millennial generation as this group is the most willing to pay extra for sustainable offerings and have potential to influence others towards sustainability and environmental protection.

The aim of the research was to understand the perception of the concept of sustainable consumption by young consumers and to identify factors contributing to their pro-ecological behaviour. Understanding purchase motives will be presented using the example of Polish young consumers. A qualitative methodology was used, and online focus group interview was employed for the data collection. The data presented in this contribution allow to further unpack the understanding of the sustainable consumption from young consumers’ perspective.

Keywords: pro-environmental behaviour, sustainable consumption, young consumers.

References

Process Dynamics of a Large European Project on the Basis of Information Activity in Social Media

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Abstract

The purpose of the paper is to present the process dynamics of a large European project on the basis of its information activity in social media. Social media are a powerful means of reaching a wide audience, while activity in this sphere reflects the degree of organisation of project partners and their involvement in achieving the project’s objectives. The paper makes use of the experience gained while promoting the results of the GoSmart BSR project via social media. The GoSmart BSR project is concerned with enhancing the low capacity for innovation in less developed Baltic Sea Regions (BSR) through mutual learning, translating smart specialisation strategies (S3) into practical joint activities of small and medium enterprises (SMEs), and applying best practices used in better developed regions. The project is fully integrated with 3S and aims at promoting efficient co-operation between the industrial sector, the R&D sector and the authorities, following a transnational approach. The obtained findings reveal a noticeable upward trend, as well as an interest on the part of various international projects, in making the accomplished results public via social media channels.

Keywords: GoSmart BSR, Interreg, project management.

References

Factors Influencing the Intention to Use Assistive Technologies by Older Adults

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Abstract

Society ageing is at an unprecedented pace worldwide making implications for the health and social care. Gerontechnology has been recognized as a solution to increase and support the independency and well-being of older adults at their home. The article aims to identify the success factors affecting the adoption of assistive gerontechnology by older adults. The object of the authors’ interest was Robot Rudy – an AI-enabled mobile solution helping users remain physically healthy, mentally sharp, and socially connected. The data was collected among Polish citizens using the CATI technique reaching 824 returned questionnaires. The authors used Generalized Least Squares (GLS) of Structural Equation Modelling (GLS-SEM) to verify the hypotheses. The obtained results confirmed statistically significant relationships between the variables of perceived usefulness of Robot Rudy and attitude reflecting the willingness to use this technology, but also between perceived ease of use and perceived usefulness of robot. However, relationship between perceived ease of use and attitude to use this technology in future was not statistically significant. The conducted research confirmed that the functionality of the analysed Robot Rudy for older adults care positively influences their intention to use it in future for their own needs or by family members.

Keywords: assistive technologies, gerontechnology, technology acceptance model, robot; older adults.

References

Investigating the Readiness Towards Practicing Dispute Avoidance Strategies in Sri Lankan Construction Industry

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Abstract

Disputes become pertinent issue in the construction industry and often affect budget, time and quality of the projects. Disputes may end up with serious failures such as abandonment of project and bankruptcy of contractor. This encourages the construction industry to step towards dispute prevention which could begin at the early stage of a project. Therefore, this research investigates the readiness of Sri Lankan construction industry to adopt dispute avoidance strategies. A questionnaire survey was completed by seventy-eight professionals who were involved in construction disputes, recruited using the snowball sampling technique. The relative importance index was calculated to identify the dispute avoidance strategies in Sri Lanka. The literature review identified 31 strategies that were further evaluated in the questionnaire survey. The research revealed that strategies such as provision for dispute resolution and use of standard forms of contract are practiced highly in Sri Lankan construction projects. Most of the strategies (28) are found to be practiced at medium level. Therefore, the research suggests construction professionals to improve their skills in adopting measures for proactive ways to avoid disputes beforehand.

Keywords: disputes, avoidance, strategies, readiness, Sri Lanka.

References.

Sustainable Printing 4.0 – Insights from the Survey in Poland

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Abstract

The transformation trend towards digital technology to achieve sustainability targets and meet legal regulations has been visible in many industries. The printing sector has already been increasingly boosting sustainability performance through digitalization to automate workflows of processes. The goal of this paper is to initially diagnose a sustainable performance of Printing 4.0 (Industry 4.0 in the printing sector). To achieve this goal, qualitative interviews were carried out with representatives of eleven printing companies. Results of the diagnostic study demonstrated that advanced technologies have a positive impact on sustainability in the analysed printing companies due to the higher awareness of sustainability. It has been observed in the surveyed sample that interviewees confirmed such an assumption. These companies which tailor their operational activities toward digitalization, have more quickly noticed a positive effect on their sustainable businesses. This survey has served as a basis for more extensive research.

Keywords: Industry 4.0, digital technology, sustainable development, sustainability, sustainable printing, printing sector, interviews.

References

Directions of Mobility Improvement in Remote Areas Attractive to Tourists

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Abstract

This paper addresses the problem of transportation systems in remote areas, defined by a set of constraints deriving from sparse population, infrequent location of transportation means stops and cost-effectiveness of the system. Remote areas attractive to tourists additionally require transportation services designed with respect to changeable demand and necessity to provide transportation solutions limiting detrimental influence on environment. The outcomes of a Delphi method investigation pointing to the future of mobility in such areas conducted with experts representing universities and local government institutions from seven EU member states, Norway and Russia (participants of the project „MARA – Mobility and Accessibility in Rural Areas – New approaches for developing mobility concepts in remote areas”, implemented under the Programme Interreg Baltic See Region 2014-2020) are discussed. The experts evaluated and discussed the relevance of theses on the future of mobility in remote areas and assessed factors favouring or hindering the implementation of the theses and indicated time perspectives for their implementation. The selected aspects include: potential changes in travel preferences as a consequence of the Covid-19 pandemic, transport solutions adapted to older people with reduced mobility, the introduction of integrated intermodal systems, the use of electric or hydrogen-powered vehicles, or the improvement of transport infrastructure development through public policies intensifying cooperation between authorities at local, regional and national level in transport planning. The outcomes of the study comprise a contribution to a vibrant field of innovative transport solutions in line with sustainable development as well as a source of knowledge for bodies responsible for transport planning.

Keywords: mobility solutions, remote areas, transport system, sustainable transport, Delphi method.

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Futures – Future Laboratories for Professional and Personal Development

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Abstract

The current global pandemic highlights precisely the importance of futures thinking, developing foresight and preparedness, but also an ability to embrace emergence, adapting to unforeseen circumstances that might impact participants’ professional lives. The aim of the article is to present an European project entitled Future laboratories for professional and personal development – FUTURES. In particular, the project underlines the need to develop skills of young people, for anticipating and promptly reacting to scenario changes, and imagining professional career paths. A key theoretical and practical contribution of the project is the transfer of foresight to the individual level. The project aims to develop the innovative, future-oriented processes, tools, and methods that will foster personal and professional development among European university students, early stage researchers and high school students, including also those that aspire to enrol in University.

Keywords: foresight, Futures project, Futures Literacy, individual foresight.

References

Agile and Hybrid Management Methodologies in R&D Projects

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Abstract

The changing market conditions affect enterprises and scientific entities with increasing challenges related to the production of innovative products and services. An inseparable element of creating innovations is research and development activity (R&D). It includes several activities aimed at generating new knowledge and defining new applications for existing scientific achievements. It concerns both technical and management knowledge as well as knowledge about humankind, culture, and society. To fully exploit the opportunities arising from this process, it is necessary to introduce appropriate project management methodologies. The main objective of the conducted research was to identify, evaluate and develop the author’s classification of methodologies used to manage research and development projects. Additionally, this study aimed to gain knowledge on the possibilities of using agile and hybrid methodologies in R&D projects and project areas where they can be implemented. The research took into account the nature of the work carried out (theoretical and empirical), the level of use of the methodology among representatives of science and industry and the factors that may limit the use of agile approaches in projects. Among the research methods used were surveys targeting project team members and academics, descriptive statistics methods, classification trees, and a literature review. The research demonstrated that the applicability of agile and hybrid approaches in research project management could provide benefits and increased flexibility in project delivery while minimizing the risk of project failure.

Keywords: research management, project management; agile.

References


Carbon Footprint Analysis Through an Input-Output Table for Construction Activities of Sri Lanka

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Abstract

The construction industry is one of the major contributors that emits carbon into the environment. However, there seems to be less focus on carbon emission studies in the Sri Lankan construction industry. Hence, this study aims to calculate the carbon footprint in the Sri Lankan construction industry through the input-output tables (IOTs) with a bottom-up approach and thereby propose strategies to minimise carbon emission. The required data were extracted through the government documentaries to carbon footprint calculations and questionnaires were presented to the forty-four experts who have sound knowledge about the carbon footprint to identify the effective strategies to minimise the carbon emission. The study concludes that cement-based activities (50%) and road and railways sector (40%) are the highest carbon emission activities and sector, respectively through Inter sector IOTs. Industry-by-industry IOTs exhibits that over 20 million tons of carbon dioxide emissions take place due to construction sector activities in the Sri Lankan construction industry. Finally, the study recommends the use of environmentally friendly energy technologies, education and training, and the adaptive re-use, recycle, and leasing of components as the most suitable carbon emission minimisation strategies that can be used in the Sri Lankan construction industry.

Keywords: carbon footprint, construction activities, input-output table, minimization strategies, Sri Lanka.

References

Strategic Innovation, Foresight and the Deployment of Project Portfolio Management under Mid-Range Planning Conditions in Medium-Sized Firms

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Abstract

The implementation of strategic innovation requires organizations to develop both a dynamic culture and flexible internal systems that yield to major external changes in their industry. Such changes could include supply – or value-chain adjustments, changes in consumer behaviour or the responses of competitors. This paper examines the planning and deployment of project portfolio management tools in organizations with a mid-range planning horizon who are required to innovate in a strategic context. It relates strategic foresight to the ability of the firm to adjust tactically including in the utilization and development of internal tools, processes, systems and culture. The paper further reviews project portfolio management models, the influence of organizational maturity and maintaining a balance between the utilization of organizational assets and the benefits achieved from this strategic agility. It argues that strategic innovation is closely tied with the ability not just to innovate, but to absorb this innovation within the organizational processes.

Keywords: strategic innovation, project portfolio management, organizational assets.

References

Gerontechnology – New Opportunities in the Service of the Elderly

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Abstract

Along with the increasingly visible trend of an ageing society, there is a need to create technologies supporting the functioning of the elderly. Therefore, more and more gerontechnologies are emerging that are designed to help the elderly in their daily functioning. The variety of technologies is large, from devices monitoring the health of an elderly person, through special trolleys improving the mobility of a senior, ending with special Virtual Reality devices, thanks to which an elderly person can actively learn. This article focuses on the analysis of which group of gerontechnologies is most desired by current and future users. Much attention was paid to individual assessments of the most desirable group of gerontechnologies in terms of various criteria. It was also important to investigate for which criterion the selected group of gerontechnologies was rated the highest. The authors distinguished 7 groups of criteria against which the gerontechnology group was assessed: technologies innovation, technology demand, social and ethical criteria, technology usability, technology functionality, technology ease of use and technology use risk. The survey was conducted in the form of a questionnaire, using the CAWI (Computer-Assisted Web Interview) and CATI (Computer-Assisted Telephone Interview) methods, and the research sample size was 1,152 people who were residents of Poland. It is worth adding that so far no studies have been conducted to evaluate this group of technologies in terms of the above-mentioned criteria.

Keywords: gerontechnology, technology, health; analysis, elderly.

References


Smart City in the Context of Aging Society

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Abstract

The smart city concept consists of six dimensions: smart economy, smart mobility, smart environment, smart governance, smart living, and smart people. An important dimension of smart city in the context of an aging society is the dimension of smart living because the measure of smart living includes living conditions (health, safety, and housing). In the current perception of the smart city concept, there is a return to the needs and preferences of residents. They are at the centre of attention and technology is designed to pursue their interests. In the context of the emerging society, the development of gerontechnology is very important in the development of smart city. Therefore, it can be shown that gerontechnology is a technology that will meet the needs of city dwellers (aging society). The article aims to show the connection between smart city and technologies designed to support the functioning of older people on the basis of selected technologies.

Keywords: gerontechnology, smart city, ageing society, technology, smart living, older people.

References

Digital Transformation of Traditional Safety Shoes Manufacturer in Thailand: A Development of Production Tracking

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Abstract

There are many challenges of digital transformation toward Industry 4.0 in Thailand, especially for the traditional manufacturing firms that have been operating without using digital technologies. This paper presents a case study of safety shoes manufacturer, CPL Group Public Company Limited, adopting digital technologies to transform its production system that has been operating for 40 years. We explore how the company changed the organization’s mindset to embrace digital transformation and how they adopt AI and IoT technologies for the productivity improvement. This research uses inductive case study research design by interviewing the executive level and participating in the project development of digital tracking using IoT sensor and image processing. The findings reveal the key practical practices and recommendations for digital transformation in manufacturing, strategies required for development, and preliminary results of IoT implementation in the production line.

Keywords: digital transformation, manufacturing, IoT.

References

Optimization of Structural Parameters of the Industry by the Criterion of Product Innovation

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Abstract

The industrial sector of the Polish economy plays an important role in ensuring the socio-economic development of the country. The Polish industry accounts for 24.1 per cent of the country's employed population and 25.1 per cent of the GVA. The aim of the article is to model the structural parameters of the industrial sector of Polish economy according to the criterion of increasing the level of product innovation on the basis of a comprehensive assessment of the performance of Polish industry in the regional context. The author's method of estimating the industrial sector of the economy at the macro and meso levels on a set of indicators of investment, innovation and labor activity as well as profitability. Using the methods of correlation-regression analysis, the author's hypotheses about the impact of product innovation on employment and wages in industry were proved. To optimize the structure of the industrial sector of Polish economy, an economic-mathematical model was developed, which was solved by the method of linear programming. The target functionality of this model is the level of product innovation at which the gross average monthly wage of Polish industry workers will double (to the EU average). The results of the simulation, which were based on data from the Central Statistical Office of Poland, provide an analytical basis for selecting industrial policy benchmarks of Poland.

Keywords: industry, efficiency, product innovation, production, models, structure, optimization.

References

Barriers to Implementation of Business Process Governance Mechanisms

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Abstract

The changing market circumstances, including digitalisation, striving for customisation of products and services causes an increase in interest of organisations in building a competitive advantage using a process approach to management. One of the main challenges in implementing process-oriented management in the organization is establishing a process governance mechanism. It creates a coherent framework for the execution, management and perception of business processes, which is the foundation of consistent Business Process Management (BPM) in the organization. Process governance (PG) refers to an organisation's ability to manage its relationships with all process stakeholders and support the value chain for their customers. Its implementation involves establishing process regulation mechanisms and stakeholder-oriented criteria to support prioritisation, cascading, and management of change within BPM initiatives. A review of the domain literature reveals that while process governance has been discussed from several but separated perspectives (strategy, business roles, performance, and maturity), there are only a few studies identifying and synthesizing the barriers to its implementation in organisations. The main aim of the paper is to identify and classify the key barriers to the implementation of process governance. The author’s approach refers to the six core elements of BPM capability and process governance frameworks. Results of the research confirm the significant role of empowerment, clear division of responsibilities, communication as well as end-to-end process understanding and monitoring. The research contributes to the literature on management through the identification of potential barriers to business process governance that constrain BPM initiatives. The PG challenges identified can provide a basis for developing a theoretical framework of Business Process Management success factors.

Keywords: business process management, process governance, success factors, barriers.

References

Resilient Manufacturing: Case Studies in Thai Automotive Industries during COVID-19 Pandemic

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Abstract

The coronavirus pandemic is the most globally disruptive and contributes to global economic slowdown. The automotive industry is one of the major sectors that accounts for approximately 12% of the overall GDP in Thailand. In March 2020, when the first full lockdown in Thailand was announced, the sales and the automotive production amount was affected significantly and continued for several months later. However, a few Thai companies quickly recover from the crisis, while supply chain partners were still struggling. The objective of this research is to identify the key factors that keep these firms resilient to the pandemic. We selected three outstanding tier 1 firms to conduct case studies. The CEOs and general managers were interviewed by using semi-structured questions. The thematic analysis was conducted to identify the patterns of resilient activities and key success factors. The results and detailed analysis are presented in the paper.

Keywords: COVID-19, manufacturing, Thailand, resilient.

References


The Impact of COVID-19 PANDEMIC on Logistic Firms and their Resilience: Case Studies in Thailand

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Abstract

The novel Coronavirus (COVID-19) is an infectious disease causing challenges and opportunities in all sectors around the world. Logistic Industry plays a huge role to keep the countries intact, in which it is accounted for 13.4% of the overall GDP in Thailand. The purpose for this article is to justify and identify key factors for the successes and failures in the Logistic Industries brought upon by the Pandemic. During March to July 2021, which is in Phase 4 of the Pandemic, we conducted our research by means of semi-structured interviews with the top-managements of three companies. Then we analysed our findings through the thematic analysis to understand the key factors within the industry. We selected logistic companies with different sizes to be used as our case studies to identify the resemblance of the effects within and see the relationship between the companies on their resilience. The results and finding analysis are presented in the paper.

Keywords: COVID-19, logistic Industry, business continuity plan, thematic analysis, Thailand, resilient, cross-comparison.

References

Determinants of the Selection of Optimization Methods in Planning the Layout of Workstations

Mateusz Kikolski

Abstract

Production efficiency is highly dependent on the location of production equipment within the plant. The layout of the machines within the production line takes into account the optimal use of available space, time and cost of material flow, and production flexibility. There are many factors influencing the shape and operation of production lines, such as: number of shifts, batch size and their nature, types of transport and storage. The article presents a review of the existing methods of optimization of the production layout and identification of the determinants of the selection of production system optimization methods. The literature review as the main problems related to the design and operation of production lines indicates: the determination of the number of machines within the lines, the location of intermediate buffers and their size, and the layout of machines and workstations within the plant. Among the determinants of the selection of optimization methods for the deployment of workstations one can distinguish, among others, the type and characteristics of the production process, factors influencing the shape of the production line and the optimization criterion. However, the most important determinant is whether a new layout is designed or an existing one is changed.

Keywords: facility layout, production lines design, optimization method selection, production optimization methods, workplace planning.

References

Application of Lean Ideas in Architectural Design

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Abstract

Design is the most critical stage in the project lifecycle. Improper design may not only lead to change orders, but also reduce constructability, therefore increasing project duration and costs. This study aims to enhance design correctness by applying lean production and concurrent design concepts through developing a Lean Concurrent Design Model. The concepts of concurrent design, building information models, and system dynamics are first explored. Lean production and concurrent design concepts are then used to develop the Lean Concurrent Design Model, in which Building Information Modeling (BIM) and Three-Dimension (3D) techniques are presented through the Industry Foundation Classes (IFC) protocol that allows for the sharing of design information. Finally, feasibility of the proposed design model is validated using system dynamics. Analysis results show that applying lean production and concurrent engineering in the design phase may reduce design errors and increase design reliability.

Keywords: design correctness, lean construction, concurrent engineering, system dynamics.

References

The Impact of Foresight Maturity on Organisational Ambidexterity

Anna Kononiuk

Abstract

In Western practice, organisational foresight has become an annual ritual for many future-oriented companies. The research field is still immature and dominated by exploratory research, most often based on case studies or expert opinion, used to create arbitrary categories to order empirical observations. As foresight implemented in the enterprise is still a new area of research, the apparent unavailability of empirically validated foresight constructs and measures may not be surprising. Such constructs and measures are arguably key to growth and progress in this area of research. The aim of the article is to present the influence of foresight maturity on organizational ambidexterity understood as the ability of an organisation to simultaneously exploit existing competencies and explore new opportunities. The application of structural modelling (SEM) made it possible to identify the constructs of foresight maturity and organisational ambidexterity as well as the indicators associated with them. The study covered 580 Polish industrial processing companies. The selection of the enterprises was motivated by the fact that they most often compete globally, experience changes of the technological environment and demonstrate a significant innovative potential. The key contribution of the article is the presentation of the empirical relationship between foresight maturity and organisational ambidexterity. It has also been demonstrated that the level of maturity depends on the size of the enterprise, its type, area of activity and the industry represented.

Keywords: foresight, foresight maturity, organizational foresight, SEM modelling, ambidexterity.

References

The Application of the Modified SERVQUAL Model for the Diagnosis of the Educational Offerings in the Field of Career Guidance Training: Industry 4.0 Challenges

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Abstract

The importance of vocational guidance is growing, and the focus on modern tools enabling the development of competences such as flexibility, the ability to identify trends shaping the labour market and considering alternatives are natural consequences of the detected changes. The aim of the article is to present a comprehensive methodology (based on the SERVQUAL model) and the results of a nationwide survey focused on the disconfirmation between the ideal features of the courses offered and the perception of the courses completed by career guidance practitioners in Poland. The research methods used in the research process are: the literature review, bibliometric analysis and the analysis and logical construction method. To diagnose the educational offerings in the field of career guidance training, the authors applied a modified SERVQUAL model. The results of the analysis carried out allow us to conclude that the themes of the analysis of scientific and technological trends, such as automation, robotization, and digitization, are treated marginally within the framework of the education completed by the respondents. This demonstrates a major challenge for including this curriculum content in the area of vocational guidance. The modified SERVQUAL model developed by the authors of the study for the diagnosis of educational offerings in the field of vocational guidance can be used to evaluate the educational offerings in other countries.

Keywords: SERVQUAL model, educational offering, Industry 4.0, career guidance.

References

Creation of the Mathematical Model Prototype to Optimize the Planning of Construction Site, Using BIM and Engineering Geological Cross Sections

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Abstract

Modern construction technologies strongly affect the environment. Taking this into consideration, design and building construction should also follow the principle of sustainable development. In this case, design and construction work based on the principle of sustainable development should be aimed at the creation of the safe and healthy living environment, the economic use of natural resources and the stimulation of economic development for creating the welfare of humans and favourable natural conditions. In the article, a mathematical algorithm is proposed as a comprehensive solution for the planning construction site - from calculation of earthworks till automated creation of engineering geological cross sections. The paper integrates mathematical modelling with BIM technology. The application of the building information model is undoubtedly one of the most advanced technologies used in the construction sector, whose advantages have been shown by researchers. At the preliminary stage of construction, the decisions, as well as the material and human resources, schedules and estimates, should be analysed and planned. The paper presents a description of the developed principal mathematical model created by the authors for designing a construction site by using the BIM technologies. The main formulas of a mathematical algorithm aimed at the selection of the objects used on the building site and the need for them are presented. The main principles and methods of selecting the mechanisms used at the construction site are given. To avoid using the irrelevant information in planning the construction site, the technologies of virtual reality are used. Having the important and new information about the construction site, all the obstacles found at the construction site, i.e. the plants, the surrounding constructions and other relevant objects, are known.

Keywords: building technologies, sustainable construction, selection of building equipment, building information modelling, building site planning.

References

Multi-Criteria Analysis in Technology Selection Problems – Systematic Literature Review Results

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Abstract

Along with the rapid technology development and the growing importance of technology impact on the competitiveness and performance of companies, the selection of the appropriate one that meets all requirements constitutes a challenging strategic decision problem faced by entrepreneurs and institutions. This paper aims to answer the following research questions: What are the main research directions in the application and adaptation of multi-criteria analysis in the field of technology selection? Which multi-criteria analysis (MCA) methods are most often used in the technology assessment process? Which features of the technology are key as criteria in the selection process and whether and how they determine the choice of MCA methods? The research methodology is based on a systematic literature review on the use of multi-criteria analysis in decision-making processes regarding technology selection and technology assessment. Text analysis methods and visualization of their results were also applied. This study contributes to the theory of technology assessment and multicriteria analysis by recognizing the state-of-the-art in the existing published works and identification of possible research directions in the future. Furthermore, an in-depth analysis of the chosen articles was carried out to identify the critical features of technology and key criteria in the technology selection process. In addition, an attempt was made to diagnose whether there is a pattern in the use of specific MCA methods in a particular sector, which may constitute a practical implication of this study.

Keywords: technology assessment, technology selection, multi-criteria analysis, multi-criteria decision making, MDCM.

References

Awareness of the Prevention through Design (PtD) Concept among Design Engineers in the Philippines

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Abstract

Purpose: The concept of “Prevention through Design (PtD)” considers construction safety during the design process. Several countries are currently practicing PtD, including the UK, Singapore, Malaysia, Australia, and the USA, which is still not the case in the Philippines. The study presented in this paper aimed to indicate the current level of awareness of the concept of PtD among the structural engineers and purposed to generate a basis of initiatives to introduce or improve the understanding and adoption of PtD in the Philippines. A knowledge, attitude, and practice (KAP) questionnaire was distributed to survey respondents obtained through a snowball sampling method, consisting of structural engineers currently working in the Philippines. Sixty-one (61) structural engineers responded and their answers were analyzed in this study. Results indicated that PtD was relatively a new concept for most structural engineers in the Philippines. Similarly, the designers’ knowledge of the concept was still low. However, structural engineers viewed PtD as necessary, and its implementation will be essential in the construction industry. Despite the known concerns in PtD implementations, structural engineers favored the adoption of the concept. The paper also discussed challenges and key drivers for implementing PtD in the Philippines based on the questionnaire results and supporting literature reviews. The findings and methodology presented in this paper could serve as a baseline for a larger sample size covering other design trades such as architectural, electrical, and mechanical design services leading to the broader adoption of PtD in the Philippines. Furthermore, the framework of this study could also be applicable to other countries with similar contexts.

Keywords: construction safety, Prevention through Design, Design for Safety, Philippines, KAP, structural design.

References

Industry 4.0 – Alternative Approaches to Efficient Implementation in SMEs

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Abstract

Industry 4.0, driven by the need to access real-time insights and information across the manufacturing process, creates a disruptive impact on industries. Large-scale machine-to-machine communication, virtual reality (VR), the Internet of Things (IoT), simulation technologies and network management are integrated for increased automation, machine learning, self-controlled social and technical systems (Smart Factories). The uptake of advanced manufacturing solutions represents a challenge for business and for SMEs in particular. SMEs possess neither the organizational capability nor financial resources to systematically investigate the potential and risks of introducing Industry 4.0. However, the so-called fourth industrial revolution is not only a matter of technology, but also a matter of cooperation between European regions to share knowledge concerning alternative regional and national approaches to successful support of the 4.0 implementation. Therefore, the primary aim of this paper is to analyse practical experience on how European policies related to Structural Funds can unlock the full potential of Industry 4.0 and overcome the fragmentation of Industry 4.0 solutions. Case studies of successful transfer of Industry 4.0 to SMEs in Europe and supporting regional instruments presented in the paper could inspire and enable the potential of digitalization by dealing with main challenges hampering their diffusion into the business ecosystem.

Keywords: Industry 4.0, digital transformation, SMEs.

References

Uncertainty and Foreknowledge of Emerging Technologies in the Context of Fourth Industrial Revolution

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Abstract

One of the key roles in the development of Industry 4.0 systems are played by “emerging technologies” as new tools with promising – but with high level of uncertainty – capabilities. The management of such systems should be based on a comprehensive – future-oriented – research approach. Such activities are enabled by foresight methodology. The main purpose of this publication is an attempt to answer the following research question: “What levels of fore-knowledge and knowledge in the context of development of emerging technologies – in relation to their feature in Industry 4.0 – should be taken into account during analysis of uncertainties in the sense of foresight research?” In detail, the relationship of classes of research foresight methods in their relation to types of future, scopes of uncertainty, cycles of knowledge and original levels of foreknowledge in the field of development of emerging technologies in Industry 4.0 was examined. Emerging technologies combined with the research of foreknowledge and uncertainties, is an interesting research area with many theoretical and practical potential implications. The study uses the results of the analysis and criticism of the literature, mental experiment and the intuitive method as the main research methods. On this basis a conceptual modelling was performed.

Keywords: uncertainty, knowledge, foreknowledge, emerging technologies, futures studies, foresight methods.

References

Realizing the objectives of infrastructure master plan: 
The role of internal operatives

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Abstract

An infrastructure master plan, in a higher education institution, serves as a blueprint for the coordinated and progressive development of the physical infrastructure and services to create a suitable academic environment required for the execution of the core functions of teaching, learning and research. Master plans are usually developed for a long period in the life of the institution, subject to rational and objective modification due to the dynamics that are internal and external to the academic institution. The single case study method of qualitative research was adopted in the exploration of the implementation process of the infrastructure master plan of a higher education institution in Zimbabwe. The findings revealed that internal and external factors were successfully managed through the consultative approach adopted by the institution’s University Council / Board and the Building Committee. Other findings include the fact that the institution adopted the mixed methods of infrastructure development, which include new construction, renewal of existing buildings, purchase and renting of suitable properties in order to keep up with the aspirations of the academic plan. Therefore, this research concludes that success in the implementation of infrastructure master plan requires the tenacity and commitment of suitable internal operatives through collaborative monitoring and evaluation of the various projects undertaken by those involved.

Keywords: academic institution, infrastructure, implementation, internal and external factors, master plan.

References

Partial Replacement of Cement with Rice Husk Ash in Concrete Production: A Cost Benefit Exploratory Analysis for Low-Income Communities

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Abstract

Cement is an important construction material in the production of concrete; however, it is expensive and unaffordable for many low income and rural communities in developing countries. Rice husk is a by-product from rice mill process, with an approximate ratio of 200 kg rice husks per one tonne of rice produced. The aim of this experimental study was to investigate the integrity of concrete produced in Zambia using Rice Husk Ash (RHA) as partial replacement of cement. The primary goal was to carry out a cost benefit analysis on the use of RHA in concrete. (RHA) was used to partially replace cement with ratios of 10%, 20% and 30%. The 20% cement replacement mix produced the optimum results of 18 MPa concrete strength at 0.5 water/binder ratio. This translated in cost reduction of concrete by 12.5% which is significant particularly for higher Vol.s of concrete. This concrete produced is suitable for lightly loaded structures such as foundation footings, surface beds and walkways to benefit low-income communities. The study further concluded that the RHA based concrete was more cost-efficient in structures that are of close proximity to areas of rice production due to reduced transportation costs of the RHA.

Keywords: rice husk ash, partial replacement, concrete, cost reduction.

References

Modelling and Monitoring the State of Transition Towards the Circular Economy in the European Union

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Abstract

The concept of circular economy (CE) has been present in the literature since the 1960s. However, in recent years it has significantly gained prominence both in scholarly and policy circles. Circular economy concept has been introduced into the European Union (EU) policies and strategies. Transformation of the dominant economic model is a long-term process, and the activities leading to the implementation of the circular economy paradigm are gradual. Measuring the progress towards the circular economy model at micro, meso, and macro level is a demanding task, mainly due to the fuzziness, complexity, and multidimensionality. The assessment of the transition towards the CE based on selected sets and subsets of indicators are a subject of numerous publications that include both simple and more sophisticated comparisons, quantitative and qualitative evaluations. One of the widely exploited methods to assess the sustainability, especially of transforming labour, capital, and energy into GDP considering pollutants (mainly greenhouse gas emissions) and renewables is Data Envelopment Analysis (DEA). The article proposes to apply the Rough Set theory introduced by Pawlak (1982), supported with cluster analysis, to reduce the number of indicators from a given set and rules induction to assess the state of transition towards the circular economy in the EU. Rough Set theory is a mathematical approach to vagueness addressing the issues of pattern discovery in data, decision rule generation, and reduction of data. The main contribution of the article is to develop a model to reduce the arbitrariness of the criteria selection in monitoring the state of transition towards the CE.

Keywords: rough set, cluster analysis, circular economy (CE), sustainability, Sustainable Development Indicators (SDI), European Union (EU).

References

Responsible Innovation in Polish Enterprises

Lukasz Nazarko

Abstract

The paper presents the results of research which aimed at studying the problematic of reflexivity and responsibility in production and service enterprises. The study was carried out in 2021 on a sample of 100 medium enterprises (between 50 and 250 employees) operating on the Polish market. The primary data was gathered through interviewing (CATI/CAWI) the top management or owners of the companies. The following research questions are addressed in the paper: 1) How unexpected events in the enterprise’s environment affect its competitive position? 2) Do enterprises express the need to acquire competences related to the systematic exploration of multiple socio-technical futures (foresight)? 3) What groups of stakeholders do enterprises feel responsible to when developing new products and services? 4) What grand societal challenges are mostly addressed by newly developed products and services? 5) Is enterprise’s future orientation is related with its understanding and practice of responsibility? General findings include the conclusion that companies are aware of the impact of unexpected events on their operations and the long-term viability. They have mixed assessment of the possibility to anticipate such events and they generally don’t indicate the need for more foresight competences. In developing new products and services they mostly attempt to address the issues of energy consumption, health and security. They feel responsible mainly to their customers and subcontractors.

Keywords: Responsible Research and Innovation (RRI), responsible innovation, future orientation, foresight, industry, enterprise, Poland.

References

Delays in the Execution of Construction Projects are Beyond Adequate Funding

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Abstract

Several researchers have identified funding (delayed payments and low cash flow of contractors) as a critical delay factor in the execution of construction projects. However, experiencing delays in projects with adequate funding requires further examination. The case study method of qualitative research was adopted, involving representatives from five universities that benefit from infrastructure funding sponsored by a government agency in Nigeria. The Delphi technique was used for data collection and analysis, complemented with interviews. The findings revealed six factors, namely, faulty contractor selection process, delays by contractors and the failure to complete appropriate phases of project, complexity in project governance system, delays from fund administration policy and the over-centralised process of inspection, monitoring and evaluation. The main contribution of this research is the fact that delays in the execution of sponsored projects emanate from the combined effect of lapses in project management by benefiting institutions and deficiencies in the project governance system of the funding agency. The outcomes of this study will assist the Directors of Physical Facilities in universities to manage their internal operations and provide them with objective information for continuous engagement with the funding agency. Improvements in project cash flow can significantly ameliorate the associated delays in project delivery. Therefore, improvements in the in-house processes of contractor selection and the decentralisation of the project governance structure of the funding agency, can facilitate timely inspection, monitoring and evaluation, which enables the quick release of necessary project funds.

Keywords: adequate funding, construction projects, delays, Delphi technique, funding agency, project governance.

Reference

Design and Operation of Low Energy Consumption Passive Human Comfort Solutions

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Abstract

The rapid growth during the last decade has been accompanied by active construction, which in some instances neglected the impact on the environment and human activities. Policies to promote the rational use of electric energy and to preserve natural non-renewable resources are of paramount importance. Low energy design of urban environment and buildings in densely populated areas requires consideration of a wide range of factors, including urban setting, transport planning, energy system design and architectural and engineering details. The focus of the world’s attention on environmental issues in recent years has stimulated response in many countries, which have led to a closer examination of energy conservation strategies for conventional fossil fuels. One way of reducing building energy consumption is to design buildings, which are more economical in their use of energy for heating, lighting, cooling, ventilation and hot water supply. However, exploitation of renewable energy in buildings and agricultural greenhouses can, also, significantly contribute towards reducing dependency on fossil fuels. This will also contribute to the amelioration of environmental conditions by replacing conventional fuels with renewable energies that produce no air pollution or greenhouse gases. This study describes various designs of low energy buildings. It also outlines the effect of dense urban building nature on energy consumption, and its contribution to climate change. Energy saving measures in buildings are also presented.

Keywords: renewable technologies, built environment, sustainable development, mitigation measures.

References

Personnel Utilisation in Project Management Office: A Real-World Application

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Abstract

The project management office (PMO) is an organisation structure with the authority to ensure efficient resource utilisation, proper division of work, and interaction among project units. Although, a PMO often operate within an existing structure (e.g. matrix), the complexity associated with contingency features and human dynamics of its design elements can influence efforts to achieve a project objective. In this study, using quantitative methods of operations research, the structure of a PMO was modeled to maximise personnel utilisation function. The work content and numbers of employees at Supervisory (S), Management (M) and Top Management (TM) levels were determined through work sampling methodology. The human utilisation factor of the firm and span of control at S, M and TM levels were (0.9640, 0.8608, 0.8674) and (6,3,3), respectively. The PMO can effectively discharge its duties with 38, 6, 2 and 1 personnel at operation, supervisory, managerial and managing director positions, respectively. This study revealed how operations research paradigm can enhance research opportunities in project-based organisations and organisation design theories. The use of quantitative approach in organisation design can optimise manpower utilisation decisions and associated cost implications in a Project Management Office.

Keywords: project, project management office, organisation structure, personnel, modeling.

References

Comparative Assessment of Deterministic Methodologies for Estimating Excavation Productivity

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Abstract

This paper investigates the prediction capability of deterministic methodologies in estimation construction productivity in earthmoving operations. Published literature includes several estimation methodologies stemming from (a) equipment manufacturers’ manuals, (b) editions from German contractors’ associations or individual researchers and (c) textbook editions. The purpose of this research is to assess the yielded productivity estimation results under the prism of fourteen estimation methodologies. It is – to the authors’ best knowledge – the first research attempt for the comparative evaluation of such a diverse set of estimation methodologies, with the aim of quantifying their effects on the operations analysis in earthmoving works. A uniform mathematical modelling approach is used to formulate the relevant estimation equations and, subsequently, a real-case scenario of an earthmoving project in Greece is used as a benchmark against which the robustness of each methodology is assessed. A sensitivity analysis on main productivity factors concludes the research. The preliminary results indicate that equipment manufacturers’ methods are more optimistic and present higher sensitivity to specific productivity factors (e.g. swing angle), whereas the German-oriented approaches are more conservative with less variability due to differing productivity factors.

Keywords: construction productivity, estimation, excavation, statistical analysis.

References


Significant Green Retrofit Technologies: A Perspective of Sustainability Pillars

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Abstract

Green Retrofit (GR) technologies have been introduced as one of the solutions to achieve sustainability in existing buildings. However, the significance of GR technologies is varied with their implications on sustainability pillars: environmental, social, and economic. Hence, this study was carried out to identify significant technologies in terms of each individually as well as all three pillars. A survey among a sample of thirty (30) experts who have involved in green building activities, having sound knowledge about GR technologies offered their views on the relative significance of those technologies using the mean and standard deviation values. According to analyses, most of the significant technologies were in the main category of energy & atmosphere (E&A) and water efficiency (WE) and contributing to sustainability from all perspective. The top four technologies include use of solar energy power generation systems, energy-efficient equipment, biomass boiler, and green roof technology. However, the level of significance of GR technologies varies according to selected sustainability pillar(s). Therefore, the study recommends that the sustainability principles should be one of the criteria along with others in selection of appropriate GR technologies for a given context.

Keywords: Green Retrofit, sustainability, sustainability criteria, technologies.

References


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Abstract

The paper is a research result of recent publications of the same authors regarding the use of alternate means in aerial work. It presents general assumptions and results of the studies on theoretical and practical aspects of providing selected services with alternative technical means. The study focused on the areas of aircraft application in building and utilising linear objects, but its results can be used in a wide range of aerial work. Specific conditions for the chosen area induce the formation of the base of rules and the base of knowledge in applying alternative technical means. It will be essential to prepare the approximate inference standards leaning on insecure or incomplete knowledge. Additionally, the article contains a list of examined factors influencing the adaptation of Unmanned Aircraft Systems as components of the model of conversion of services that could have an impact on decision-making in terms of applications of alternative air platforms. The presented method of using machine learning for decision making in that area gives a possibility of model development and innovation in aerial work.

Keywords: aerial work, service provision effectiveness, process management, air services, air-services, Unmanned Aircraft Services (UAV/RPAS), alternative technical means.

References

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Support for the Development of Technological Innovations at an R&D Organisation

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Abstract

The paper is focused on the problem of supporting the management of the processes of the generation, realisation, and the implementation of technological innovations. It is aimed at presenting an original methodology for supporting the development of technological innovations at an R&D organisation. The development of the methodology is preceded by extensive literature review and case study analyses, and is based on the author’s practical experience in managing research project. The methodology assumes the integration of the triad of tools, i.e. future research (foresight), technology assessment, and organisational capabilities assessment. An original matrix approach is adopted where the individual tools in the triad are applied in a way enabling their mutual complementation at successive stages of the innovation process. It is an original contribution to the body of knowledge as an integrated use of the tools in question is still a rare phenomenon and the identified single examples relate mainly to combining only two out of the three considered tools. Furthermore, the tools are not used comprehensively, but only selectively, e.g., at some stages of innovative processes. The usefulness of this methodology has been demonstrated in the course of executing strategic research projects in the field of machine construction and maintenance.

Keywords: R&D organisation, technological innovations, future research, technology assessment, organisational capabilities assessment.

References

Technology Commercialisation Processes at R&D Organisations

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Abstract

The problems related to R&D results commercialisation constitute an area of in-depth analyses due to a significant importance of applying research results in the economy, high level of their complexity and numerous barriers hampering effective application of innovations in enterprises. The remedy for overcoming or limiting the existing barriers are effectively conducted commercialisation processes with the use of dedicated models. Although commercialisation processes models are a subject of theoretical investigations and practical applications, there is a research and empirical gap concerning commercialisation processes models for the use by R&D organisations. The article is aimed at presenting a proposal of such a model, composed of several hybrid submodels, meant for the use at R&D organisations, based on the input criteria (the type of innovation, the production scale) conditioning the choice of the commercialisation path (sale, licence, service, spin off), while taking into account the sets of dedicated marketing tools (ATL, BTL). The model, with a focal point of an R&D result (innovation), comprises the phase from the idea generation (R&D concept) to the phase of its marketisation (launch). The article presents good practices on the use of the developed model while implementing R&D results in the fields of, e.g., materials engineering and optomechatronics.

Keywords: commercialisation, R&D organisation, models of the commercialisation process, marketing tools.

References

Assessment of Construction Risks in Projects Funded by External Sources in Jordan During the COVID-19 Pandemic

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Abstract

In general, construction projects suffer different risks during their lifecycles, depending on the project specifications and environment. The COVID-19 pandemic has provided many challenges and difficulties for the construction industry. This study presents an assessment of 47 major risks affecting construction projects funded by external sources. The studied risks were categorized by using PESTLE technique that includes political, economic, social, technological, legal, and environmental risks. A questionnaire survey was conducted on thirty-four construction organizations who implemented or supervised projects funded by external sources. The six risk groups were assessed in terms of the probability of occurrence and the severity on both project cost and project schedule. In conclusion, the results showed that the environmental and legal risks are the most important groups of risks according to the respondents’ opinions. The results showed that the most important risk factors are the difficulty of issuing licenses and permits, and the inappropriate definition of scope of work. This study indicates the difficulties and risks faced by construction organizations involved with construction projects funded by external sources during the COVID-19 pandemic. This will help managers and fund providers to make decisions regarding risks during difficult health conditions. Although this study was conducted in Jordan, it can be applied in other countries with similar properties and conditions.

Keywords: construction projects, risk factors, COVID-19 pandemic, crisis, external sources, PESTLE, questionnaire survey.

References

Effect of Zirconium Addition on the Wear Resistance of Aluminum Grain Refined by Ti-B: A Three Dimensional Presentation

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Abstract

In this paper a review analysis and the presentation of three-dimensional effect of addition of zirconium, Zr, on the wear resistance of commercial aluminum using a pin-on-disc apparatus at different loads, speeds, and periods and the loss of mass was measured at each condition then taken as a criterion for comparison. Al-Zr master alloy was prepared followed by Al-Zr, Al-Ti-B, and Al-Ti-B-Zr micro alloys preparations. After the casting process that produced cylindrical workpieces that were used in the wear test, a modified and calibrated wear tester machine was used. The obtained results, presented three-dimensionally, indicated that the mass loss is the function of the three parameters: load, speed, and time. The speed was found to be the main affecting factor, where the grain refined alloy is recommended to work under the medium speed and load conditions for prolonged service. The wear resistance of aluminum is appreciably enhanced by the addition of Ti-B as a grain refiner, but is deteriorated by adding Zr. This work is original in that it was conducted on a set of Al micro alloys and the study was performed three-dimensionally i.e taking into account load, speed, and time.

Keywords: aluminum, grain refinement, titanium-boron, zirconium, three dimensional, wear resistance.

References

Challenges and Barriers to Connect Manufacturing Continuous Improvement Processes to Industry 4.0 Paradigms

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Abstract

The article exposes the difficulties in integrating the vectors ‘industry practices 4.0’ and ‘World-Class Manufacturing’ due to the rapid expansion of production systems and the increasingly complex data monitoring. The methodology applied was a study of multiple cases, with the aid of a semi-structured questionnaire. Responses from 16 companies were analyzed. The companies of different expertise, all of large size represented five countries and three continents. The results show when organizations’ strategy is linked to industry 4.0 practices and the World-Class Manufacturing method. The outcomes also demonstrate that human resources are essential in this integration. However, the practices of continuous improvement do not keep up with the speed of development that the industry 4.0 model proposes, requiring studies directed to the vectors ‘World-Class Manufacturing’ and ‘industry practices 4.0’. Although if there is a coexistence of improvement and innovation in world-class manufacturers, the literature has not yet provided a complete understanding of how this coexistence can be achieved at the manufacturing level. Like this, the authors of the article present the main actions to overcome these barriers. The conclusions drawn suggest that the barriers found for the increasing progress of these procedures, such as the costs associated with the use of technologies, the lack of knowledge of the methods and tools applied, the lack of trained and qualified human resources and the resistance of people to the use and application of the new practices adopted, has been shown to be robust in the face of the desired progress.

Keywords: Industry 4.0, World-Class Manufacturing (WCM), continuous improvement, strategy, case studies, human resources.

References

Ambidextrous Governance Impact on Supply Chain Performance – Buyer and Supplier Perspective

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Abstract

One of the most important issues in today's supply chain management is a choice of governance mechanisms that foster receiving the highest possible supply chain performance. Supply chain governance consisted mainly of two dimensions: contractual and relational. The substitute perspective emphasises that governance mechanisms are substitutes. However, in the dominant perspective governance mechanisms function rather as complements. The interaction of relational and contractual governance is called ambidextrous governance. The problem of how different supply chain governance mechanisms affect supply chain performance is still not solved. Additionally, the research shows different impact of governance mechanisms on collaboration in supply chain and its influence on performance for buyers and suppliers. Therefore, the purpose of the study is to analyse the ambidextrous governance impact on supply chain performance. Models taking into account buyers and suppliers’ perspective were developed. The study is based on Computer Assisted Telephone Interviews among buyers and suppliers representing manufacturing companies. The results prove that supply chain performance is influenced by relational governance in case of buyers and suppliers. Furthermore, the presence of a second-order construct called ambidextrous governance and its effect on supply chain performance for suppliers was proved. However, in case of contractual governance the impact on performance is significant only for suppliers.

Keywords: supply chain, ambidextrous governance, relational governance, contractual governance, supply chain performance, buyers, suppliers, model.

References

Exercising Hybrid Statistical Tools GA-ANN and GA-ANFIS to Optimize Underwater Friction Stir Welding Process Parameters for Tensile Strength Improvement

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Abstract

This work investigates the tensile strength (σUTS) of tests ASTM D3039 specified parts manufactured using UWFSW by Al 6082-T6 material. Three parameters were varied in the fabrication of test specimens: rotational speed from 1000 to 1800 rpm, traveling speed from 4 to 10 mm/s, and shoulder diameter from 10 to 20 mm. Using a polynomial fitting model of second-order, hybrid optimization methodologies such as artificial neural network-genetic algorithm (ANN-GA), and adaptive neuro fuzzy interface framework-genetic algorithm (ANFIS-GA) are also used to optimise these process parameters. ANN-GA achieved the highest precision of 98.99%, resulting in optimum parameters like rotational speed 1800 rpm, travelling speed 4 mm/s, and shoulder diameter 15 mm to produce a maximum tensile strength of 199.0212 MPa. The hybrid models developed could be used to predict and maximise specific process parameters and impacts for a variety of industrial situations.

Keywords: underwater friction stir welding, ANN-GA, ANFIS-GA, RSM-GA, tensile strength.

References

Extended EDAS and VIKOR Method for Fuzzy Multi-Criteria Decision-Making: An Application to Underwater Friction Stir Welding

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Abstract

This work provides a method to help optimize the underwater friction stir welding (UFSW) process of pipes based on the fuzzy multi-criteria decision making (FMCDM) methodology. In the optimization phase ambiguity and vagueness are dealt with using linguistic variables parameterized by triangular fuzzy numbers. In the UFSW an important consideration is the cooling effect during the process on the surrounding water. A study is being conducted to conclude and optimize the effects of the UFSW process parameters on the welded joint’s mechanical properties. Experiments were performed at three levels of three parameters: tool shoulder diameter tool, tool rotational speed and travel speed. For optimization, the MCDM methods were applied as an approach for selecting the optimal values of the parameters. Using MCDM in optimizing the UFSW process is rare and has a limited number of publications. The MCDM techniques used are the Evaluation Based on Distance from Average Solution (EDAS), VlseKriterijumska Optimizacija I Kaompromisno Resenje (VIKOR), hybrid Fuzzy – EDAS and hybrid Fuzzy -VIKOR to find the optimum process parameters which maximize the values of responses: the UTS and the VHN of the welded joint. Results showed that hybrid Fuzzy-EDAS and Fuzzy-VIKOR theory can solve the limitations of using EDAS and VIKOR when uncertainty problems exist in the data. For the used parameter ranges the optimum values were 20 mm, 1800 RPM and 4 mm / min respectively for shoulder diameter, rotational speed and travel speed.

Keywords: UWFSW, aluminium pipes, EDAS, VIKOR, hybrid Fuzzy -EDAS, hybrid Fuzzy -VIKOR.

References

Significant Factors Affecting the Life Cycle Cost Elements of a Building

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Abstract

Life Cycle Cost (LCC) is a vital decision-making tool for realization of investments. However, it is often challenging to forecast the LCC of a building as it comprises several elements which are influenced by a range of factors. Hence, this study was carried out to identify the significant factors affecting LCC elements of buildings. Twenty-six factors identified through a comprehensive literature review were presented to thirty-four experts in the construction industry through a questionnaire survey to collect their views on the significance of those factors. Weighted mean was calculated for each factor to determine the relative significance and thereby identify the affecting level of each factor for LCC elements of buildings. The six most significant factors include: plan shape of the building, size of the building, number of occupants, quality of materials and equipment used, the function of the building, and technology used. Further, the cost of most elements, such as utility, administration, services maintenance, cleaning, external work, and maintenance management is highly influenced by the function of the building. Hence, the study recommends that having a clear understanding on the factors affecting LCC elements is important to proper LCC planning.

Keywords: building; factors influencing LCC; LCC; LCC elements.

References

Thinking and Shaping Industrie 4.0 Ecosystems for Sustainable and Resilient Futures

Björn Sautter

Abstract

How can we think and shape collaborative manufacturing networks in digital ecosystems to support Sustainable Development Goals of the United Nations? Since the introduction of “Industrie 4.0” ten years ago – igniting the vision of a fourth Industrial Revolution – progress has been made in digitally connecting the shopfloor with the business level within smart factories. According to the new 2030 vision for Industrie 4.0, the collaboration between factories and complementary actors in flexible and globally networked value creation systems is at the forefront. An analysis of practice examples in that context revealed three development paths towards a digital, networked and sustainable manufacturing industry of the future. This article describes and analyses the collaborative vision and scenario building processes for Industrie 4.0 based on the concept of a multi-actor, multi-level and multi-sector policy approach. Key findings underpin the relevance of interpersonal relationships and networks based on mutual trust for successfully thinking and shaping futures in a participatory, systemic and integrative way. Based on some practical implications for designing collaborative manufacturing networks in digital ecosystems the article concludes with a call for collective action towards the Sustainable Development Goals to be achieved by the year 2030.

Keywords: Industrie 4.0, Sustainable Development Goals, futures, digital ecosystems, collaboration.

References

Exact Solution of a Variable Temperature Plate in a Porous Medium

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Abstract

This paper studies the heat transfer (free convection) over a variable temperature plate in porous medium. The governing differential equations are non-dimensionlized and solved by the Laplace transform technique. Exact solutions for the non-dimensional variables (velocity and temperature) with variable temperature plate are obtained. The solutions agree with the existing literature. The effects of temperature and velocity variations of the plate are analysed for different Prandtl number, Grashof number and for Newtonian and non-Newtonian fluids.

Keywords: free convection, porous medium, variable temperature, Laplace transform, exact solution.

References

Multidimensional Aspects of Risk-Taking in Entrepreneurs: a Global Study

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Abstract

The current study presents in-depth analyses of five distinct risk dimensions concerning age, gender, country of origin and existence of an entrepreneur in the family. A unique aspect of this study was the repeated analyses for the same hypotheses, using data from three independent rounds of data collection. This design made it possible to identify inconsistencies in any data trends. Individuals who had an active enterprise had significantly higher scores for risk-taking propensity and profit-contingent risks than aspiring and non-entrepreneurs' groups across all three rounds of data collection. On the other hand, entrepreneurs did not have significantly different scores for risk aversion than the other two groups. A series of linear regression analyses indicated that younger males from a developing country and existence of an entrepreneur in a family had significantly higher risk-taking propensities. Inconsistencies in results for risk-enjoyment and creative risk dimensions may be better understood through qualitative, longitudinal research.

Keywords: entrepreneur, risk-taking, personality, entrepreneurial personality, social entrepreneur.

References

The Adoption of Robotic Process Automation Technology to Ensure Business Processes during the COVID-19 Pandemic

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Abstract

The study provides knowledge on the adoption of the Robotic Process Automation (RPA) technology during the COVID-19 pandemic in 110 Polish service companies. As this research was the first of its kind in Poland, the objectives of the CAWI survey were to identify the technology features of the RPA technology and the related determinants and barriers influencing the adoption of the RPA as well as to determine correlations between them. Moreover, the statistical analyses involved considering whether there were differences in the evaluation of individual RPA technology features, mainly in terms of perceived usefulness, ease of use, security and functionality. The results of the study show that almost 60% of the respondents indicated that robotization tools allowed maintaining continuity of business processes during the pandemic. The highest rated were features related to usefulness of the RPA technology. Furthermore, the analysis pointed to the most frequently indicated barriers to technology implementation that were related to non-optimized, non-standardized and non-digitized processes with a large number of exceptions. The study contributes to scientific knowledge and has practical implications for process automation decision-makers concerned with the adoption of the Robotic Process Automation technology. The obtained results can help them to understand the potential enablers and barriers to the adoption of software robots by enterprises and may be an important determinant for companies’ managers in the area of implementation of such solutions.

Keywords: Robotic Process Automation, RPA, business processes, software robots, business continuity.

References

What Can We Learn from Critical Incident Technique in Investigating the Factors of Power Dynamics in Dyadic Business-to-Business Relationships?

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Abstract

In business exchanges partners are rarely similar in terms of their resources and competencies, which cause differences in power. The power asymmetry can be defined as the difference between the dependence level of the other relationship party which can increase or decrease over time of the relationship. The power asymmetry is not a static concept as it changes over time, which suggests the logic of dynamic viewpoint on power and power asymmetry. In our study we distinguished two types of factors being externally positioned with regards to the relationship, factors occurred inside or outside the companies which constitute the relationship. It is a need for better understanding of power dynamics factors in business-to-business relationships, which we recognized as a research gap. The aim of the article is to identify and organize the factors which caused the most significant increases and decreases of power in the business-to-business relationships from the weaker suppliers perspective in manufacturing industries context. The applied research method is focused on a qualitative approach, in particular essays writing by 23 suppliers’ representatives to analyse the factors of power change. We used Critical Incident Technique to identify situations in which the power increased and decreased in researched relationships the most considerably.

Keywords: power asymmetry, power dynamics, Critical Incident Technique.

References

Formulation of Change Management Model for Achieving Business Excellence in Large Organizations

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Abstract

This study aims to investigate how the different leadership levels can apply change management successfully in larger organisations in order to facilitate business excellence. First, change models and leadership theories are analysed under EFQM principles, as it is selected as the framework for excellence. Then, a theoretical change management process is synthesised in alignment with leadership organisational levels. The research process is enriched by 6 semi-structured interviews in two different case studies, while the previous findings are validated through 3 structured interviews in a third case study. The analysis shows that although leaders believe that they identify the need for change, sometimes they do not, or they make sense of it too late. As such, a five-step change process model is created as the conclusion of the theoretical and case studies analyses. The value of this research is the connection between theory and practice as it tries to identify the responsible gaps for wrong or not fully successful organisational change projects. The suggested model simplifies the theory into practical steps while the success factors ensure that the enablers can support change efficiently. Further research based on the adoption of Senge’s systems theory for network leadership level is recommended to organisations.

Keywords: business excellence, change management, model, process.

References

Foresight as a Tool for Participatory City Management. Evidence from Poland

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Abstract

All over the world, there has been a growing demand for innovative ways of managing cities, due to the continuing problems in many areas of urban life. Tools that involve multiple stakeholders in working together to create shared benefits are now essential in developing new solutions in cities. One such tool is foresight. The aim of the article is to verify the author’s methodology of applying foresight research in creating a vision of city development. The study was conducted as part of the social project “Zambrów Foresight 2040”. As a result of the research process, 4 scenarios were developed – visions of the development of the city of Zambrów in the perspective to 2040: the names of scenarios are the following: S1 – Winning Zambrów, S2 – Neglected Zambrów, S3 – Dead Zambrów, S4 – Worried Zambrów. In addition, 14 actions were identified that need to be taken in the perspective until 2040 in each area in order to make the S1 – Winning Zambrów scenario a reality. The results obtained from urban foresight projects can definitely be used as a set of data and proposals for socially acceptable solutions when creating long-term city development strategies and many other documents important for the city’s functioning.

Keywords: foresight, city management, participation, vision, Poland.

References

IoT-Based Smart Cities: a Bibliometric Analysis and Literature Review

Katarzyna Szum

Abstract

Modern cities face many challenges related to globalisation, metropolisation and digitalisation. The smart city concept, which has been gaining popularity in recent years, is considered an answer to their needs. One of the paradigms of modern smart cities is the Internet of Things. This article aims to identify the main research directions and trends in the scientific literature in the field of Internet-of-Things-based smart cities. The author of the paper conducted a bibliometric analysis of publications from 2012-2021, collected from the Web of Science, Scopus and IEEE Xplore databases. The methodology includes: (i) the selection of databases and key words, (ii) defining search criteria, (iii) data export, creation of an aggregate database and record selection, and (iv) the analysis of the results and identification of the major research trends. The study involved 1019 publications. The last stage of the research process identified the leading countries, institutions, journals, and authors in terms of publication activity, as well as the most frequently occurring terms. The key word analysis allowed identifying five main research directions: IoT application domains in smart cities, IoT architecture for smart cities, energy, security and privacy and data. Within each area, the main research themes were identified, and selected publications were reviewed.

Keywords: smart city, Internet of Things, IoT, bibliometric analysis.

References

Innovative Mobility Solutions in Baltic Sea Region Rural Areas

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Abstract

The research problem discussed in the paper is innovative mobility solutions in rural areas. The aim of the study is to identify the specifics of the different research methodologies and innovative mobility solutions in the Baltic Sea rural regions. The article consists of two parts: theoretical and practical. The first part presents the literature review of the rural areas mobility problems and innovative solutions in this field. The theory is confronted with the results of empirical research. The study was conducted between 2019 and 2021 using different research methodologies. The research was carried out by different institutions like universities and local governments representing 7 countries. Both quantitative and qualitative methodologies were used. The research confirmed the assumed concept and demonstrated an interesting differentiation of the methodologies and relatively many innovative mobility solution proposals in rural regions. The most common and expected solutions by the local citizens are electric bikes and cars as well as bike sharing model. The paper is novel in character mainly because of the presentation of the juxtaposition of different methodological approaches and innovative mobility solutions. The paper fills this gap in both theory and practice.

Keywords: innovations, mobility models, mobility research, rural areas.

References

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Determination of Blackspots by Using Accident Equivalent Number and Upper Control Limit on Rural Roads of Thailand

Wanit Treeranurat, Suthathip Suanmali

Abstract

The Department of Rural Roads (DRR) is one of highway authorities in Thailand that is responsible for over 48,000 kilometers of rural roads and highway networks. One of its responsibilities is to provide better road safety management. In road safety procedures, blackspots are usually identified by observing the frequency of accidents that occurred at a particular road section. This research is aimed to develop a model that includes levels of severity of accident in the process of blackspot identification. The classification of severity levels includes deaths, serious injuries, minor injuries, and damaged property only. The Analytic Hierarchy Process (AHP) is employed to derive the weight of each severity level. The identification model is developed using Equivalent Accident Number (EAN) together with Upper Control limit (UCL). The data applied in the model are obtained from road accident investigation of DRR. The five roads, including Nakhon Ratchasima 3052, Chonburi 1032, Nonthaburi 3021, Samutprakarn 2001 and Chiangmai 3029 have been selected based on the top frequency accident recorded in the last three years. Based on the results of blackspots founded in the study, most accidents occurred from frontal and rear ends by road users driving above the speed limit. Recommendations are also discussed.

Keywords: blackspot, equivalent accident number, road safety, rural roads.

References

Inventory Management of the Air Conditioner Industry Utilizing the System Dynamics Modelling Approach

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Abstract

Air-conditioner is commonly used in high-temperature countries, including Thailand. Moreover, global warming and Covid-19 pandemic raise demand of high-quality air conditioners in the country. The air conditioning companies then need to properly manage their inventory to ensure the stock availability. This study examines and minimizes the inventory cost of air conditioners in the long-term utilizing the system dynamics (SD) modelling approach. Key factors affecting air conditioners’ demand in Thailand are considered in the developed SD model. The results show that the most suitable order quantity that leads to the lowest inventory cost is 4,201 per order. The air conditioning companies may use the developed SD model to test with different demand and select the most suitable order quantity that will bring the lowest inventory cost in the long term.

Keywords: air-conditioner, inventory management, order quantity, system dynamics modelling.

References

An Innovative Design Approach to Meet the Customer Requirements: A Case Study of Charcoal Briquettes Packaging

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Abstract

It is a known fact that design plays a very important role on effective and efficient marketing and customer satisfaction of any kind of products. New products have to be dramatically designed and manufactured: they are expected to meet the needs and requirements of customers, differ from the competitors, and be friendly with the environment. Thus, it is important to work closely with customers to make sure that the products will fulfil their needs and requirements. This research was to propose an innovative design approach for charcoal briquettes packaging design to meet the customer requirements. It has four phases. First, it was to explore the customer’s requirements and translate the customer’s requirement to product characteristics. Second, it was to explore the customers’ perceptions to product visual form through emotional design approach. Third, it was to create the new product packaging. Customers’ requirements and customer perceptions were integrated to create a new charcoal briquettes packaging. Forth, it was to evaluate possible impact on the environment of a new packaging design and process during its life cycle through carbon footprint values. Based on the results found in our study, it appeared that customer requirements play an important role of design and production as well as functional design of briquette packaging. The innovative design approach can be used to guide designer design the charcoal briquettes packaging to meet the requirements and perceptions of customers, illustrate the product identity and be friendly with the environment.

Keywords: customer requirements, emotional design, quality function deployment, brand identity, life cycle assessment.

References

Factors Determining the Development of Printing Technologies in Poland in Long-Term Perspective

Cezary Winkowski

Abstract

The dynamics of change in the area of innovative technologies, the continuous development of industry, as well as advancing globalization and increasing competition, force to implement and use new technologies or improve existing ones. This article attempts to identify the factors that determine the development of printing technologies in Poland. The research process included the following methods: desk research, STEEPVL, interviews, expert panel, brainstorming, survey research. The evaluation process of factors determining the development of printing technologies in Poland was conducted among printing companies in PKD section C, division 18 printing and reproduction of recorded media, \(N=370\). The surveyed group consisted of technologists and management staff of the following departments: production, technology, and quality control. As a result of the conducted research process, key factors were identified in terms of importance and uncertainty with a perspective of 2030. The conducted research helped to fill the gap manifesting itself in the lack of determination of the influence of factors of the internal and external environment of enterprises that influence the development of the printing industry in Poland in the long-term perspective.

Keywords: STEEPVL, printing technologies, printing industry.

References


Towards Achieving Engineers’ Career Satisfaction in the Australian Public Sector: Integrated Structural Equation Modeling and Bayesian Networks Approach

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Abstract

This paper proposes a novel approach that integrates the capability of empirical validation of structural equation modelling (SEM) and the prediction ability of Bayesian networks (BN). The Hybrid SEM-BN approach was used as a decision support framework to examine the interplay between salient organizational constructs and their ability to influence engineers’ career satisfaction in the Australian Public Service (APS). The results emphasize that the ambidextrous culture for innovation was the most important factor that needed to be implemented in their organization. Managerial implications are recommended for senior managers on how they can implement innovation culture to increase workplace innovation, which could, in turn, help reduce the turnover rate of engineers employed in the APS.

Keywords: structural equation modeling, Bayesian networks, career satisfaction, engineer, Australia.

References

Factors Influencing the Adoption of Building Information Modelling (BIM) in the South African Construction Built Environment (CBE), from a Quantity Surveying Perspective.

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Abstract

The construction industry has often been described as stagnant and non-innovative, mainly due to the lack of innovation and the use of innovative ways of working to improve the state of the industry. The adoption of Building Information Modelling BIM within the Construction Industry has been relatively slow and in particular in the South African Construction Build Environment (CBE). A quantitative research approach, grounded in a theoretical framework, was used for the study. A descriptive statistics method was used to analyse data collected through a distributed questionnaire used for data collection. The study was limited to the professional consultants within the South African Construction Built Environment (CBE). The study concludes that the South African CBE still operates mainly in silos and without a centralized coordinated incentive. BIM adoption will continue to be implemented in an organic manner. Project teams are mostly project-orientated, seeking solutions for immediate project solutions and adopting the most appropriate technologies for the team’s composition.

Keywords: Building Information Modelling (BIM), South African Construction Built Environment (CBE), design silos.

References


Analysis of Simulation of Different Forms of Production Organization

Patryk Zwierzyński

Abstract

Globalization has led to a situation where an important feature of enterprises is the ability to react quickly to emerging opportunities. A large variety of products, a progressing fourth industrial revolution, one of the main elements of which is the individualisation of products, forces manufacturers to design agile production processes. Companies need efficient and flexible production systems to meet customer requirements. Currently known systems that meet these requirements are cellular production (CM) and the Japanese variety of cellular production referred to as seru production. Both of these systems are similar to each other and are characterized by their ability to produce small production series of products with a short life-cycle, a large variety of assortment produced. In this publication, the author has calculated and compared the work efficiency index of each variant with the work efficiency index of a traditional assembly line with a serial structure. The results of each variant of converting the assembly line with a serial structure into a cell structure were compared with the results obtained in a traditional assembly line. The juxtaposition of results was made in context of manufactured products, average production time, costs, average employee utilization.

Keywords: cellular manufacturing, cellular production, assembly line, computer simulation.

References

Selected Aspects of Inconel Alloy Green EDM Machining Development

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Abstract

Inconel alloys are one of the most difficult to machine materials with conventional machining methods. The alternative which can be used is electrodischarge machining (EDM). EDM process requires dielectric utilization, during the research the eco-friendly approach and gaseous dielectrics were used. The main aim of this research was to determine the influence of EDM milling in carbon dioxide used as dielectric in two configurations – with and without external workpiece cooling with deionized water on the EDM technological parameters (material removal rate, electrode wear) as well as technological surface integrity and surface structure. The EDM machining was conducted on the research test stand equipped with electrodischarge generator. The dry electrodischarge machining of cuboid workpiece with tubular cooper electrode with outer diameter of 1 mm, in the EDM milling kinematics, was carried out in the carbon dioxide as a dielectric supplied to the machining gap through the channel in the working electrode, in two configurations. Described in the paper dependences and differences between two machining variants are believed to be related with the changing of the machining process mechanism (material oxidation occurs) as well as better heat dissipation from the machining area.

Keywords: electrodischarge machining, Inconel alloy, dry EDM.

References
