



Book of Abstracts

DPISE 2023 Workshop

31st May 2023



Universidade do Minho
Escola de Engenharia



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Preface

This book compiles the abstracts presented at the 2023 Doctoral Program in Industrial and Systems Engineering (DPISE/PDEIS) Workshop.

The workshop took place on May 31st of 2023 at Campus Azurém, Guimarães.

This meeting was created to promote the doctoral programs scientific research areas, by getting together students, supervisors, and researchers with a special interest in the research areas covered by the doctoral program. This was the 7th of a series of annual meetings engaging DPISE members.

The workshop was held in a single day devoted to the presentation of all the DPISE students' individual projects.

The Editors would like to thank all the authors/students of DPISE for their valuable contribution and for making DPISE 2023 Workshop such a big success.

Paula Ferreira
*Organizing Committee
Chair, Coordinator of DPISE*

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Program

DPISE 2023 PROGRAM			
2:00 PM	Opening Session (Room: 0.08/Ed.11)		
	President of the School of Engineering, Professor Pedro Arezes Director of ALGORITMI Centre, Professor José Machado Deputy Director of the Department of Production and Systems, Professor Nelson Costa Director of DPISE, Professora Paula Ferreira Best Papers Awards Announcement		
PARALLEL SESSIONS #A			
	Session A1 Room: 0.08/Ed.11 Moderator: Jorge Cunha	Session A2 Room: 0.07/Ed.11 Moderator: Lino Costa	Session A3 Room: 0.11/Ed.11 Moderator: Leonilde Varela
2:30 PM	Hospital Operations Management - sensor fusion and data analytics for the improvement of patients' flow Erik Teixeira Lopes	Whole-system effects of transport electrification in Portugal Alaize Dall-Orsoletta	Characterization of the perception of high frequency vibrations of the hand Emanuel Teixeira Silva
2:45 PM	Adoption of modern training techniques and their influence on the financial performance of companies Lauro Eduardo Magrini	The importance of open design João Dias	Contributions to the industrialization process in the construction industry Sara Rego da Costa
3:00 PM	IMUs-based human breathing mechanics measurement wearable device Rodrigo Brandão Martins	On optimizing firefighting resources using a genetic algorithm Marina Araújo de Matos	User requirements and stakeholder considerations in the implementation of Robotic Process Automation (RPA): A multiobjective model for efficiency evaluation Leonel Filipe S. Patrício
3:15 PM	Multivariate Statistical Method to Detect Drowsiness in Drivers Ana Rita Oliveira Antunes	Multi-objective optimization in job shop scheduling problems with unrelated machines Francisco Álvaro dos Santos	Smart and Parallel General Variable Neighborhood Search for the Pollution-Routing Problem Mário Leite
3:30 PM	On the development of a Rapid Assessment Method of the potentiality for the implementation of collaborative robots in manufacturing workstations André Cardoso	Development of a questionnaire to understand future users' preferences about human-centric Autonomous car interior Hatice Kirkici Gonçalves	A Critical Overview of Shale Gas Exploitation Impact Andrea Gomes

3:45 PM	Break		
PARALLEL SESSIONS #B			
	Session B1 Room: 0.08/Ed.11 Moderator: Sameiro Carvalho	Session B2 Room: 0.07/Ed.11 Moderator: Celina Leão	Session B3 Room: 0.11/Ed.11 Moderator: Anabela Tereso
4:05 PM	Application of artificial intelligence algorithms: the case of olive growing João Mendes	Barriers of Kanban Implementation in Agile Project Management Ingrid Teixeira de Souza	Multi-Project Scheduling Under Uncertainty: an approach to exploit resource flexibility Marzieh Aghileh
4:20 PM	Intelligent System for Occupational Safety and Well-being in the Retail Sector Inês Sena	A safety index to improve Humans-Robots collaboration towards Industry 5.0 Eduarda Manuel de Barros Pereira	Assessment of consumer willingness to participate in demand-side management Sara Golmaryami
4:35 PM	Lean Safety - The impact of lean on safety José Carlos Sá	Influence of the Urban Waste Collection Strategy on Work-related Musculoskeletal Injuries Pamela Consuelo Castro e Sant'Anna	Enhancing Stakeholders Communication in Non-Governmental Organizations: Exploring Effective Governance Models Paulo Manuel Ferreira de Sousa
4:50 PM	Supply Chain Quality Management and Industry 5.0 - A Literature Review and Analysis Joana Lazzaris	Industry 4.0: The Challenges of a Revolution Pedro José de Araújo Pinheiro	Socioeconomic Evaluation of Projects: A Methodological Contribution Thomaz Fagá
5:05 PM	Applying deep learning algorithms to keep track of emotions during online training Walter Aoiama Nagai	Digital Transformation in the Water Sector: Present Situation, Future Prospects, Challenges and Opportunities - A Case Study on Operational Alerts and Notification Frederico Lopes	Identification and Categorization of Data Science Project Barriers Natan Labarrère Mendes
5:20 PM	Closing Session (Room: 0.08/Ed.11) Best Posters Awards Announcement		

Session A1

31st May 2023, 02:30 P.M. – 03:45 P.M. | Room: 0.08/Ed.11

Moderator: Jorge Cunha

Hospital Operations Management - sensor fusion and data analytics for the improvement of patients' flow

Erik Teixeira Lopes (erik.lopes05@gmail.com)

Abstract. The healthcare industry comprises intricate processes, involving diverse stakeholders and multiple clinical outcomes that affect decision-making. The duration between patient arrival and treatment is a critical factor affecting healthcare outcomes, presenting an opportunity to enhance the quality of care provided. Emergency departments have even more complex processes, given the unpredictability of demand, a variety of cases, and hospitals' limited resources. This project aims to implement a technological solution that collects, analyzes, and simulates data from emergency processes using Industry 4.0 tools and lean healthcare concepts to optimize process flow. The solution involves collecting data on patients' time and location using smartphones, followed by process mapping and simulation scenarios for improvement. The final artefact integrates various tools to enable data-driven decision-making in hospital operations management and improve service quality, leading to increased operations and patient benefits. Additionally, it is a first step in an application that can integrate other hospital areas, with gains as real-time patient management based on resource availability, tracking hospital infections based on the patients' pathways, and managing beds in wards. Finally, an analysis of the effectiveness of the integrated model, the gains obtained, and its implementation feasibility will be conducted to identify the limitations and challenges of the developed solution.

Adoption of modern training techniques and their influence on the financial performance of companies

Lauro Eduardo Magrini (id10258@alunos.uminho.pt)

Abstract. This research work is motivated by the proposal of a method that allows evaluating the impact on the financial performance of the company resulting from the regular application of training with modern techniques. For the purpose of this work, modern training technique is understood as the replacement of conventional training, which involves Instructor and physical environment, by a training that adopts techniques with Virtual Reality or Augmented Reality. Equipment related to information and communication technologies, such as computers, tablets or smartphones, as well as by the adoption of active teaching and learning

methodologies such as gamification (GBL – Game Based Learning) and PBL (Problem/Project Based Learning).

The method to be proposed aims to identify the variables or factors that may directly or indirectly affect the improvement of the company's financial performance, as well as the weighted participation of each of them in this result. The analysis of the influence of the adoption of modern training techniques will be carried out considering the effects caused on the financial performance of the company, both in the financial year in which they were implemented and in the following economic years.

IMUs-based human breathing mechanics measurement wearable device

Rodrigo Brandão Martins (rbdmartins@gmail.com)

Abstract. Breathing Pattern Disorders (BPD) are a group of conditions that affect the normal pattern of breathing. These disorders involve an alteration in the rate, depth, and rhythm of breathing, and can lead to a variety of physical and emotional symptoms.

BPD direct observation assessment and its inconsistent nomenclature impacts the diagnosis, management, and understanding, making it difficult to reach a consensus on the outcome measurement results among clinicians, and consequently, the patient's recovery time.

Clarity in diagnosis, informing consistency in assessment, is fundamental to improving recognition and treatment of BPD.

The use of a non-intrusive wearable device based on Inertial Measurement Units (IMUs) and machine learning has been proposed to standardize the measurement and evaluation process objectively, thereby minimizing or nullifying the lack of consensus in measurement outcomes and contributing to better-informed decision-making.

This project aims to validate the merged solution of IMUs and machine learning's ability to discriminate chest movement, detect limit values for breathing pattern variations, and classify BPD.

It is also intended that this device may become an integral part of the BPD assessment process as a conventional measuring instrument, complementary to clinical diagnosis, and a remote monitoring instrument allowing for the observation of the BPD variation during users' daily activities, enabling the identification of events that trigger changes.

Multivariate Statistical Method to Detect Drowsiness in Drivers

Ana Rita Oliveira Antunes (id9069@alunos.uminho.pt)

Abstract. Drowsiness at the wheel has been studied in different countries since it is important for road safety and its prevention. Since it is considered a public health problem, solutions must be found to avoid worse scenarios and identify a low-cost system.

Therefore, this research work is intended to detect the drowsy state considering the heart rate variability, a wearable device, and the information extracted from the driving simulations. Statistical Process Control using Principal Components Analysis was applied to improve the drowsiness classification for each individual. Then, Feature Selection Optimization was implemented to assess the most important features to classify the drowsy state. A uni-objective optimization was implemented to evaluate, individually, the accuracy, f1, and recall metrics with different machine learning algorithms.

In future work, it is necessary to perform multi-objective optimization for the minimization of Type I and Type II errors since it is fundamental to reduce them and understand which features will be selected. It is also important to identify the best model to distinguish between the awake and drowsy states. Aside from that, time series can also be an opportunity to predict the next value for heart rate variability and make a prediction for the drowsiness state.

On the development of a Rapid Assessment Method of the potentiality for the implementation of collaborative robots in manufacturing workstations

André Cardoso (andre.cardoso@dps.uminho.pt)

Abstract. Work-related musculoskeletal disorders and workforce aging are two critical issues confronting the industry today. Implementing an assistive adaptable solution, such as collaborative robots (cobots), could be one way to reverse these conditions. However, most of the industry's application of these technologies does not take advantage of cobots' major characteristics, such as their flexibility. Therefore, there is a need to evaluate whether a workstation will benefit from the implementation of cobots. The goal of this work is to create a methodology for assessing the potentiality for the implementation of an assistive collaborative system in existing workstations. Physical ergonomics, cognitive ergonomics, health and safety, product and process quality, collaboration, economics, and technological requirements are all factors considered by this methodology. The results demonstrate the assessment methodology's applicability, namely its success in identifying the key significant concerns of the present workstation. Future work will include replicating the methodology in further workstations and the development of a digital tool to facilitate the application of the proposed methodology.

Session A2

31st May 2023, 02:30 P.M. – 03:45 P.M. | Room: 0.07/Ed.11

Moderator: Lino Costa

Whole-system effects of transport electrification in Portugal

Alaize Dall-Orsoletta (alaize.orsoletta@gmail.com)

Abstract. The transport system is undergoing deep transformations as a means to reduce sectoral emissions. A key technology in passenger road transport decarbonization is electric vehicles (EVs). Nonetheless, there are many problematics that arise from EVs widespread adoption, especially when considering a lifecycle perspective. From resource extraction to the establishment of a circular economy for end-of-life (EOL) batteries, there are many complex, interconnected challenges that must be addressed. Among them, this work focus on the socio-economic whole-systems impacts of EVs adoption in Portugal. For the Portuguese case, this means being concerned with lithium mining activities and the related distributive, procedural, and recognition justice aspects. Next, the manufacturing stage and the evaluation of policies for the development of the automotive cluster. And finally, the operation of EVs by end users and its effects on energy poverty and infrastructure availability, as well as the management of EOL batteries, which together have a deep impact on society and the environment. These three main components of EVs lifecycle will be evaluated with the aid of system dynamics (SD), a computational simulation tool based on systems thinking. SD models will be used to reproduce the internal dynamics of these problems and to try out different policies for the mitigation of negative socio-economic impacts and the achievement of a just energy transition.

The importance of open design

João Dias (joaopedro-dias@hotmail.com)

Abstract. Open design refers to a collaborative and participatory approach to design that involves sharing knowledge, resources and skills with a diverse group of individuals or communities. Open design is based on the principles of openness, inclusiveness and transparency, and encourages the exchange of ideas and feedback throughout the design process. As such, this approach enables individuals with different perspectives, experiences and backgrounds to work together to create innovative solutions that meet the needs of a wide range of users. Open design also promotes the use of tools, materials and technologies, which can be freely shared and modified to suit different contexts and purposes. The result is more sustainable, accessible and adaptable design that can be used to address social, economic and environmental challenges in different contexts.

The manufacture of prosthetics through this approach is a growing trend in healthcare. The idea is that people can have access to quality prosthetics at affordable prices by the existence of collaborative projects.

Through online communities, open design projects for the production of prosthetics are emerging all over the world. These projects are led by healthcare professionals, engineers and designers, whose goal is to create customised and functional prostheses that can be manufactured using 3D printers.

On optimizing firefighting resources using a genetic algorithm

Marina Araújo de Matos (mmatos@algoritmi.uminho.pt)

Abstract. Over the past few years there has been an increase in the occurrence of forest fires. The main factors in these events are the increase in ambient temperature and the fact that world demography is increasing. Forest fires damage wildlife and the atmosphere, causing serious environmental problems. To help fight forest fires, techniques and studies are needed to help suppress fires on the planet. The number, skills, and level of preparedness of firefighting teams are very important factors in fighting fires. Planning how many and which forest firefighting resources are needed to extinguish a given fire is a very relevant area of study that can lead to damage reduction and support decision-makers in fighting actions. To this end, the optimization of forest firefighting resource dispatching problem allows to improve the effectiveness and speed of firefighter's actions.

In this work, it is intended to solve a problem of dispatching forest firefighting vehicles. For this, a problem with 7 resources was simulated to extinguish 20 ignitions of a forest fire. The Genetic Algorithm (GA) adapted by permutation representation was used to solve this problem. A statistical analysis of the crossover, mutation and selection operators, as well as other parameters of the GA, was performed.

Multi-objective optimization in job shop scheduling problems with unrelated machines

Francisco Álvaro dos Santos (francisco_dos_santos@outlook.pt)

Abstract. Optimization is used in work scheduling problems in industry, in this sense, different algorithms have been used to solve different problems. With the increase of data in industrial systems and the existence of multiple conflicting objectives, optimization problems become even more complex (Santos et al., 2022, Zhang et al., 2019). In this sense, it is necessary the application of adequate algorithms for solving these optimization problems.

This work concerns the application of different multi-objective optimization algorithms to solve a set of instances of a job shop scheduling problem on unrelated parallel machines with sequence-dependent setup time. Single-objective optimization problems are solved using a Genetic Algorithm (GA) (Katoch et al., 2021; Antunes et al., 2022) and multi-objective ones using the NSGA-II (Non-dominated Sorting Genetic Algorithm-II) algorithm (Deb et al., 2002), considering as main objectives the minimization of both makespan and average task

completion time. All the results were statistically analysed and demonstrate the influence of the size of the population on the performance of the algorithms in this type of problems.

Development of a questionnaire to understand future users' preferences about human-centric Autonomous car interior

Hatice Kirkici Gonçalves (hatice.kirkici@gmail.com)

Abstract. Recent technological news and developments demonstrate that autonomous cars and their interior will have the potential to offer numerous advantages to passengers and, consequently, it will affect their daily routines. Therefore, it is crucial to monitor the opinion of the population on this issue. The main objective of this study was to construct a questionnaire to evaluate the preferences of Portuguese users about human-centric car interiors and apply a pilot test to understand possible corrections that should be considered. The questionnaire was constructed based on a literature review and applied to a sample of 12 volunteers. According to the pilot test results, three questions need some improvements, and the participants made several suggestions. Overall participants' evaluations of the questionnaire showed that the duration, structure, clarity of the text and relevance of the questions are adequate. The revised questionnaire will be an essential tool to collect the preferences of possible users of autonomous cars.

Session A3

31st May 2023, 02:30 P.M. – 03:45 P.M. | Room: 0.11/Ed.11

Moderator: Leonilde Varela

Characterization of the perception of high frequency vibrations of the hand

Emanuel Teixeira Silva (emanuel_silva_456@hotmail.com)

Abstract. This project aims to study the human perception of vibrations, using highly controlled psychophysics experiments. First, we intend to characterise and map, for the first time, the perception of high frequency vibrations in the dominant human hand and fingers. Previous studies mainly focused on low frequency vibrations (8 to 125 Hz) leaving a gap in our basic knowledge of how high frequencies (250 to 500 Hz) are perceived by our tactile receptors. Thus, we will establish, for the first time, data regarding Vibration Perception Thresholds (VPTs) for a range of high frequency vibrations and investigate how these VPTs are influenced by age, sex, or weight. Secondly, we intend to establish design guidelines and recommendations for the use of vibrotactile actuation on devices with haptic feedback capabilities. Results from our experiments will be crucial in opening designers to a new set of stimulation for assisting users in future technologies.

Contributions to the industrialization process in the construction industry

Sara Rego da Costa (regodacosta.sara@gmail.com)

Abstract. Construction Industrialization (CI) is seen as a promising paradigm for boosting productivity and competitiveness. However, figuring out how to effectively put it into practice remains the industry's biggest challenge; a challenge to which a doctoral program seeks to contribute. Specially, such challenge was felt and lived firsthand by the doctoral student, who also works for one of the Portugal's largest construction companies, which is starting its industrialization process. Search was made and two gaps were found: the lack of both a common understanding of CI and transformational models for its implementation.

Costa et al. (2023) took a first step toward understanding the paradigm: a new definition and a new approach to its operationalization are provided. A more comprehensive understanding of the CI paradigm justified a theoretical extension to the previously unexplored Organizational Transformation concept in CI literature. After achieving this level of knowledge, an exploratory multiple-case study is conducted with the aim of exploring the CI implementation process in real-world context. As a result, the doctoral program investigation concludes with an organizational transformation-oriented model toward CI.

User requirements and stakeholder considerations in the implementation of Robotic Process Automation (RPA): A multiobjective model for efficiency evaluation

Leonel Filipe Santos Patrício (leonelfilipepatricio@gmail.com)

Abstract. Robotic Process Automation (RPA) is an emerging technology that utilizes software to automate repetitive and routine tasks, thereby reducing human labour and increasing operational efficiency. The aim of this work is to investigate how user requirements, along with other stakeholders requires, impact decision-making regarding the evaluation of RPA systems feasibility, and how these requisites or conditions can be integrated in a multiobjective model for evaluating RPA implementation efficiency. A mathematical model was developed and applied in a case study of RPA projects, with the objective of minimizing costs, along with the minimization of the total completion time of the robotic processes (makespan), the average workload, and other relevant performance measures. The results have been expressed through different graphics that did enable to select a solution that fulfils the main requirements imposed by a set of stakeholders. The investigation carried out permits to conclude that considering user requirements in the initial phase of RPA implementation planning is of paramount importance to ensure its feasibility and long-term sustainability. In summary, the research conducted contributes to the RPA field and highlights the importance of considering users and stakeholders requirements to guarantee a successful and sustainable RPA implementation in organizations.

Smart and Parallel General Variable Neighborhood Search for the Pollution-Routing Problem

Mário Leite (mario.leite@dps.uminho.pt)

Abstract. This talk addresses a new approach to the Pollution-Routing Problem (PRP), a variant of the Vehicle Routing Problem (VRP) under environmental concerns, which includes costs associated with fuel, drivers, and greenhouse gas emissions. The many factors impacting the environment and, simultaneously, the real cost of the routes are usually ignored in the approaches defined to solve routing problems. The total distance traveled remains the standard objective. However, in pollution-routing problems, these elements play an essential role. Each element is significantly influenced by the vehicle load and/or speed in each arc it travels. To develop methods that can provide solutions within an acceptable computational time, we propose optimization approaches based on local search heuristics and meta-heuristics, establishing a Smart and Parallel General Variable Neighborhood Search algorithm for the PRP. Innovative neighborhood structures allowing continuous speed values in the arcs were implemented. Additionally, we incorporate parallel programming strategies. To evaluate the effectiveness of these strategies, we report on the results of the computational experiments conducted on benchmark instances.

A Critical Overview of Shale Gas Exploitation Impact

Andrea Gomes (andreasgomes@gmail.com)

Abstract. The energy transition from coal-based sources to natural gas-based sources is questionable, as although natural gas has a smaller contribution to GHG, natural gas is still a fossil source. The use of shale gas is highly questioned by both the civil community and environmental agencies. Due to extensive experience carried out by the United States (US), many impact studies highlight the need to analyse the implications of this type of exploitation. This paper presents a preliminary analysis of publications on the impacts of shale gas exploitation using common spreadsheets along with the VOSviewer software. Our first results show that publications are not directly proportional to the Top 10 world ranking of the countries with larger technically recoverable reserves of shale gas. We identified 128 relevant papers from Scopus and Web of Science databases published from 2017 to 2022. This paper aims to contribute to the understanding of the impact of shale gas exploration, presenting a critical assessment of environmental, technological, social, political and economic aspects. The results showed that environmental concerns, worker health, clean technologies are the main impediments to the development of shale gas for countries around the world. And as positive aspects: increase in the offer of jobs and income, growing diversity of producers, improvement in security of supply and reduction of the risk of a single producer becoming unavailable to the global energy market. Based on the findings, we proposed some sustainable policy recommendations.

Session B1

31st May 2023, 04:05 P.M. – 05:20 P.M. | Room: 0.08/Ed.11

Moderator: Sameiro Carvalho

Application of artificial intelligence algorithms: the case of olive growing

João Mendes (joao.cmendes@ipb.pt)

Abstract. Of extreme importance, olive growing is an active part of the daily lives of the world's population, it is estimated that olive oil consumption almost doubled from 1990/91 to 2020/21. Associated with these consumptions, imports, and exports of these products prove to be essential for the economies of the producing countries, with an estimated movement of 1.23 billion dollars in world trade.

In addition to its economic importance, olive growing is largely associated with the history of producing countries. It is estimated that for 6 thousand years, people have been consuming olive oil and domesticated olives, making the olive tree one of the first fruit trees to be domesticated, with more than 2000 different cultivars. Each of these cultivars has physical and chemical characteristics that make it more adapted to specific climatic and geographic conditions.

In this way, the producer must be able to distinguish his batches and know how to specify the type of varieties present, thus valuing their qualities, which will result in a final product, with added value and different from most. This identification, carried out using genetic identification techniques, is a time-consuming process with associated costs. This work presents a way to complement this identification without any associated fee and transform it into a quick on-site procedure. For this, an entire system was developed, from the dataset and the artificial intelligence algorithms to the platforms for use.

Intelligent System for Occupational Safety and Well-being in the Retail Sector

Inês Sena (ines.sena@ipb.pt)

Abstract. Accidents at work are events that generate concern, difficulties, and problems for companies, which is why, over the years, they have been the subject of several studies, although they have actions that help to explain, prevent, and reduce them continue to be recurrent the number of the accident continue elevated, so digital technology solutions that have already been used to improve other factors are starting to be studied and implemented to improving safety in the workplace. Given this, this thesis aims to develop an intelligent system to reduce accidents at work through predictive analysis, to introduce an innovative tool that allows the introduction of a zero-accident policy, and consequently, improve safety at work of a Portugal retail company. To this end, it is planned to design a data model with several datasets of different types and information, use statistical analysis to analyze them, apply pre-processing techniques, and use variable selection methods to benefit only from the variable's significant values of each dataset, operate different Machine Learning algorithms to calculate and predict the risk level, and finally apply optimization methods to increase the performance of the prepared prediction model. So far, with the interconnection of eight different datasets, it

is possible to predict the occurrence of accidents at work in a retail company with an accuracy greater than 80%.

Lean Safety - The impact of lean on safety

José Carlos Sá (cvs@isep.ipp.pt)

Abstract. Globally, organisations need to adjust their strategy to the constant changes in the market in order to remain competitive and improve their results. In this sense, various methodologies can be implemented, among which is the Lean philosophy.

The Lean philosophy, when applied correctly, offers companies competitive advantages, focusing on the reduction and elimination of waste, thus obtaining greater productivity and profitability. However, does lean philosophy only have an impact on productivity, or can it have an impact on other areas of the company, such as Occupational Safety?

Occupational Safety is a topic with great importance in the current days of organizations, given the social and financial implications that arise from it. To accentuate such problems, the manufacturing industry is one of the main responsible for the amount of work accidents in the year 2017, in Portugal. In addition, organisations focus on process improvements and eliminating waste from production flows. This research aims to investigate if lean practices and tools have mutual benefits in these areas (productivity and safety).

A survey was conducted with 96 valid answers, which showed that the contribution of Lean philosophy to occupational safety was classified as being of great importance by the companies.

The development and application of the Safety and Value Stream Mapping tool (SVSM), with the objective of evaluating the impact of the improvements introduced in the processes, allows the reduction.

Supply Chain Quality Management and Industry 5.0 - A Literature Review and Analysis

Joana Lazzaris (joana_l@msn.com)

Abstract. There is a growing interest in the concept of industry 5.0 (i5.0), towards a more sustainable, resilient and human-oriented industry, as its development is seen as one of the means to achieve the EU2030 goals. To pursue the objectives of i5.0 it is crucial to measure relevant indicators through regenerative metrics and frameworks. However, there is a gap in understanding how Supply Chain Quality Management (SCQM) frameworks are suitable to the challenges of i5.0. The aim of this paper is to establish the guidelines to support the future development of assessment metrics in this area, through a comprehensive literature review. This study reviews the latest development of approaches that aligns SCQM with the principles of i5.0. As a result, this article presents how Supply Chain, Performance, and Quality Management have been related to the concepts of Industry 5.0.

Applying deep learning algorithms to keep track of emotions during online training

Walter Aoiama Nagai (walternagai.uminho@gmail.com)

Abstract. The recent pandemic situation allowed the use of several computational media and devices to conduct instruction and training sessions. In a short time, the use of videoconferencing solutions became routine in both educational and business environments. It has become increasingly essential to monitor the attention, engagement, and emotions of those involved during online sessions with students and/or trainees. The existence of six universal emotions such as fear, disgust, anger, surprise, happiness and sadness is already known, but they can be subtle or instantaneous in training situations because it is an immediate reaction to something that is happening in the training session. Establishing a relationship between the emotions, the immersion and engagement and the learning gained in an online training session is part of the objectives of this work. Emotion monitoring is very sensitive and fast, that only trained people can realize it. In this context, deep learning algorithms such as VGG, AlexNet and LeNet are used, as they have greater, similar or lesser accuracy than human observers. There are image datasets for detecting emotions using deep learning algorithms that allow monitoring and feedback to datasets with new images and improve the accuracy and identification of emotions. In this work, the DAiSEE (Dataset for Affective States in E-Environments) image dataset was considered, along with the validation dataset image performed by the author.

Session B2

31st May 2023, 04:05 P.M. – 05:20 P.M. | Room: 0.07/Ed.11

Moderator: Celina Leão

Barriers of Kanban Implementation in Agile Project Management

Ingrid Teixeira de Souza (engingridsouza@gmail.com)

Abstract. Over time, the new mindset proposed by the Agile Manifesto to project management evolved into different areas of knowledge. The traditional form of designing, developing, and delivering a service or a product through a very well-defined project scope was put in check by the values and principles defined by the Agile Manifesto.

According to Anderson and Reinertsen (2010), since 2003 David Anderson has attempted to tailor the Kanban system to software development, formulating the Kanban method, which applies incremental, evolutionary process and systems changes in organizations.

The most common scenario is a team trying to run the Scrum framework to manage their projects but with difficulties to follow the complete framework. In some cases the framework does not work well in the specific team context. On the other hand, the Kanban method do not have prescriptions; it is built according to the team, project, and customer necessities, aligning lean agile practices. A Kanban System may be designed and adapted according to each project phase, helping from the beginning, with product or service discovery phase. It can be understood as the minimum viable product (MVP) creation and may help as well with the development of the final product by limiting the work in progress (WIP) in the development phase. Additionally, it may give support in defining explicit policies and analyzing the deliveries through the lead time rate, cycle time, throughput metric and control flow diagram (CFD).

A safety index to improve Humans-Robots collaboration towards Industry 5.0

Eduarda Manuel de Barros Pereira (id8976@alunos.uminho.pt)

Abstract. The use of robots is a hot topic for companies across the globe. This disruptive innovation does not fully eliminate the need for the presence of human operators. In fact, this requires collaboration between robots and humans and the use of hybrid tasks, increasing process efficiency. Since it is predictable that companies will become more integrated with robots, companies need to understand how to embrace risk and uncertainty to take advantage of hybrid tasks. From a human factors' perspective, it is critical to determine how the workforce interacts with robots: the way workers cooperate with and understand robots is closely linked to the system's efficiency and safety. Hence, this project aims to develop an index for a cognitive ergonomics assessment of Human-Robot Collaboration (HRC), able to determine the impact of the collaborations in the worker workload level, thus forecasting high-risk situations. As well as provide design guidelines for developing proficient HRC systems.

Influence of the Urban Waste Collection Strategy on Work-related Musculoskeletal Injuries

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Abstract. The activity of urban waste collection is known to require from workers a high performance in the execution of the task due to the effort exerted during the collection process. This study aims to investigate the waste collection method that causes the least impact on workers' health. A total of 41 male municipal solid waste collection workers participated in the present study. The participants were recruited by the Department of Urban Services and Environment of the municipalities of Guimaraes and Fafe. An interview was conducted to collect psychophysical data, then the application of the Nordic Musculoskeletal Questionnaire (NMQ) was performed to identify the prevalence of pain and discomfort in the last 12 months and in the last 7 days and in 9 different body regions. To assess the workers' perception of the effort exerted during the activities, it was applied the Borg perceived effort rating scale. The activity of waste collection, performed manually and door-to-door, has the potential to cause Musculoskeletal Disorders (MSD) in the shoulder, lumbar, and knee regions. Despite being a high-performance activity, since it requires a high energy expenditure, the classification of the activity according to the workers' average heart rate was considered as light or moderately heavy. According to the obtained results so far, it seems that establishing an appropriate and standardized strategy of collection can reduce the workers' risk exposure.

Industry 4.0: The Challenges of a Revolution

Pedro José de Araújo Pinheiro (pedro.tele9@gmail.com)

Abstract. Industry 4.0 emerged a decade ago after the United States introduced the concept of Cyber-Physical Systems. They often share the same technologies and organizational structure thoughts.

Ways of doing business have changed with the connectivity that the growth of the Internet has provided, global economic balances are different, and inequalities prevail.

Things have become intelligent and autonomous to speed up and facilitate the manufacturing process. The Internet of Things thrives. And it all came about with the political purpose of triggering the fourth industrial revolution. However, I argue that this objective has not yet happened in many countries, namely Portugal. Old-fashioned technologies like artificial intelligence and virtual or augmented realities could catalyze an eventual revolution. But in addition to technologies, manufacturing requires behaviour change. The perception of the dynamics of the context is fundamental to avoid future disappointments in the evolution of the application of these and other technologies.

Digital Transformation in the Water Sector: Present Situation, Future Prospects, Challenges and Opportunities - A Case Study on Operational Alerts and Notification

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Abstract. The water sector is undergoing a rapid Digital Transformation with the advent of new technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and big data analytics. These technologies are providing water companies with unprecedented

opportunities to optimize operations and improve service delivery. The objective is to offer a comprehensive view of Digital Transformation in the water industry. This overview will concentrate on the present state, potential prospects, obstacles, and possibilities for triumph. There is no question that the digital age has arrived, and a rapidly changing digital landscape is shifting government-owned infrastructure utility organizations toward Digital Transformation. The transformation is inevitable as water and wastewater utilities are now facing new risks from increasing demand, water scarcity, water quality and water security. The adoption of digital technologies will become necessary to provide improved, more reliable, secure, efficient, and cost-effective water and wastewater services. Water companies that embrace Digital Transformation can unlock significant benefits and position themselves for success in an increasingly digital world. However, to achieve success, water companies must adopt a strategic approach to implementation that considers the unique challenges of the water sector. The importance of Digital Transformation in the water sector cannot be overstated. By adopting emerging technologies, water companies can overcome some of the biggest challenges facing the sector, including aging infrastructure, water scarcity, and climate change.

Session B3

31st May 2023, 04:05 P.M. – 05:20 P.M. | Room: 0.11/Ed.11

Moderator: Anabela Tereso

Multi-Project Scheduling Under Uncertainty: an approach to exploit resource flexibility

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Abstract. Project scheduling problems constitute one of the most important problems for both research and practice. In the 1950s, methods for the control and planning of projects such as program evaluation and review techniques (PERT) and the critical path method (CPM) emerged, where resources are considered unlimited. However, at the beginning of the 1960s, the study of planning and control of projects taking into consideration the existence of limited resources. That resulted in the proposition of the resource-constrained project-scheduling problem (RCPSP). An extension of the RCPSP that accounts for multiple projects is the resource-constrained multi-project scheduling problem (RCMPSP), where several projects must be executed simultaneously, competing for the use of resources. Perceiving this, researchers increased their efforts, in modeling the basic Project Management variables: time and resources, not as deterministic ones, but being affected by uncertainty. In the sequel, several models were developed for the optimization of resource allocation in projects, considering stochastic work contents, proactive/reactive project scheduling techniques to deal with uncertainty, and several approaches to explore resource flexibility. Therefore, it is the researcher's challenge to propose a new model resulting from the previous ideas to be applied to multi-project settings, for effective multi-project management under uncertainty, and considering resource flexibility.

A safety index to improve Humans-Robots collaboration towards Industry 5.0 Assessment of consumer willingness to participate in demand-side management

Sara Golmaryami (sara.golmaryamii@gmail.com)

Abstract. Today, the growth of population, the cities expansion, and the continuous quest for economic growth worldwide have brought a set of new problems associated with the increasing use and depletion of resources. Society faces fundamental challenges reaching a sustainable energy supply, which should ensure a clean and affordable energy provision. Therefore, the consumers' behavior and their willingness to actively participate in the energy market will have a fundamental role in attaining a sustainable future. Solutions to mitigate

global climate change should be grounded in a rigorous understanding of energy demand, particularly the factors that drive energy demand. This research is aimed to evaluate consumers' willingness to participate in demand-side management (DSM). For this purpose, agent-based modeling (ABM) was used. Data on DSM acceptance and consumers' flexibility was available based on a survey conducted in Portugal including the socio-economic characterization of the respondents and the assessment of their willingness to participate in DSM programs. According to this methodology, the consumer is defined as an agent. For consumer agents, effective factors were defined and assessed. In this paper, simulation was run with NetLogo software, and the result showed the importance of the agents social network on their willingness to participate.

Enhancing Stakeholders Communication in Non-Governmental Organizations: Exploring Effective Governance Models

Paulo Manuel Ferreira de Sousa (id8978@alunos.uminho.pt)

Abstract. Non-Governmental Organizations (NGOs) operate in complex social environments, where stakeholder engagement and communication play a crucial role in achieving their mission and objectives. These organizations play a crucial role in addressing various social, economic, and environmental issues worldwide (Barney & Clark, 2007; Porter, 1997). As NGOs continue to expand their reach and influence, the need for effective governance models becomes paramount.

This study is being conducted as part of a project whose aim is to develop the Portuguese Project Management Observatory (PPMO). It is supported by APOGEP (Associação Portuguesa de Gestão de Projetos) – a non-profit organization (NPO) – and it is expected to be a center of excellence for the development of the profession in Portugal. The main task of the PPMO is to produce an annual report on the status of Project Management (PM) in Portugal (using a survey) as well as to support professionals and organizations to consolidate the latest and best practices in PM.

This article examines the significance of stakeholder communication within NGOs and explores governance models that facilitate effective stakeholder engagement.

The findings of this research contribute to a deeper understanding of effective stakeholder communication within NGOs and its implications for organizational success.

Socioeconomic Evaluation of Projects: A Methodological Contribution

Thomaz Fagá (thomazfaga1@gmail.com)

Abstract. Well-founded public policy evaluation processes allow us to verify the reach of results, the degree of efficiency of the processes. It is also an important source for the improvement of public policies. Among the OECD countries, it is known that methods for monitoring and evaluating programs and public investment projects are well disseminated. However, in countries like Brazil, these practices are still incipient, especially in smaller projects. In Brazil, only in 2017 were general governance guidelines sanctioned for public institutions to develop procedures for evaluating their investments. In this context, the present work aims to develop a framework, based on the best available practices and on the main methods recognized worldwide. The platform will be an excel tool, in order to standardize the evaluation procedures, and to allow the consideration of regional impacts promoted by public

policies. The methodological structure is divided into two phases: (i) ex-ante evaluation, carried out from a perspective of analysis of the intervention design, economic viability and inherent risks; (ii) ex-post evaluation, measured after the maturity of the investment, to verify the results achieved. As a result, it is expected that the framework proposal will contribute with substantial technical elements to subsidize managerial decisions in public policies and in the dissemination of the culture of the evaluation process of small public investment projects.

A Lean approach for overcoming barriers in Data Science projects

Natan Labarrère Mendes (natan.labarrere@gmail.com)

Abstract. Context: The rise of big data came with a series of challenges and opportunities. To cope with this new technology arose the field of data science (DS), mixing traditional statistics with computer science and machine learning techniques. However, DS projects have a high probability of failing its expectations. DS management methods lack connection to change management for sustainable solutions.

Objective: The aim of this thesis is to identify and evaluate the barriers for the success of DS projects that involve process improvement and propose a Lean approach for overcoming these barriers.

Methods: The study uses PRISMA methodology for conducting the SLR to identify the barriers in the literature. The barriers are then hierarchically clustered with average-linkage. A MCDM method is used for modeling the barriers, which includes expert interviews and validations. Finally, a Lean approach is proposed and tested in a case study.

Expected results: At the end of the project, it is expected that the barriers for the success of DS projects involving process improvement are identified and evaluated. It is also expected that the proposed approach is updated following the case studies.

Originality: This thesis adds new knowledge for understanding the barriers which affect DS projects involving process improvements in organizations and provides a framework for managing and dealing with these barriers.

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