RESEARCH and TECHNOLOGY –

STEP into the FUTURE

Volume 18. No. 1 - 2023

**THE JOURNAL IS DESIGNED FOR PUBLISHING PAPERS
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The 43ʳᵈ Research and Academic Conference

RESEARCH AND TECHNOLOGY – STEP INTO THE FUTURE

21 April 2023 Riga, Latvia

43. zinātniski praktiskā un mācību metodiskā konference

ZINĀTNE UN TEHNOLOĢIJA – SOLIS NĀKOTNĒ
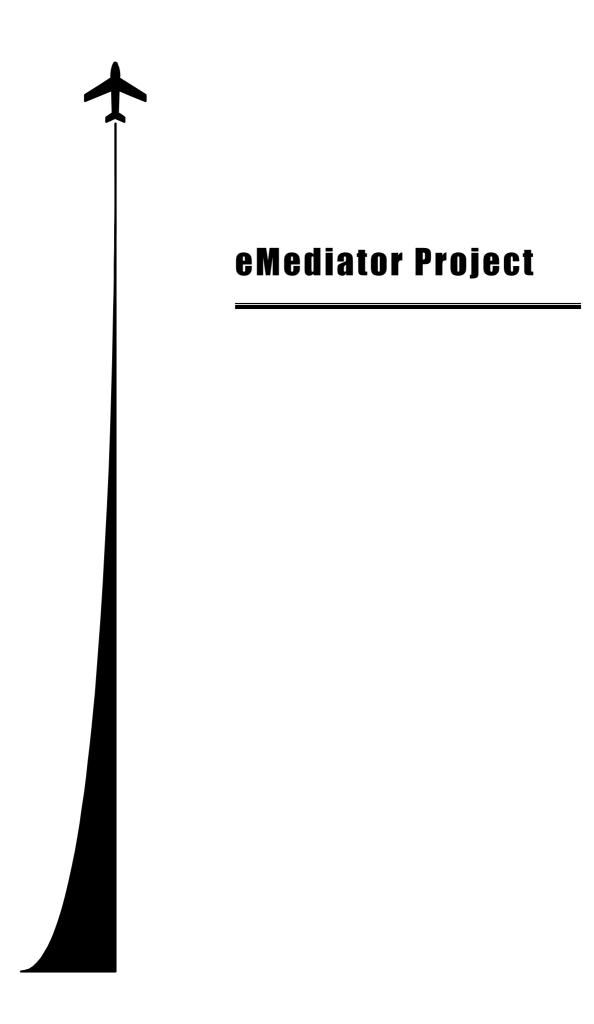
2023. gadā 21. aprīlī, Rīga

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eMediator Project

EMEDIATOR: NEW DIGITAL ECOSYSTEM FOR MOBILE COMPETENCE-ORIENTED HIGHER EDUCATION

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Keywords: Education mobility, competence-based education, digital platform, European market

The field of education is undergoing a transformation, and there is a growing need for a new ecosystem – education mobility as a service. With the advent of modern information technologies, such as artificial intelligence and blockchain, education services can now be designed with adaptive properties, making it easier to verify the receipt of education andtraining from various establishments, including universities and legal training centers. The architecture of the modern economy enables the creation of networked information structures, allowing for direct interaction between students, education providers, and teachers, without the constraints of formal educational structures. As a result, new mobility requirements for education have emerged, including the ability to receive educational services without changing one's location, the option to access services at any time, and an increased level of agility in education mobility (Misnevs *et al.*, 2022).

The eMEDIATOR project aims to promote virtual cooperation in educational mobility at the EU level by creating an ecosystem of European educational mobility services. This ecosystem is designed to offer added value that cannot be achieved through events held in one country alone.

The project's goal is to create a model ecosystem with a demo portal that employs the principles of service-based, competence-based, student-centered education, and business-academia partnerships. This ecosystem will provide courses and various types of employment within a single European education and employment market. This will be achieved through the following (Misnevs *et al.,* 2023):

- Offering individuals (students and lecturers) and corporate structures (highereducation institutions and enterprises) opportunities to obtain and offer services from other European countries while residing in one specific location within the European Union. This will merge education and business, studies and work into a single agile "eduwork" space created by online activities.
- Providing academic institutions with the opportunity to recruit specialists with specific competences that they cannot find on the local market.
- Creating an economic environment for implementing academic competences.
- Implementing a competence-based model of higher education into a digital reality, offering educational and employment opportunities.
- Boosting the educational competitiveness of small economies, such as Latvia, by providing open access to various educational and business European markets via lecturer and academic institutions' employment in other European countries, mostly in the online, part-time, and project-based modes, often on a continuous basis.

The presentation discusses expected project results and other outcomes including the following:

- Model of education ecosystem as a service for transition of academically acquired competences to the work environment of real market.
- Demo portal of education mobility as a service with competence-based approach.

▪ Training guidelines how to use the portal for education purposes at universities and training centers for members of academic staff and corporate structures – universities and employers.

The creation of such an ecosystem is an innovative approach to implementing the concept of Digital United Europe into the real life. The consortium team from Latvia, Greece, Spain, Germany and Poland assumes, after the successful completion of the EMEDIATOR project, to contact the European Commission with a proposal to support the next stage of development to create an industrial implementation of an ecosystem of educational mobility in Europe for global use.

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Session 1

Computer Problems of the
Information Society

Informatīvās sabiedrības
datorizācijas problēmas

IT SERVICE MANAGEMENT SYSTEM IMPROVEMENT IN MUNICIPAL COMPANY

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Keywords: ITSM implementation, Software Selection Method, ITIL, AHP, USM, MCDA

Currently, many research documents describe various methods for selecting an ITIL-compatible ITSM software tool for small and medium enterprises (SMEs). In the situation, under the current research topic, where the modern ITSM system should be implemented (a proposal for real implementation of a complex software product should be established) it was identified, that there are not so many state-of-the-art research papers, and the real selection and implementation scenarios, which explain preferable methods for utility companies' sector. The biggest part describes FinTech companies, like banks and other financial institutes, and provides information for a wide variety of processes involved in the IT Service Management model (Widianto and Subriadi, 2022). Quite often there is a situation, that tool is provided with many modules, which are not all used in fact by IT personnel and management too. At that point, companies overspend on financial and sometimes other resources, like human resources, which were involved in implementing a particular software product in a firm.

The purpose of this master thesis is to cover the gap in specific ITSM tools research area, by proposing cost-effective methods, time-saving approaches, and recommendations for the selection of a specific software product (Doheny *et al*., 2022), by analyzing it carefully, using the most effective software selection methods available, and considering new risks, such as customer`s sensitive data protection and full control of it and new EU limitations for not selecting a product from regions, which have been put under sanctions from both EU and USA legislation. At the same time considering the replacement of the legacy, Oracle Forms IT ticketing system and proposal for IT management of a company to implement best IT practices in the form of ITIL v4 framework (Sahid *et al*., 2022). The thesis work will be done based on an analytical hierarchy approach (AHP) as the most appropriate in the current economic situation.

Methods, which will be evaluated for applicability in thesis work: analytical hierarchy approach (AHP), Multiple Criteria Decision Analysis approach (MCDA), and the Unified Service Management method (USM), which is a universal methodical approach to service management (van Bon, 2023). The literature review will be organized using related scientific papers, reports or journals.

As the expected outcome, the research will propose methods, approaches, and recommendations for selecting a modern ITSM tool for a Utility company in Riga. To answer the question about identifying of best of these elements, the following tasks have been formulated:

1. Completing state-of-art in the domain (SOTA).
2. Analyzing the existing barriers to adopting ITIL-compliant ITSM software products andInformation Technology Governance (ITG) model.
3. Defining necessary/required ITSM processes in the utility company.
4. Analyzing what is the practical applicability of the proposed ITSM framework in thecontext of the utility company.
5. Analyzing ITIL tool's application and evaluating the usefulness and usability of selectedITIL software tools in the selected utility company (Shetty, 2022).
6. Analyzing the results and the conclusion.

The results of the proposed hypothesis about the most appropriate software selection techniques, method/s, and approaches were identified. The methodology included a review of the corresponding research papers, which are no older than 3-5 years from now. The thesis paper results would also contribute to further discussion on the theme of the most effective software selection techniques in the market. This should result in a usable strategic path for companies' IT management, who are on their way to replacing the ITSM platform with a modern one (van Bon, n.d.a).

The research is supervised by Dr.sc.ing., Professor Mihails Mihails Savrasovs

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DEVELOPMENT OF AN AUTOMATED BUSINESS PROCESS MODEL FOR ERP SYSTEMS OF MEDIUM-SIZED ENTERPRISES

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Keywords: Enterprise Resource Planning, field service, Finance & Operations, automation, data synchronization

The purpose of this thesis is to present the development of an automated business process model for Enterprise Resource Planning (ERP) systems as a means to enhance the efficiency and effectiveness of medium-sized enterprises. The implementation of this system is aimed at streamlining data acquisition processes and saving resources by reducing the time and effort required for labour-intensive tasks. Real-time coverage of the entire spectrum of business activities and directions is provided by the system.

The integration of automation and ERP systems can significantly improve the competitiveness of medium-sized enterprises by reducing costs and increasing efficiency. Integrated reporting and business intelligence capabilities, which provide fast and reliable views of business data, are a key feature of this system. Creating a robust technology infrastructure is crucial for all businesses as it directly affects the quality of service experienced by internal and external users of the system in terms of speed and responsiveness to their requests for information.

Integrated reporting and business intelligence capability reports and visualizations provide a fast and reliable view of business data (Luszczak, 2019).

Creating an effective technology infrastructure is vital to all companies. The infrastructure directly affects the quality of service experienced by internal and external users of the systems in terms of speed and responsiveness to their requests for information (Woods, 2010).

The objective of this Master's thesis is to investigate the importance of automation for business process models and compare the potential benefits with the main challenges. The development of a universal system in Microsoft Dynamics 365 that includes necessary business processes for synchronizing data in an ERP system is a crucial step in achieving this goal. A report that compares employee work time before and after the implementation of the system will be presented in a table. To achieve this, the following tasks were undertaken:

1. An overview of enterprise resource planning systems and systems for data synchronization;
2. An analysis of the synchronization process in ERP data systems and a comparison of different systems;
3. The development of a system in Microsoft Dynamics 365, with the addition of functionality between Field Service and Finance & Operations systems, using T-SQL for special business processes, Power Automate, and Power BI for reporting;
4. Analysis of data accuracy and quality for the resulting system and comparison of employee work time before and after implementation.

As a result, an ERP solution has been developed that is specifically suitable for medium-sized enterprises, incorporating Microsoft Dynamics FS and FO platforms and integrated

reporting capabilities with Power BI using Power Automate. The decision taken by the business, which was based on insights from the data provided by the developed ERP solution, has yielded noteworthy benefits in terms of resource, time, and effort savings for medium-sized enterprises.

The research is supervised by Mg.sc.ing. Aleksandrs Avdeikins.

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COMPARISON OF ACOUSTIC AND VIBRATION ANALYSIS IN THE CLASSIFICATION OF THE OPERATIONAL STATUS OF POWER TOOLS USING MACHINE LEARNING TECHNIQUES

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Keywords: Machine signals, machine learning techniques, signal processing techniques, power tools, condition monitoring

A manual drilling machine is used in this study to compare the effectiveness of acoustic and vibration analysis performed in classifying the operational state of power tools. Although both acoustic and vibration signals are frequently used to track the health of machines, their ability to distinguish between various operational stages can vary. The objective of this research is to compare the two signals and determine which approach is more accurate at identifying a drilling machine's operational status (Li *et al*., 2013).

The processing of the sound waves that the equipment emits while it is operating is a part of the acoustic analysis. On the other hand, vibration analysis examines the machine's oscillation patterns. Both approaches have benefits and drawbacks (Wang *et al*., 2014). Acoustic analysis can be used to identify issues like bearing wear because it is sensitive to high-frequency signals. Vibration analysis, on the other hand, has the ability to detect lower frequency signals, making it helpful for detecting issues with machine alignment and unbalance (Zhao *et al*., 2017).

The acoustic and vibration signals will be subjected to a number of machine learning methods in order to categorize the operational state of the drilling machine. Neural networks, support vector machines (SVM), decision trees, and random forests will all be used as methods. Accuracy, precision, memory, and F1 score will all be taken into consideration when assessing each technique's performance (Lessmeier *et al*., 2016).

This study will contribute to the increasing body of knowledge regarding the analysis of machine signals using machine learning techniques. It will shed light on the efficiency of various signal processing techniques in classifying the current operational state of power tools. In several sectors, including manufacturing and construction, the findings of this research may be helpful for machine maintenance and condition monitoring.

This research is supervised by Dr.sc.ing., Professor Emmanuel Alejandro Merchán.

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DEVELOPMENT OF MICROFRONTEND IMPLEMENTATION FRAMEWORK

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Keywords: Microfrontend, Software Architecture, DevOps, User Interface

Most of the modern applications can't stand without proper User Interface (UI) as it has huge impact from business aspect. The frontend development is a part of application development which main goal is to build scalable and user-friendly UI that will provide interaction between user and service.

It's very crucial to have proper UI however current state of frontend development brings a lot of different combinations of frameworks, libraries, patterns and approaches. This variety of the options brings an extra complexity for enterprise to choose proper architecture solution and development team working with the same environment and with the same set of tools. As the market grows, application become more and more complex and same happened with client-side layer. Many different operations can be delegated on the application frontend part and therefore having efficient and responsible interface to interact with a user is very important for every modern software application.

Modern software architecture has many shapes and more and more companies spend resources for investigating the right approach for building stable and reliable system. This becomes more complicated to decide when it comes to the frontend development level. The traditional solution is monolith architecture what makes codebase less scalable and limited for possible changes. The main problem with monolith architecture is that all codebase is located in a single domain without any modules separation and it increases risk of system failure if any of code part fails. On other hand, there is no perfect architecture and there are always trade-offs in terms of implementation some of patterns however microfrontend (MFE) approach allows achieving more structured and systematic design with bare minimal of trade-offs (Mezzalira, 2021).

The main problems which are going to be investigated during this research are flexibility and accessibility issues related to the usage of monolith architecture and possible solution of its optimisation by separating modules and decentralising core nodes of application. The hypothesis of this research is that MFE architecture can accelerate application development and decrease single point of failure comparing to monolith approach and can be standardised as general framework.

The aim of this work is to design and develop general end-to-end framework using multiple frontend libraries, establish CI/CD processes and proceed with deployment of this solution, investigating possible limitations and complexities.

To achieve the goal, following tasks are defined:
1. Make an overview of the modern frontend frameworks that are used in enterprise;
2. Make an overview and comparison of different architecture approaches;
3. Make analysis of the available solutions for establishing microfrontend architecture;
4. Design microfrontend architecture framework using one of investigated solution and provide implementation steps;
5. Implement of the proof of concept using designed framework;

6. Design of continues integration and continues deployment strategy;
7. Validate framework using GQM approach.

Expected result should provide step-by-step implementation guidance of how to migrate legacy monolith architecture to decentralised MFE architecture. During this research most of the common problems will be touched and investigated such as global shared state, CI/CD process establishment complexity and possible solution how to and deploy and run several independent modules under the single shell application. Also, expected framework will be evaluated by GQM approach emphasising all of the main pros and cons of using or/and migrating to MFE solution. Together with research this work implies a proof of concept (PoC) implementation with several independent frontend modules combined into a single application for demonstration purposes.

The scientific meaning and practical usage of this research might be a standardised way of MFE architecture implementation with defined integration steps what can make MFE architecture more accessible for any level enterprise and prevent different teams of creating own solutions. The provided results might be an entry point for extended solution based on research or for further architecture researches.

The given research is supervised by Dr.sc.ing. Irina Pticina.

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ENHANCED DATA SECURITY IN CLOUD IMPLEMENTATION USING BiGRU, BiLSTM MACHINE LEARNING ALGORITHMS

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Keywords: (CS) – Cloud Security (IDS) – Intrusion Detection System (NIDS) – Network Intrusion Detection System(HIDS) – Hardware Intrusion Detection System

Nowadays, data security is a topic that is being discussed on a global scale. The Internet's extensiveness, accessibility, and complexity have all contributed to a dramatic rise in the threat level posed to information systems. The situation has not improved, and the potential damage and loss that an unauthorized person or an act of malice can cause to an information system is becoming increasingly familiar to an increasing number of people, particularly after the term "cloud computing" came into the public consciousness. Intruders constantly view users as well as their systems using cloud computing as easy targets due to the power system distribution of users as well as their lack of understanding on managing the cloud services (Abinaya, 2018). Study aimed to develop a robust, advanced and efficient data security solution for cloud storage environments by leveraging the power of bi-GRU and bi-LSTM algorithms.

Cloud-based intrusion detection system (Aris *et al*, 2020), that monitors network activity for signsof intrusion, can help companies defend infrastructure from these kinds of threats since neural networks areflexible and well-qualified for handling massive amounts of data (Alruhaily *et.al*, 2021). Deep learning- based neural network is implemented using Bi-GRU and Bi-LSTM algorithm models. Solution is based on Recurrent neural networks (RNN). RNN use the backpropagation through time (BPTT) algorithm to compute gradients, which is significantly different from regular backpropagation because it is particular tosequence data (Werbos, 1990). The concept of BPTT is the same as those of classic backpropagation, in which the model trains itself by computing errors from its output layer to its input layer. BPTT varies fromthe standard technique: it sums errors at each time step, whereas feedforward networks do not need to sum errors since they do not exchange parameters between layers.

Research uses UNSW-NB 15 dataset, containing the total number of records more than two million and five hundred thousand record. The UNSW-NB 15 dataset's raw network packets were generated by theIXIA PerfectStorm tool in the UNSW Canberra Cyber Range Lab to provide a hybrid of genuine modern normal activities and synthetic contemporary attack behaviors. The tcpdump program was used to collect 100 GB of raw traffic (e.g., Pcap files). The Argus and Bro-IDS tools are employed, and twelve algorithms are constructed to yield a total of 49 characteristics with the class label. Collected data from UNSW NB-15contributed for analysis of important features and detected top 20 features.

This study was conducted using deep RNN networks in bidirectional training mode using bi-LSTMand bi-GRU. Prediction remains difficult due to the limits of traditional model-driven and data-driven techniques, necessitating the use of mentioned algorithms. Although learning representations from prior time sequences is a big difficulty in standard RNN networks (Géron, 2018), bidirectional networks are meant to learn representations from future time steps. It improves comprehension and eliminates ambiguity(Ashwini *et al*, 2020). Moreover, in RNNs, a bi-GRU cell deploys an update gate and a reset gate in a hidden state layer, which is computationally efficient than a traditional LSTM network due to the reduced number of gates, but can still

perform as well as a bi-LSTM network (T *et al*, 2022). Experiment results reveal that by adjusting the bidirectional learning attribute in the training process, the suggested models outperform most state-of-the-art approaches, greatly enhancing performance and capacity to extract more different features.

Finally, models' performance is evaluated, including, but not limited to accuracy and loss. bi- LSTM received 96% and 9% for bi-GRU model. Vanishing gradients in RNN is the limitation for current study and subject of future research.

The given research is supervised by Mg.sc.inf.sys Aleksejs Vesjolijs.

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USABILITY OF WIRELESS NETWORK TECHNOLOGIES TO CHECK THE SERVICEABILITY OF THE GAS PIPELINE CATHODIC PROTECTION

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Keywords: Network Time Protocol, GPS, Packet Delay, 4G, Stratum, cathodic protection, PLC

Cathodic protection is a method of protecting metal structures from corrosion by creating an electrical field that causes the metal structure to become a cathode, thereby reducing the rate of corrosion. To achieve this, an anode is installed on the metal structure, through which a continuous electrical current is supplied, causing a change in the potential of the metal structure and thus protecting it from corrosion (Ridha *et al*., 2011).

To measure potentials at the protected sections of the gas network in reference points, it is necessary to simultaneously disable all devices that provide protection for the section. This is especially important for cathodic protection (CP) systems, where high-precision (no more than 25 ms) time synchronization is a critical parameter. This is because regular checks are required to ensure the effectiveness of electrochemical protection in gas pipelines. Therefore, time synchronization in CP systems is an important step in ensuring reliable and safe operation of gas pipelines. The accuracy of time synchronization can be achieved using specialized software and hardware solutions, which allows for high CP efficiency and ensures the safety of the technological process.

To address this issue in Latvia, a Stratum 1-3 NTP device is used, which is installed next to each CP cabinet. The main drawbacks of this solution are the cost of the device. Another inconvenience of this solution is that in urban areas, the GPS signal can be attenuated by natural obstacles such as trees or various concrete buildings. To solve this problem, an alternative solution is to use a device that receives time through 4G networks instead of using a satellite NTP server."

The aim of this study is to investigate the possibility of using wireless networks technology for high-precision time synchronization (Nakashima *et al*., 2003).

"The study analyzed network technologies such as NTP, GPS, and PTP (Neagoe *et al*., 2006).

During the project, a test bench was created to evaluate the proposed solution by measuring the delays and deviations at different parameters such as the number of cathodic stations and, or their synchronization frequency. NTP Server-Client routers Westermo Merlin 4400, and a Wago 8212 PLC were used for cathodic protection management.

Analysis of the measurement results shows that the chosen equipment and protocol allow meeting the requirement of a 25 ms error in the measurement start.

The research is supervised by Dr.sc.ing. Aleksandr Krainukov.

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COMPARATIVE ANALYSIS OF HYPERLOOP TECHNOLOGY MODES IN TRANSPORTATION

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Keywords: hyperloop, high speed transportation, maglev-magnetic levitation, vacuum tubes, multi-modal transportation, unimodal transportation

The paper is part of the research project conducted in the scope of PhD thesis "Assessment methodology for Hyperloop technology implementation for multimodal freight transportation" lead by Aleksejs Vesjolijs.

Hyperloop (HL) is a constantly developing technology for high-speed land transportation introduced in 2013 (Tesla, 2023). Alpha paper (AP) was introduced by SpaceX and Tesla, written by American entrepreneur Elon Musk. Musk envisioned dream of moving people and cargo at hypersonic speed through vacuum-sealed tunnels using capsules. AP described initial design for Hyperloop technology, and vision. Further, HL was presented by Space X as standalone fifth transportation mode alongside the air, road, sea and rail. HL as fifth transportation mode raised a debate in scientific society (Dhote, 2017). Currently, most of research papers on HL topic and companies working on technology implementation consider it as fifth transportation mode (Transpod, 2023).

Current research aims to understand similarities and highlight differences between unimodality and multimodality of HL technology based on cases from ultra-high speed transportation industry.

Original Hyperloop vision proposed by Elon Musk is unimodal. HL is intended to transport passengers from point A to point B. It refers to the use of an Hyperloop as single mode of transportation for the entirety of a journey. Current research raised debate over HL efficiency as unimodal transportation mode.

Study explored advantages and disadvantages of HL for unimodal and multimodal transportation. While unimodal transportation can be coherent for some use-cases, it may not be the most efficient, sustainable, or accessible option. Relying solely on one mode of transportation can contribute to congestion, pollution, and limited accessibility, particularly in urban areas (Zgonc *et.al.*, 2019). HL as unimodal system negatively affects resource and cost effectiveness. More unimodal system limits HL use in hard reachable landscape. To the contrast, many European cities and regions are working to promote multi-modal transportation systems that integrate various transportation options to improve efficiency, sustainability, and accessibility for all travellers (COM, 2023).

Multi-modality in transportation refers to the integration and utilization of multiple modes of transportation within a single journey or transportation system (COM, 2023). This concept aims to provide more efficient, flexible, and sustainable transport options by allowing system objects to easily switch between different modes of transportation based on their needs, preferences, and the specific circumstances of their trip.

Goal of multimodal approach is to increase access to destinations and to provide an alternative to the use unsustainable transportation modes. The benefits of HL as multi-modal transportation include: improved accessibility, reduced congestion, environmental sustainability, cost savings, enhanced urban planning.

Hyperloop multi-modal transportation systems include a combination of public and private transportation options, such as public transit, private vehicles, shared mobility services, active transportation. 30 different Hyperloop projects have been analysed to supplement comparative analysis. Scope of tech scan included the following stakeholders involved in Hyperloop implementation: China Aerospace Science and Industry Corporation (CASIC, 2023), Delft (Delft, 2023), ePICenter project (ePICenter, 2023), Hardt (Hardt, 2023), Hyperloop One (Hyperloop One, 2023), HyperloopTT (HyperloopTT, 2023), NEVOMO (Nevomo, 2023), Severstal (Severstal, 2023), Space X (Space X, 2023), Swisspod (Swisspod, 2023), Transpod (Transpod, 2023) and Zeleros (Zeleros, 2023). Scanned projects geography covered Europe, Asia, North America, and Australia continents.

Research analysed Hyperloop technology in the context of unimodal and multimodal transportation modes.

Study limited to unimodal and multimodal transportation modes. Intermodal transportation is not included in the analysis as research focuses on engineering and technology aspects of Hyperloop technology, rather than contract and carrier selection for cargo to reach from point A to point B. Further research is needed to cover intermodality aspect of Hyperloop technology.

The given research is supervised by Dr.sc.ing., Professor Mihails Savrasovs.

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ИССЛЕДОВАНИЕ СЕТЕВЫХ ТЕХНОЛОГИЙ ДЛЯ ИХ ИСПОЛЬЗОВАНИЯ В ОБЛАСТИ "ИНТЕРНЕТ ВЕЩЕЙ"

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Ключевые слова: интернет вещей, сетевые технологии, ситуационная осведомленность, метод анализа иерархий

В последние годы спрос на IoT-решения вырос в геометрической прогрессии, и, как следствие, возросла сложность проектирования. Из-за этого, проектировщикам и заинтересованным сторонам становится сложнее выбрать наиболее подходящую сетевую технологию для своих проектов, особенно учитывая широкий спектр доступных вариантов. Данное исследование направлено на решение этой проблемы и имеет практическое значение для ряда заинтересованных сторон, включая проектировщиков систем IoT, разработчиков продуктов и поставщиков технологий. Повышая ситуационную осведомленность при выборе сетевых технологий в проектах IoT, исследование может помочь улучшить производительность, надежность и функциональность решений таких систем. Это, в свою очередь, может принести пользу целому ряду отраслей, включая здравоохранение, транспорт, энергетику и другие.

Стоит выделить следующие основные характеристики исследования:

- Целью является ранжирование сетевых технологий для принятия решения о наиболее подходящей для проектирования системы IoT в различных сценариях использования;
- Объектом - свойства сетевых технологий, применяемых в IoT;
- Предметом – методы ранжирования актуальности применения сетевых технологий при проектировании систем IoT;
- Гипотезой – при помощи метода анализа иерархий возможно повысить ситуационную осведомленность о выборе целесообразной сетевой технологиидля проектирования систем IoT.

В ходе исследования рассмотрены современные сетевые технологии, применяемые в системах IoT, а также выделены ряд качественных и количественных параметров данных технологий, которые нужны для ранжирования. Для принятия решения рассмотрен метод ситуационной осведомленности, а для ранжирования - метод анализа иерархий.

Суммируя вышесказанное, данное исследование посвящено оценке пригодности различных сетевых технологий в системах IoT для различных сценариев применения с использованием подхода ситуационной осведомленности к принятию решений.

В результате работы получены ранжированные при помощи метода анализа иерархий данные и оценена эффективность полученного результата.

Исследование выполняется под руководством Dr.sc.ing. Александра Кривченкова.

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THE IMPACT OF JIRA AND CONFLUENCE ON REMOTE PROJECTMANAGEMENT: A CASE STUDY OF IT COMPANY – WISEBITS

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Keywords: Project Management (PM), Jira, Confluence, Remote Work (RW)

Remote work (RW) has become increasingly popular in recent years, driven by advances in communication technology and the need for greater flexibility in the workplace. This trend has been further accelerated by the COVID-19 pandemic, which has forced many organizations to adopt remote work on a large scale. While remote work presents several benefits such as increased flexibility, reduced overhead costs, and greater access to a wider pool of talent (Amponsah-Tawiah and Mensah, 2017), it also presents several challenges, particularly in the realm of project management (PM). Effective project management in a remote environment requires the use of appropriate communication and collaboration tools to ensure seamless coordination and teamwork among team members who may be geographically dispersed.

Jira and Confluence (Atlassian, 2022) are two commonly used software tools that can aid remote project management. The results (Naghshbandi and Javadian, 2019) made conclusions that these tools are the most popular tools for remote project management but the impact of them on project management is not yet fully understood, particularly in the context of specific industries or companies. Therefore, this study aims to investigate the impact of Jira and Confluence on remote project management in an IT company.

The study focuses on exploring the impact of Jira and Confluence on remote project management in a specific IT company. The study seeks to understand how these tools are used in there, assess their impact on project outcomes and team collaboration, and identify the benefits and challenges of using Jira and Confluence (Wang *et al*., 2022) for remote project management.

The analysis of information sources helped to confirm or refute the assumptions made about the impact of Jira and Confluence on remote project management. Also, the analysis of all sources partially confirmed the Wisebit's expert opinion regarding this topic. As a result of this study, hypotheses will be formulated about the possible reasons for the challenges faced by the specific company in using Jira and Confluence for remote project management. Additionally, the study investigated the decision-making processes of enterprises in selecting Jira and Confluence as tools for remote project management.

In order to gain a deeper understanding in this topic an empirical approach was used. It involved the creation of a survey form that was used to gather responses from a range of project managers, team members, and other stakeholders involved in remote project management. The survey aimed to identify the criteria that are used in selecting Jira and Confluence for remote project management, as well as the goals that the organization sets when using these tools.

The quantitative characteristics that can be used to assess the impact of the tools used in remote project management include time spent on tasks, project completion rate, accuracy, user adoption rate and cost savings.

The qualitative characteristics that can be used to assess the impact of the tools used include: user satisfaction, collaboration and communication between team members, transparency and adaptability.

From the survey results, it can be concluded that the majority of respondents use project management tools for remote work every day and are satisfied with them. Additionally, most respondents noticed some improvements in remote project management since implementing Jira and Confluence, and collaboration using these tools is considered easy by the majority. The respondents considered collaboration tools to be extremely or very important in remote project management.

As a result, this study identified areas where improvements can be made in the use of Jira and Confluence for remote project management, such as better integration with other tools or more streamlined workflows. Also, this study highlighted the benefits of using these tools for remote project management, which could encourage other organizations to adopt them. This could lead to increased adoption of these tools and greater standardization in remote project management practices.

The given research is supervised by PhD cand., MSc.proj.mgmt. Silvija Bruņa.

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KANJI ARCHITECTURAL PATTERN

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Keywords: Services, pattern, development, framework, structure, solid, components, architectural patterns

The actuality of this research lies in the fact that the author has created the Kanji architectural pattern as a new approach to web application development and presents it in this work. This pattern offers greater flexibility and adaptability for designing and implementing software systems with a strong emphasis on reusability and modularity. This is particularly important in the modern context of software development, where the need for responsive and engaging user interfaces is crucial and applications can span thousands of files and lines of code.

Research is devoted to problematizing the development of modern architectural patterns, such as Model-View-Controller (MVC), Model-View-Presenter (MVP), Model-View-ViewModel (MVVM), Atomic, and others (baeldung, 2022), (Freeman, 2004). These patterns were developed to solve software design issues but have limitations that affect the development process. One of the main problems with these patterns is that they tend to create tightly coupled code, making it difficult to change or maintain. Additionally, these patterns were developed during a time when applications did not have access to modern tools and development approaches, leading to longer development times and increased complexity. Moreover, architectural patterns often do not address cross-cutting concerns, such as component samples and component reusability. This research aims to provide a comprehensive analysis of these issues and offer potential solutions to improve the development process.

The goal of the research is to analyze existing architectural pattern approaches and determine how the newly developed Kanji architectural pattern can resolve contemporary issues to provide a comprehensive analysis and offer potential solutions to improve the development process.

The Kanji architectural pattern consists of five main components: Bookmark, Reference, Remark, Paper and Page, each of which is designed to be modular, self-contained, and highly reusable. And submodular components such as: Stroke, Radical, Word and Paragraph (Kano *et al.,* 1990), (Sasaki, 2005). That submodular components gives possibility to create application view structure with reusability principles.

Author provides a detailed description of each component, as well as guidelines and best practices for their use in software design and implementation, based on S.O.L.I.D that is a mnemonic acronym for five design principles intended to make object-oriented designs more understandable, flexible, and maintainable (Erinç, 2020). The performance and maintainability of software systems designed using the Kanji pattern are evaluated in comparison to other architectural patterns, demonstrating its effectiveness in building responsive and engaging user interfaces.

Furthermore, the suitability of the Kanji pattern for different types of software systems and domains is investigated, showing its potential to be used in a wide range of applications, including those in the context of the emerging Society 5.0 (BrandNewsPicks, 2021). That one of the main aims for Society 5.0 is to reuse components of Kanji architectural pattern at any applications without additional time spending on maintenance and restructuration.

Overall, this research presents a new approach to web application development that combines the strengths of existing architectural patterns in a flexible and adaptable way, providing a solid foundation for building sophisticated and responsive software systems.

The research is supervised by Dr.sc.ing., Professor Irina Yatskiv.

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AUTOMATISATION OF INTERNAL CONTROL SYSTEMS FOR SANCTIONS MONITORING - REQUIREMENTS AND CHALLENGES FOR DEVELOPERS AND USERS

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Keywords: Sanctions, AML, KYC, suspicious transactions, monitoring, reporting

In recent years, investigations into sanctions violations of inadequate sanctions screening have resulted in huge fines for non-compliance with standard of anti-money laundering (AML) and know-your-customer (KYC) due diligence and sanctions regulations. The subjects of this Law are persons performing an economic or professional activity (Saeima, 2019) in the areas listed in the Law. The main cause for the significant fines is that a considerable portion of companies fail to conduct regular assessments of their sanction screening protocols, and only a few of them take measures to improve their compliance procedures. As regulatory scrutiny around sanctions has become stricter than ever, noncompliance can cost for businesses millions. The magnitude of money laundering penalties has shown the need for a robust control system and knowledgeable staff to manage AML risks.

Money laundering activities pose and financing of terrorism has become a threat to the global economy as the proceeds of these activities can be used to fund further criminal endeavors and undermine the existing system worldwide. Therefor technology is crucial in the fight against money laundering. Employing suitable technology tools and automation can enhance productivity. The internal control system must act quickly in signaling suspicious transactions to help investigators eliminate risks.

Evolving regulations and recent anti-money laundering violations by major financial institutions have demonstrated the need for continuous technology improvement and controls to manage anti- money laundering operations.

In recent years, various studies in the field of KYC have become increasingly relevant. For example, a Taiwanese bank has chosen to separate data into two subgroups for its own purposes: data of individuals and companies. The advantage of this categorization is that it can compare the risk drivers between the two subgroups (Chen, 2020).

According to a survey conducted by Deloitte (2019), automating internal controls can bring about meaningful and concrete advantages.

The increased use of automation is expected to play a crucial role in reducing control deficiencies and their negative effects. This view is further supported by the fact that those who automated 50% to 75% of their financial controls did not experience any significant deficiencies or weaknesses in the past two financial years. The survey notes that this makes a compelling case in favor of increasing automation (Deloitte, 2019).

The purpose of this thesis is to explore the requirements and challenges faced by both developers and users in implementing internal control systems and sanctions monitoring, and provide practical solutions for SMEs to overcome these challenges and achieve success. The design of a model should consider factors like the type of business, countries involved, and currencies utilized. Tasks should include two types of screening controls: transaction screening and customer screening. The results obtained in the study conducted in 2021 show that for the detection of money laundering by natural and legal persons, the proposed model produces far fewer false positives (Rocha-Salazar, 2021) than the model of mathematical scoring.

Through a comprehensive literature review and case studies of successful implementation, this thesis highlights best practices for risk assessment, control design, monitoring, reporting, employee training, and communication. By implementing these best practices, SMEs can enhance their efficiency, reduce their operational costs, and improve their decision-making. Ultimately, this will enable them to achieve their business objectives and compete effectively in today's rapidly changing business landscape.

The research is supervised by Dr.sc.ing., Professor Mihails Savrasovs.

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DEVELOPMENT OF A UAS TRAJECTORY CONTROL SYSTEM IN THE LANDING ZONE USING TWO STATIONARY VIDEO CAMERAS

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Keywords: Unmanned Aerial Vehicles, Flight Path Monitoring System, Image Processing, Automatic Collision Warning System

The Flight Path Monitoring System (FPMS) in Landing of Unmanned Aerial Vehicles (UAV) using stationary video cameras is a solution to the problem of the possible presence of:

- Reduced equipment costs. The use of a fixed video camera for the FPMS UAS can lead to a reduction in the cost of additional equipment, as it can be used both for navigation (Yan *et al.,* 2018) and for viewing from the ground.
- Increasing Safety. This system allows you to perform tasks with greater speed, due to the automatic collision warning system.
- Use on unprepared Landing Places. It is possible to use of UAVs in various scales like commercial aviation (Hall, 2015), agriculture, geological surveys, etc.

The purpose of this work is to explore the possibility of building a system for automatically determining the coordinates of the UAV during the landing approach and in the event of approaching a dangerous distance, automatically sending a signal to change course.

To detect a moving UAV, Motion Detection Based on Frame Difference Method (Singla *et al.,* 2014) and Mass Center vectorization algorithm for vehicles counting portable video system (Gaidash *et al.,* 2016) computer vision algorithms are used. The first algorithm fixes the change in the frame, the second one finds its center of mass.

In this paper, an attempt is made to solve the above tasks, to develop a common architecture that can solve the tasks set and to compare with the already proposed solutions.

The given research is supervised by Dr.sc.ing., Professor Aleksandrs Grakovskis.

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ANALYSIS OF EMOTIONS ON SOCIAL NETWORKS THROUGH IMAGES

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Keywords: Data analysis, artificial intelligence, socials networks, images, emotions, Big Data

Social media has become an important platform for people to express their thoughts and opinions on various topics. Twitter, one of the most popular social network, provides a large amount of data that can be analyzed to understand the public's opinion on specific topics. One method of analyzing Twitter data is to analyze the emotions expressed in the images posted on the platform. Thus, the objective here is to determine a public opinion on a given topic by analyzing the facial emotions of people appearing in photos related to that topic.

The goal of our research is to determine the public's emotions towards a particular topic by analyzing images posted on Twitter. For this purpose, we have chosen to use the Python programming language and several libraries. First of all, we use SNScrape to retrieve data from Twitter and OpenCV to manipulate images in Python. Then, we set up two algorithms to analyze the retrieved data. The first one, YOLO (You Only Look Once), allows to detect faces on a picture. The second one, "Deepface", allows to analyze the emotions of each face on the photos. For images with multiple people, we apply the Deepface algorithm to each face separately.

Subsequently, the "Deepface" algorithm will classify the emotions of faces into 6 different categories: sad, angry, neutral, disgusted, surprised and happy. Thus, if an image contains 2 people and these two people reflect different emotions, each of them will be counted.

Finally, by applying this algorithm to a very large amount of recovered images, the objective is to determine which emotion stands out the most. This allows us to obtain the general opinion of people regarding the given hashtag.

In conclusion, the use of image analysis techniques, such as the ones employed in this research, can be highly effective in analyzing emotions expressed on social media platforms like Twitter. This type of research can provide valuable insights into public sentiment, which can be used by businesses, policymakers, and researchers to make informed decisions.

The given research is supervised by Dr.sc.ing. Professor Dmitry Pavlyuk.

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DEEP LEARNING MODEL TO ANALYZE SOCIAL MEDIA

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Keywords: Artificial Intelligence, Data Analyses Deep Learning, API, Social Networks, Big Data

This study explores the use of artificial intelligence (AI) and social media to analyse the context of significant events or topics. Social media platforms provide a wealth of information about people's opinions and emotions. In this project, an AI model was developed to detect, classify, and understand users' feelings.

To achieve this, a deep learning model called Transformers (introduced in 2017) was used. This model is specifically designed for handling sequential data, such as natural language, which is a predominant feature of social media. To evaluate the performance of the emotion classification model, various text analytics models were evaluated against the TweetEval1 dataset. Results suggest that the model is effective in detecting and categorizing emotions in social media.

Moreover, a practical application was designed to filter social media posts related to a specific event or topic. This enables users to analyse the emotions expressed in those posts. Although it may not be feasible to fully comprehend people's emotions based only on their social media posts. Especially since it is not uncommon for a user to distort words according to his or her audience or the reaction to be sought. The model provides a useful tool for analyzing and summarizing the emotions expressed in social media.

As one of the goals of AI is to simplify human work by solving repetitive problems, we will also propose some practical applications of these models. Indeed, we set up an API and a website in order to use our emotion classification model. In order to target a search, we have set up a filter system that allows for example to target only the publications related to a topic or an event.

In conclusion, this study highlights the potential of AI and social media data for understanding people's emotions in the context of important events or topics. The model proposed here has practical applications in fields such as market research, political analysis, and public opinion polling, security, and businesses where public opinion is critical.

The given research is supervised by Dr.sc.ing., Professor Dmitry Pavlyuk.

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APPLICATION DEVELOPMENT FOR INFERENTIAL STATISTICS AND PREDICTIVE ANALYTICS LEARNING

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Keyword: Data generation, classification, statistical modeling, data science, synthetic data

The digital age's massive increase in data presents numerous challenges for data analysis and processing. Some of the key aspects that require careful attention and expertise are data quality, integration, security, visualization, and interpretation. However, these aspects become harder to manage as data volume, variety, velocity, and veracity increase exponentially.

Data analysis is a crucial skill for students and researchers, who must collect and analyze data for a variety of purposes. Searching, focusing, monitoring, selecting, extracting, and capturing data are all part of the data generation process. These tasks can prove difficult and time-consuming, especially for beginners who lack experience and knowledge of data sources and formats. Furthermore, due to ethical or technical concerns, some data sets may be sensitive, incomplete, or inaccessible.

A web-based data generation application can assist in overcoming these challenges by providing a user-friendly interface and allowing users to create their own data sets based on their needs and preferences. Users can generate realistic and consistent data in a few clicks by selecting from a variety of data types, fields, ranges, distributions, and formats.

Developed web application allows the user to select a type of test among the following topics: Distribution fitting, Two-sample problem, Correlation/Regression and Classification.

After selecting the adequate test, a few editing options become available, depending on the parameters evaluated through this test. Then data can be generated using different algorithms, and a random dataset following the requirements is made. The test is then applied to the generated dataset and both the data and the test results appear on the next page, along with a small amount of explicative text to ensure the results are understood as they are supposed to be.

Regarding the correlation and classification problem, an auto encoder generates faces, which is a type of neural network that can learn a compressed representation of images. Once the auto encoder has been trained to generate faces, encoded vectors are used as inputs to different algorithms to perform correlation/regression and classification tasks. By applying these algorithms to the encoded vectors, insights are gained into how different features of the faces are related to each other and how they can be used to classify different face types.

The aim of the web application is to facilitate the study of a course that includes Inferential Statistics and Predictive Analytics. Users will be able to test their knowledge and computational skills and will have as the output the results and conclusions of the problem solved by the selected method.

The given research is supervised by Dr.sc.ing., Associate Professor Nadezda Spiridovska.

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SIMULATION AS A DECISION SUPPORT TOOL: CASE STUDY OF KRIŠJĀŅA BARONA IELA

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Keywords: Transport simulation, modelisation, traffic fluidification, multimodality, decision support tool, modern simulation software

Every city has its "red routes". These are roads which have the most potential to have dense traffic. In London, 5% of the roads are red zones, as they carry 30% of the traffic. Rīga also has its red zones, and Krišjāņa Barona iela is one of them.

This paper will examine the evolution of traffic flow over one hour on Krišjāņa Barona iela in Rīga, and aim to optimize these flows. We will study nine intersections, from Elizabetes iela to Tallinas iela.

Our first objective in the frame of research is to optimize the movement of traffic flow on Krišjāņa Barona iela by organising the green wave. As a primary system analysis tool, the simulation on microscopic level has been selected. Our process is to finetune our model until we are confident that it reflects the current situation on Krišjāņa Barona iela. When, we will attempt to optimize the traffic movement, primary by tuning the traffic lights operations.

The second objective of the research is to compare the development process of the simulation model and final results (model outputs). For this objective two modern simulation tools were selected, one is a specialised traffic flow simulation software PTV VISSIM, the second universal simulation tool (with traffic library) - AnyLogic. Both software tools are known and widely used for implementing not only research projects, but also for conducting the practical problem solving.

The research results could be formulated as following outcomes: two valid models developed using VISSIM and Anylogic, specific recommendations on how to optimise the movement of the traffic flows; detailed analysis and comparison of the development process and output data from two models (VISSIM and AnyLogic).

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IDENTIFICATION OF FINGER-BASED SIGNATURES USING COMPUTER VISION TECHNIQUES

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Keywords: Airwriting signature, computer vision, image processing, deep learning

The COVID-19 pandemic has brought significant changes to the way we live and work, forcing many individuals and organizations to adapt to a new way of doing things. One area that has been particularly affected is document signing, as traditional methods that involve physical contact are now discouraged to minimize the spread of the virus. To address this challenge, this project aims to develop an application that uses computer vision techniques to identify finger-based signatures, providing a contactless and secure way to sign documents.

The project plan outlines the objectives, scope, methodology, and technologies that is used in the development of the application. The objectives of the project include developing an application that identifies a user's finger and captures the depth, implementing a solution to recognize and transcribe the signature in 3D and 2D, testing the application to ensure it is accurate and reliable in identifying and transcribing signatures, and developing a user-friendly interface to allow for easy signature creation and storage. The application is designed to operate on both desktop and mobile devices with a camera, allowing users to create digital signatures on the go.

To implement the proposed solution, the project team has leveraged existing technologies and frameworks that are commonly used in computer vision, image processing, and software development. The primary technologies selected for this project are OpenCV (Bradski *et al.*, 2000) and TensorFlow (Paszke *et al.*, 2016). In this application, TensorFlow is used to train a machine learning model that can accurately identify finger positions and orientations in images captured by the camera.

Other potential technologies that may be used in the development of the application include PyTorch (Abadi *et al.*, 2016), Unity (Lange *et al.*, 2005) and Qt (Nord *et al.*, 1995).

This project provides a new solution for individuals and organizations seeking a secure and contactless way to sign documents. It contributes to the growing field of computer vision and image processing, demonstrating the potential of these technologies to solve real-world problems. It is an innovative and useful tool that can be used by anyone with a camera-enabled device to create digital signatures quickly and easily.

The given research is supervised by Dr.sc.ing., Professor Aleksandrs Grakovskis.

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HEURISTIC ALGORITHMS APPLIED TO MULTIDIMENSIONAL MACHINE SCHEDULING

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Keywords: Heuristic algorithms, combinatorial optimization, multidimensional scheduling, assets allocation

A research area that has been of great practical value in the management of operations and production is finding efficient methods to schedule and determine the optimal order in which given tasks, events, or actions should be carried out, most of the time with specific constraints to take into consideration (Pinedo, 2012). Over the past 60 years, a significant amount of research has been dedicated to developing scheduling in theory and in practice, with a view to providing the industry with tangible solutions to such optimization problems (Garey and Johnson, 1979). Nowadays, the literature contains numerous state-of-the-art studies on existing algorithms that are suitable to solve a wide range of scheduling problems in various contexts; this documentation presents the analytical performance of these algorithms by establishing their computational complexity or empirically through numerical analysis (Brucker, 2007).

Yet, numerous challenging scheduling problems arise with new application domains. Various types of resources can be defined, such as human resources in a hospital or machines in a factory, and it is still quite rare for one particular scheduling solution to be able to schedule different types of resources. Thus, the development of models enabling the scheduling of both material and human resources will probably be key for the future of management optimization in many areas (Baker and Trietsch, 2013). Therefore, scheduling remains an active research field with lots of real-world applications in diverse sectors such as manufacturing, logistics, healthcare, etc. (Blazewicz *et al*., 2019).

In this research project, we will be focusing on a machine scheduling problem; more specifically, we will be working on the problem faced by a cleaning company, which acquired many floor cleaning machines coming from different providers and having disparate capacities and productivity. Usually, when a cleaning company needs to plan the best asset allocation, the common practice is to rely on the experience of managers to estimate what combination of assets is appropriate in order to fulfill the different cleaning tasks that are carried out simultaneously in different locations; it is precisely what we call a combinatorial optimization problem, similarly to the knapsack problem or the traveling salesman problem (Korte and Vygen, 2012). For two particular use cases, our goal is to determine what the optimal solution is, by implementing a First-Come-First-Served (FCFS) approach as well as a multi-dimensional approach using several heuristic algorithms (Glover and Kochenberger, 2003). For each algorithm that is tested, the expected result will be the measure of efficiency of that specific repartition of the cleaning machines, which will include measures of complexity, resources needed, etc.

Thus, effective planning management remains a critical research area for various sectors. The research project described later on aims to contribute to the development of effective machine scheduling solutions that can help companies optimize their operations and production management.

The research is supervised by Ph.D., Professor Emmanuel Alejandro Merchán.

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Session 2

Innovations and Smart Technologies in Transport and Logistics

Inovācijas un viedās tehnoloģijas transportā un loģistikā

OPTIMISED ROUTE RECOMMENDATION INDUCED BY INDIVIDUAL'S PREFERRED TRANSPORTATION MODE

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Keywords: route recommendation, personalization, transportation modes

Traveller`s preferences play a significant role in transportation mode selection. Route personalization is a fresh field of study that aims to improve travel experiences by tailoring travel routes to specific user needs. This approach is based on the idea that individuals have distinct travel patterns, which can be used to generate personalized recommendations that are more relevant and useful than generic travel suggestions. The goal of general route recommendation is to provide a route between two points on a road network, an origin and a destination, based on a given cost function (Chen *et al.*, 2011; Wei *et al.*, 2012).

Similarly, advances in this area of research, focus on providing personalized route recommendation based on historical GPS trajectories to infer implicit driving preferences and suggest new routes from previous trips (Letchner *et al.*, 2006). Other studies (Zhu *et al.*, 2017), (Hu *et al.*, 2020), make use of users' social media data to model route attributes, build data set of popular locations, extract temporal information such as visiting time and transition time.

One of main challenges encountered in personalization algorithms is that user preferences might not always reflect their true behaviours and are invariant to time. Moreover, the training process of machine learning techniques in that field, might be not suitable for the route personalization task. Therefore, to address this gap literature review about personalized route recommendation algorithms has been done and subsequently, a pilot study consisting of three stages has been proposed.

The first stage is devoted to identifying pertinent data sources and real-time variables such as weather, road infrastructure, public transport offering, that allow to model a city of interest (Torino) as a tensor representation (Kuang *et al.*, 2014). The second stage concerns in implementing a tensor-based data fusion approach that estimates a vector of optimal trajectories, given an origin-destination pair (start location, end location) for four classes of users such as car user, bike user, hybrid user – which uses different modes of transport – and user with disabilities, where each class of user can be encoded, as a multidimensional matrix holding information about past trips, points of interests (POIs) of individuals. Eventually, the final stage is engaged in evaluating the proposed algorithm with applicable quality metrics.

The topic of route recommendation plays a vital role in Mobility-as-a-Service (MaaS) as it enables the system to suggest the most efficient and convenient route based on the user's preferences, real-time traffic information, and the availability of transportation modes. Personalization is also an essential aspect of MaaS, as it allows the system to tailor recommendations to the user's unique needs and preferences, such as their preferred modes of transportation, travel times, and cost constraints.

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DIGITAL APPROACH TO THE SUPPLY CHAINS OF SMALL AND MEDIUM SCALE ENTERPRISES

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Keyword: Digitalization, supply chain management, SMEs

The majority of nations' economies get a considerable boost from the contributions made by small and medium-sized businesses. Yet, since they have limited resources and access to technology, they often run into difficulties while attempting to manage their supply chain. The adoption of a digital strategy for managing supply chains has proven to be a game-changer for SMEs, as it enables these companies to improve their competitiveness, simplify their operations, and lower their expenses.

Using digital technology to automate and improve various aspects of supply chain management is what people mean when we talk about "digitalizing" supply chain management. The way that SMEs handle their supply chains has been fundamentally altered as a result of the widespread use of digital technologies. The enterprises may increase their visibility into their supply chain networks, manage inventories in real time, improve communication with their suppliers, and automate procedures with the use of digital technology.

The decrease of expenses that are often connected with supply chain operations is one of the most important advantages that can be gained by using a digital approach to supply chain management. Digitization gives the ability to improve their order fulfillment process, manage their inventory levels, and cut down on stock-outs. In addition, the use of digital technology may provide better communication with both customers and suppliers.

The use of digital technology makes it possible for SMEs to obtain access to important data and analytics, which can then be utilized to gain insight into the operations of their supply chains. The use of big data analytics may assist SMEs in recognizing patterns and trends, which can then be used to further improve the efficiency of their supply chain operations. The use of artificial AI and machine learning algorithms may also assist SMEs in making choices based on data, improving the accuracy of their forecasts, and seeing possible problems before they arise.

Also, digital technologies have the potential to enhance sustainability activities that are implemented inside the supply chains of SMEs. The SMEs have the potential to improve their performance in terms of sustainability, boost their reputation, and appeal to customers who are environmentally sensitive if they monitor and optimize their energy use, reduce waste, and manage their carbon footprint. The goal of the research is to analyse the digital approach to the supply chains of small and medium scale enterprises and the object of the research is major SMEs in Riga.

In conclusion, the digital approach to supply chain management offers SMEs a variety of advantages, some of which include a decrease in costs, greater cooperation and visibility, access to important data and analytics, and enhanced visibility. Yet, to implement new technologies, SMEs must first overcome obstacles, such as a lack of resources and skills. It is possible for governments, industry associations, and technology providers to play a significant role in assisting SMEs in their journey toward digital transformation, which will ultimately contribute to the expansion and competitiveness of SMEs and the economy as a whole.

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ELEKTROMOBIĻI PRIVĀTAI MOBILITĀTEI UN MAZAJIEM UZŅĒMUMIEM KĀ DAĻA NO EIROPAS ZAĻĀ KURSA

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Atslēgvārdi: Green Deal, ekoloģiskais transports, elektromobili, ieviešanas veicināšanas metodes

Eiropas Komisijas priekšsēdētāja Ursula von der Leyen savā uzrunā Eiropas Komisijai 2019. gadā paziņoja par Eiropas Savienības (ES) Zaļā kursa (Green Deal) uzsākšanu. Green Deal ir pasākumi, kas jāveic visām ES dalībvalstīm, lai līdz 2050. gadam panāktu klimatneitralitāti. Paziņojumā teikts: „Mūsu mērķis ir saskaņot ekonomiku, ražošanas un patēriņa veidu ar mūsu planētu un panākt, lai tas būtu izdevīgi mūsu iedzīvotājiem". Programma ir vērsta uz Parīzes klimata nolīguma mērķu sasniegšanu, un tā ir atzinums par klimata pārmaiņu pieaugošo nozīmi Eiropas rūpniecībā, tirdzniecībā un politikā.

Tieši transports ir visvairāk atkarīgs no fosilā kurināmā, tāpēc tas ir viens no galvenajiem CO_2 emisiju avotiem. 2021. gadā tas veidoja 37% no CO_2 emisijām no galapatēriņa nozarēm. Lai gan šī bija viena no nozarēm, ko visvairāk skāra Covid-19 pandēmija, emisijas atkal ir palielinājušās, jo ekonomika ir atguvusies. Alternatīvo degvielu izmantošana transportā joprojām ir ierobežota.

Darba teorētiskā daļa sākas ar dažādu ekoloģiskā transporta veidu nozīmes analīzi Zaļā kursa īstenošanā. Darbā galvenā uzmanība pievērsta elektriskajiem vieglajiem un mazajiem kravas automobiļiem, kurus izmanto gan mājsaimniecībās, gan uzņēmumos. Kā daļa no šī jautājuma izpētes ir ierosināts elektromobiļu ieviešanas modeļu pārskats ES valstīs. Turpmāk sniegti dati par elektromobiļu izmantošanu Latvijā. Abos pārskatos detalizēti analizēti faktori, kas ietekmē elektromobiļu parka attīstību gan privātajā sektorā, gan uzņēmumos.

Darba praktiskajā daļā uzmanība pievērsta elektromobiļu ieviešanas veicināšanas metožu izstrādei Latvijā. Tiek aplūkoti konkrēti pasākumi, kas saistīti gan ar attiecīgās infrastruktūras attīstību, gan ar elektromobiļu ekonomisko rādītāju uzlabošanu. Darba pēdējā daļā ir parādīts analītiskais modelis, kas ļauj aprēķināt elektromobiļa ekspluatācijas izmaksas un CO_2 emisijas apjomu Latvijas apstākļos.

Darba vadītājs Dr.sc.ing., Dr.rer.nat.habil, Emeritus profesors Jurijs Tolujevs.

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A STUDY ON THE IMPLEMENTATION OF GREEN SUPPLY CHAIN - A COMPARATIVE ANALYSIS BETWEEN SMALL SCALE INDUSTRIES IN INDIA AND DEVELOPED NATIONS

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Keywords: Small-Scale Industries (SSI), Green Supply Chain Management (GSCM), Lean Supply Chain Management (LSCM)

Natural contamination is the serious issue that humankind faces in present express, the significant emissions of harmful gases from vehicles and enterprises. The proposed study centres around three unique sorts of Small-Scale Industries (SSI) in India that are guard fabricating industry, dyeing industry, and food industry. The patterns of the product life cycle for every industry are distinguished and their recent green strategies for garbage removal are researched. The ventures are related to additional waste inside their item life cycle process. The significant waste from their removal techniques has high impact on climate and must be diminished by means of a reasonable storage network. In the present organizations' practice no storage network was associated. The implementation of such network could reduce the environmental tensions and misuse of the organizations to a certain extent. The waste distinguished in the process could be reduced by appropriate mechanisms and strategies. The technique for removal considered by the SSIs in India shows the extent to which they worry about the climate. The investigation attempts to reveal appropriate waste administration strategies for the enterprises and discusses significance of government activities on promoting relevant methods. The SSIs need to coordinate waste storage, so the execution would pave a way for green production network. Lean and green model is recommended for the enterprises on the grounds of waste decrease procedures. It likewise helps in accomplishing both lean and green business results.

The given research is supervised by Ph.D. Berdymyrat Ovezmyradov.

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ANALYSIS TRAFFIC FLOW AROUND THE MULTIMODAL TERMINAL USING SIMULATION MODEL

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Keywords: Intermodality, airport, rail, co-modality, transportation, simulation, utilization

Before pandemic time air transport faced several challenges due to the increasing demand, including capacity constraints at airports; congestion, delay times and environmental issues associated with aviation. Consequently, the need for intermodal airport strategies is becoming more essential than ever. Tremendous efforts have been devoted by the European authorities towards implementing efficient intermodal strategies while preserving the environmental aspects. This can be mainly achieved through the use of rails. The year 2021 was marked as the European Year of Rail, with the aim to promote the advantages of rail as a "sustainable, smart and safe means of transport" (European Commission, 2020). A set of initiatives were geared towards emphasizing the advantages of rail being affordable, secure and sustainable (Global Railway Review, 2021), and towards promoting the use of rail by citizens and businesses alike. The main objectives of the European commission are to have a completely functional and multimodal central network across Europe, as well as supporting information services by 2030, and to connect all airports networks to the rail network by 2050.

The European Commission defined intermodality as an attribute of a transportation system where at least two means of transportation are combined in a consecutive manner (EC, 2020). On the other hand, Project KITE, describes intermodality as a development strategy related to transport systems that aims to integrate different modes of transport in order to achieve uninterrupted journeys for passengers (KITE, 2007). In addition to intermodality, the concept of co-modality is also being incorporated. Co-modality adds to the concept of a continuous transport system through integration of modes, the idea of using each mode independently in an optimal manner. This means that the system is designed such that it's components function efficiently as independent parts and as a whole, thus resulting in the best use of resources. (EC, 2006)

This study focuses on passenger intermodality and particularly on the cases of the combination of several transportation infrastructures such as connecting airport transportation outlets (railway and bus stations) directly to other external transport networks. This study looks into a specific case of intermodality in the frame of forming Airport Hub including Riga International Airport (RIX) and infrastructure developed in the frame of the Rail Baltica project. Rail Baltica is a new train infrastructure project aimed at connecting the Baltic countries to the European rail network. The RIX project consists of the expansion of the passenger terminal of the airport to accommodate additional passengers and infrastructures relating to public and private transport will be updated to meet the requirements of service quality, safety, and capacity. The new transportation system will also provide connections to Rail Baltica Railway Station.

A thorough review of studies related to new trends in multimodal transport system is conducted, as well as of successful examples where these practices have been applied. Moreover, the future plans and strategies to be taken by the European authorities related to intermodal strategies are investigated.

Before significant changing of infrastructure as mentioned above simulation modelling as a powerful tool can be used to analyze complex systems, discover any unexpected bottlenecks and to make critical decisions to ensure that the project will comply to the specified requirements.

Specifically, simulation can aid in making decisions in airport related activities. The aim of the simulation in this study is to analyze the new transportation infrastructure of RIX without incurring additional costs or time.

Adding different scenarios to the model to study traffic and passenger flow intensity of the new terminal and surrounding infrastructure in order to deduce bottlenecks and capacities and propose any further system improvements and a more efficient utilization of transportation means.

The given research is supervised by Dr.sc.ing., Professor Irina Yatskiv.

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Session 3

Market: Research, Projects, Technologies and Problems of the Modern Economy

Tirgus: pētījumi, projekti, tehnoloģijas un mūsdienu ekonomikas problēmas

THEORIES OF ECONOMIC DEVELOPMENT

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Keywords: Economics, development, theory

The study is devoted to the theoretical substantiation of the doctoral thesis "Digital Transformation and the Future of Work: Preparing Students for the Digital Economy". The goal of this research is to determine the economic theories which can serve as a basis for the doctoral thesis. The research object is economic development theories and research subject is economic theories compatible with doctoral study. The author applied bibliographic method and method of qualitative analysis.

The author chose three theories that are connected with digital economy. The first theory is by Jean Tirole who was awarded the Nobel Prize for his work on industrial organization, which includes the study of how firms interact in the digital economy. His research has contributed to our understanding of market power, regulation, and competition in digital markets (Tirole, 2017). The second theory is by Paul Romer who was awarded the Nobel Prize for his work on endogenous growth theory, which includes the study of how technological progress drives economic growth. His research has contributed to our understanding of how digital technologies can spur innovation and economic development (Romer, 2018). The third theory is Alvin E. Roth who was awarded the Nobel Prize for his work on market design, which includes the study of how digital technologies can be used to design efficient and fair markets. His research has contributed to our understanding of how digital platforms can facilitate transactions and allocate resources in various markets, including labor markets, kidney exchange, and school choice (Roth, 2012).

The given research is supervised by Dr.oec., Associate Professor Jelena Popova.

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DEVELOPMENT OF SOCIAL-ECOLOGICAL TRANSFORMATION MEASURES FOR CHARLES DE GAULLE AIRPORT

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Keywords: Ecology, airport, Paris, Charles de Gaulle, development

One of the major challenges of the aviation industry nowadays is the ongoing consequences of the climate change on our world. The aviation industry is responsible for 5% of global greenhouse gas emissions (Lai *et al*., 2022). The industry is additionally responsible for many other emissions and is the cause of various pollutants. If the ecology crisis is not maintained, this will affect sustainability as well; which is needed in order to fulfill the needs of the current generation but also to ensure that the future generations' needs will be satisfied. The goal of United Nations is to reach carbon neutrality by 2050 but the process is long and perilous. Even if the problem has been persisting for a long time, it is only recently that airports have been implementing solutions to counter it. Research on the global hurdle is still very limited due to that. This paper analyzes one of the major airport hubs in the world in Paris, Charles de Gaulle (CDG) airport. The goal of this research is the creation of a development program that CDG can use to achieve socio-ecological transformation. Policies measures that were set up by the airport as well as other airports are analyzed to understand which ones are the most effective in order to reduce climate impacts. The main objective of this research is the study of entrepreneurial activity at Charles de Gaulle airport. The additional value of this review is its broader reflection of the different parameters or components airports can consider to reduce their ecological impact through the development program that was created. The subject of this research focuses on the study indicators of socio-environmental sustainability.

The research is supervised by Dr.oec., Professor Inna Stecenko.

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IMPACT OF LEADERSHIP STYLES IN EMPLOYEE'S MOTIVATION IN THE AUTOMOBILE INDUSTRY IN INDIA

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Keywords: leadership style, motivation of employees, automobile industry, personnel, HRM, company

Leadership is a crucial aspect of any organization as it sets the direction and tone for the entire workforce. In the automobile industry in India, leadership plays a critical role in driving growth, innovation, and employee motivation. The leadership style adopted by managers can significantly impact employee motivation, job satisfaction, and performance (Wright *et al.*, 2020). Therefore, understanding the relationship between leadership styles and employee motivation is vital for organizations' success. The capacity to direct the efforts of a group of people towards the formulation and accomplishment of certain objectives is an essential component of leadership (Bhatti *et al.*, 2012). Recent years have seen a growing awareness in both academic circles and the business world about the critical role that capable personnel and strong leadership play in the successful operation of a company. The accomplishments of an organization as a whole are often determined by the achievements of its individual members, since the prosperity of an organization is directly proportional to the effectiveness of its workforce (Goel *et al.*, 2013). Leadership styles have a great impact on groups and individuals within an organization (Chaudhry *et al.*, 2012).

The topicality of this research is pointed towards today's business world. The automobile industry is one of the key sectors driving economic growth in India, and effective leadership is essential for achieving high levels of employee motivation and engagement, which in turn can lead to increased productivity and profitability. As such, understanding how different leadership styles can affect employee motivation and performance is crucial for managers and leaders in this industry, as well as for scholars and researchers interested in the broader field of leadership and organizational behavior.

The main goal of the research is to analyze the impact of different leadership styles on employee motivation in the Indian automobile industry to identify the most effective leadership style for enhancing motivation and performance. The object of this research is employee's motivation system in automobile industry and the subject of the research is the impact of leadership styles in employee's motivation in the automobile industry in India. The study utilizes a mixed approach utilizing both quantitative and qualitative approach. This incorporates online survey and an interview. The methodology involves conducting a systematic literature review, followed by a self-structured questionnaire derived from identified factors, and utilizing online surveys and interviews, aimed to assess the impact of leadership styles on employee motivation in India's automobile industry. Five hypotheses are considered stating the impact of leadership styles, (Autocratic, Democratic, Laissez- Faire, Situational and Transformational leadership style) on employee motivation credentialed using Chi square test. The survey responses are analyzed using SPSS software and validated using Chi Square test. Chi Square analysis is used to validate the impact of these leadership styles in employee's motivation in automobile industry and the responses from interview is analyzed using the Analytic Hierarchy Process.

After conducting a comprehensive analysis of the results, the favorable outcomes are utilized to identify an optimal leadership strategy that would effectively facilitate the growth of the Indian automobile company, while concurrently ensuring the satisfaction of its employees by offering appropriate inspiration. The outcomes of this research, with the requisite modifications,

could serve as a viable model for identifying optimal leadership strategies for employee motivation across Indian Automobile Industry.

The research is supervised by Dr.psych., Associate Professor Ishgaley Ishmuhametov.

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RELOCATION OF A TECH BUSINESS: CHALLENGES AND EMPIRICAL EVIDENCES

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Keywords: Electroplating industry, decision making, relocation, crisis, data analysis's industry

Nowadays, the world is experiencing a rapid acceleration and escalation of different crises, which has caused companies in various industries to take a closer look at the relocation of their businesses.

The business relocation problem is a complex issue that organizations and businesses face when they need to move their operations from one location to another. Business relocation issues are particularly complex in the electroplating industry due to the potential environmental, health, and safety risks associated with this type of manufacturing.

Electroplating is a process that involves the application of a thin metal coating to a metal or plastic surface. It is an important process in the manufacturing of electronics, automotive parts, and jewelry, as well as in industries such as aerospace, defense, construction, and medical device manufacturing. The success of an electroplating business is highly dependent on the location of its operations. Factors such as the availability of resources, the presence of other industries in the area, the political situation, and the country's legislation and sanctions can all impact the success of an electroplating business.

The relocation of an electroplating business should be part of any crisis management plan, but can provide the business with access to new technologies and resources that can help them improve their efficiency and production to access to new markets and customers, cost savings in labor and taxes, availability of technical talent, closer proximity to suppliers and partners, regulatory compliance, mergers and acquisitions, favorable business climate, quality of life in a new location, access to new resources (natural and human), expansion of operations.

This thesis focuses on the relocation of electroplating businesses and investigates the potential impacts of such relocations on the businesses' operations. Through a review of the literature, interviews with industry experts, and a case study of a successful business relocation, the thesis seeks to identify best practices for organizations considering a move.

This thesis examines the challenges and empirical evidence associated with relocating a tech business in the electroplating industry. By looking at a range of case studies, we will explore how relocation can be beneficial for a tech business and how to carefully assess the needs of the business and associated costs before beginning the relocation process. Using the principles of decision-making and data analysis, in conjunction with the author's experience in the electroplating industry, this thesis seeks to create an appropriate approach and make accurate predictions.

The research is supervised by Dr.sc.ing., Professor Dmitry Pavlyuk.

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THE ENTRY STRATEGY OF A SME IT INTO INTERNATIONAL MARKET

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Keywords: Strategies, business, IT, socio-economic indicators, international market, Netherlands

The entry of a SME IT into the most attractive European market is a big part of successful business development. SMEs are the backbone of the economy in several developing countries (World Bank Group, 2016). SMEs account for more than half of all formal employment worldwide (IFC 2013). A cross-country study of 49,370 firms in 104 countries finds that although SMEs (< 100 employees) have a comparable share of aggregate employment as large firms, small firms (< 20 employees) have the largest share of job creation and highest sales growth and employment growth (Ayyagari *et al.,* 2014). In this research, the author chooses the Netherlands as a country where they want to show how to create and develop a small business. Nowadays the Netherlands is a country that is increasingly developing its technical sector every year which has a positive impact on the development of the IT business. Additionally, the country has favorable conditions for conducting a small IT business, which will be further explained in the work. It is important to highlight that the performance of a SME IT in the Netherlands will be higher than in other countries.

The aim of the research is to develop a strategy for a small IT company to enter the international labor market of the Netherlands. The object of the study is the IT industry in the Netherlands. The subject of the research is the strategy for a SME IT to enter the international market.

The given research is supervised by Dr.oec., Professor Inna Stecenko.

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ASSESSMENT OF THE FINANCIAL STABILITY OF A SMALL BUSINESS IN THE CONTEXT OF GLOBALIZATION

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"Financial stability is the condition in which the financial system – comprising financial intermediaries, markets, and market infrastructures – is capable of withstanding shocks and the unravelling of financial imbalances, thereby sustaining the flow of critical financial services that support real economic activity" (Bank of Canada, 2021).

This thesis aims to investigate the financial stability of a small business in the context of globalization. Using the conducted analysis, a model has been developed for evaluating and predicting the financial stability of small businesses in Latvia. This model could prove to be a valuable tool for making informed decisions. Using a case study approach, the examination of the financial performance of a small business operating in Latvian market has been done. The research investigates the issue of a proper assessment of a small business's financial stability in the frames of its adaptation to the changing global market conditions. To achieve this objective, the study examines the potential risks faced by small businesses and evaluates the current techniques used to assess and predict their financial stability.

The study's theoretical framework incorporates financial stability theories and globalization theories to explain how the two concepts interact. The research design includes a review of literature on the topic, followed by a case study analysis of a small business operating in Latvian market in terms of European globalization.

The research methodology involves literature review, the analysis of the case business's financial statements, development of both a theoretical model for assessing financial performance and a theoretical model for forecasting financial performance.

The study's findings indicate that a small business's financial stability is highly dependent on its ability to adapt to global market conditions. The financial analysis reveals that the business is facing liquidity and profitability issues. The research shows that the ability to adapt is affected by factors such as access to capital, government policies, and customer behaviour. The study concludes that small businesses should adopt strategies including cost-cutting measures, diversification of product offerings, and expanding its customer base, which enable them to navigate the changing global market conditions to remain financially stable. The study also recommends that policymakers provide appropriate support to small businesses, including access to capital and resources, to promote their growth and development.

In conclusion, the financial stability of small businesses in the context of globalization is a critical issue that requires attention. The challenges posed by globalization can influence the financial stability of small businesses, making it difficult for them to compete and survive. The research study determines the affection of internal and external factors on the financial stability of the small business enterprise (SME); highlights the challenges faced by small businesses in the context of globalization and recommends appropriate strategies to address these challenges. The results of the present study offer an objective evaluation of a small business's future prospects,

ascertain its financial stability and dependability in Latvia, and develop the model of predicting its financial condition for future periods.

The given research is supervised by Dr.oec., Professor Irina Kuzmina-Merlino.

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COOPETITIVE GLOBAL BRANDS GOVERNANCE IN THE SPORTS INDUSTRY

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Keywords: Sport globalization, commerzialization, ice hockey, coopetitive brand governance

Over the past decades, the field of professional sports has undergone a number of transformations, as a result of which sports branding has become a distinct and of growing importance subject area (Bodet. & Séguin, 2020). The topics of sports brand and branding have appeared quite recently and their driving processes, whether they concern the consumer side and the way sport brands are perceived and impactful or the organizational side and the way sport brands are strategically co- constructed and managed, remain widely unknown. Taking into account my personal professional experience of playing hockey, I will focus on the topic of brands governance in ice hockey.

The choice of ice hockey relies on four main reasons. First, ice hockey is facing an extremely competitive environment worldwide in terms of teamsports and teamsports events, and finding a right branding approach is key to exist in these globalized sports marketplaces (Giulianotti & Numerato, 2018). The second reason deals with the fact that ice hockey branding has received very little scientific attention. Although the topic is widely discussed in the North American continent, but there is little scientific knowledge gained in the European ice hockey marketplaces, which could more openly highlight the problems and prospects for European professional teams and their national teams. It is worth noting that there are scientific works that touch on the issues and perspectives of hockey brands and marketing, but the overwhelming majority of these works are written from the point of view of the North American market where the League (e.g. the National Hockey League) and the franchises, are the main stakeholders in the development of the industry, although the Federation, which is a key stakeholder in the European system, is rather an auxiliary actor on the path of brand development. These key differences in terms of stakeholders and sport systems represent the third scientific reason, as these differences are likely to uncover differences in terms of stakeholders' perceptions, strategies and effective roles. The fourth reason relates to the increased image vulnerability of the sport of ice hockey, whether it relates to the sport as a spectacle or the sport as a practice. Indeed, the issues of concussions and violence (e.g. fights are authorized in the NHL) (Donaldson et al., 2013), as well as its related perceived hegemonic masculinity, have been strongly, and increasingly, negatively affecting the image of the sport (Gee, 2009).

From a scientific perspective, brand research in general and in sport in particular have predominantly focused on the framework of brand equity (Aaker, 1991), (Bodet & Séguin, 2020).

Therefore, a recent original approach has focused on the concept of brand governance (Séguin & Abeza, 2019) defined as "a system of building a brand that is guided by the vision, mission and values of an organization and that systematically nurtures a brand value to become and remain a long-term strategic asset" (Séguin & Abeza, 2019). However, despite of its relevance, this approach needs to be theoretically advanced and empirically applied to more

diverse contexts in general and contexts in particular, which supports the need for comparative approaches. To further enrich the brand governance scientific literature, and considering the context international of ice hockey that integrates numerous and diverse stakeholders with common but also competitive goals and strategies in relation to branding orientations, the concept of coopetition, and which is an economic concept mixing competition and cooperation, and more specifically coopetitive branding (Chiambaretto *et al*., 2013) represents a stimulating theoretical avenue to combine with the concept of brand governance, in general, and in the sport context in particular. This is because it aims to complement the existing scientific literature on brand governance and address a gap in the literature by exploring the potential of the economic concept of coopetition in the sport context, specifically in relation to branding.

It is important to note that the concept of coopetition has been applied to sport contexts, and therefore could be pertinently applied in relation to branding.

In this research the author will apply following research methods:

1. Literature review: To explore the Status Quo on global brand governance and coopetition in the sports industry, including case studies and best practices.
2. Interviews and surveys: To gather qualitative and quantitative data from sports brands, fans, and industry experts in Canada, France, and Latvia, in order to understand the perspectives and experiences related to brand governance and coopetition in the ice hockey industry.
3. Comparative analysis: To compare and contrast the findings from different countries and identify similarities and differences in the strategies used to manage coopetition and maintain successful brand governance.

The aim of this study is to explore the strategies and dynamics of coopetitive global brand governance in the sports industry, with a focus on identifying successful approaches to managing coopetition among sports brands in the global marketplace.

While working on the doctoral thesis, responses will be obtained to the following questions that are intended to accomplish the research aim:

Research questions:
1) What are the key strategies used by sports brands in Canada, France, and Latvia to manage coopetition and maintain a successful global brand governance in the ice hockey industry?
2) How do cultural and sporting systems influence the coopetitive global brand governance of ice hockey in Canada, France, and Latvia?
3) What are the most effective approaches to coopetitive branding in the ice hockey industry, and how do they contribute to successful brand governance in the global marketplace?

Expected Outcomes:
1) Identy successful approaches and strategies to managing coopetition among sports brands in the global marketplace, with a focus on the ice hockey industry in Canada, France, and Latvia.
2) Improved understanding of the cultural and sporting systems that influence brand governance and coopetition in the ice hockey industry.
3) Development of recommendations for sports brands, clubs to enhance their global brand governance strategies and maintain successful coopetitive relationships with competitors in the marketplace.

The given the research is supervised by Professor Irina Kuzmina-Merlino (Latvia) and
Professor Guillaume Bodet (France).

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INVOLVEMENT OF WOMEN IN STEM AND ITS IMPACT ON DIGITAL BUSINESS ECONOMY IN UZBEKISTAN

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Keywords: Women in STEM, ICT, digitalization, online entrepreneurship, digital economy

Considering high demand for professionals in ICT, AI and robotics for last decade, STEM can be stated as the main pathway to get on digital workspace. Thus, the research is driven by assessment of digitalization in business processes and involvement of women in it. Author investigates current status of digital transformation in Uzbekistan, classifies digital business opportunities and reveal incentives and drivers of females involvement in digital economy.

Research problem. As stereotypes about tech skills impact on girls' interest in STEM from young ages, they might have significant role in choice made for future career. Studies show that sixth-grade girls who believed that adults viewed boys as better than girls in mathematics and science tended to have poorer mathematics and science self-concepts (Kurtz-Costes *et al*.,2008). As transformation of future professions is leaning toward digitalization, this can be a factor for less confidence and involvement in ICT and technical for females that cause a gap in digital workspace.

Aim. The aim of the study is to find correlation between several factors in tech sciences for women in order to reduce the future gap of gender roles in virtual labor market. To compare awareness and involvement of females in digital business transformation in Uzbekistan and Latvia by taking into account socio-cultural differences and common goals have been set as the tasks of the research. In the framework of the study the goals are supposed to be revealing of key indicators of active women position in digital economy transformation.

Research questions:
1. Correlation between the social factors and personal skills in females' competence in digital labor market.
2. How gender equality impacts digital business economy in a country.
3. Main drivers to increase involvement of females in science, technology, engineering and mathematics.

Object of study: Gender distribution in digital workspace and the role of women in digital businesseconomy.

Subject of study: Females involvement in STEM, tech skills and competence in educational institutions, online entrepreneurship.

The given research is supervised by Dr. oec., Professor Inna Stecenko.

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DIGITAL TRANSFORMATION AND LABOR PRODUCTIVITY GROWTH IN SUB-SAHARAN AFRICA

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Keywords: Labour productivity, digital transformation, reallocation channel, MCO

The countries of sub-Saharan Africa need more than ever to catch up in terms of their development compared to the rest of the world. These countries must experience a structural change, that is to say, achieve a certain productive efficiency that favours a specific type of redistribution of labour (Lewis, 1954). Given that one of the determinants of productivity growth is technological innovation and considering the advent and rapid adoption of information and communication technologies (ICT) in sub-Saharan Africa, it is therefore important to consider the contribution of ICT to productivity growth.

Indeed, at the end of 2018, sub-Saharan Africa had 456 million unique mobile subscribers, an increase of 20 million compared to the previous year and the penetration rate of 44%. Around 239 million people, or 23% of the population, also use mobile Internet on a regular basis. Sub-Saharan Africa will remain the region with the highest growth rate, with a compound annual growth rate of 4.4% and 167 million additional subscribers by 2025 (GSMA, 2020). Moreover, regarding broadband connection, 3G and 4G also show good prospects in terms of adoption in sub-Saharan Africa. In 2019, the number of 3G connections greatly exceeded those of 2G with more than 45% of the total number of connections, so it remains the most used network compared to 4G, which however is increasingly taking its place. Due to lower affordability costs the level of adoption of 4G is expected to overtake 3G by 2023 (GSMA, 2020).

On the other hand, if the observation was made that the African continent had the highest activity rate in 2019, this was 63.1% higher than the world average of 60.7% (ILO, 2020). This could suggest that the continent has higher labour productivity. This is unfortunately not the case because of the predominance of the informal sector which occupies nearly 85.8% of jobs (ILO, 2019) this rate would even reach 90% in Central, Eastern and Western Africa (ILO, 2020). Informal employment is often characterized by lower productivity, lower wages, limited social security coverage, high levels of working poverty and lack of rights. A peak in labour productivity growth was noted in 2020 while the COVID-19 pandemic was at its height in sub-Saharan Africa, the fact remains that this growth remained weak in the percentage of 3%. It is therefore impossible to say which was the channel of reallocation of resources during this episode of growth where ICTs were the main engine of economic growth.

The main aim of this research is to assess the effects of digital transformation on labour productivity and on the labour reallocation mechanism. The lag of sub-Saharan African countries in terms of labour productivity growth raises questions about its sources of growth. Therefore, the following supporting objectives have been formulated:

1. Study the concept of digital transformation and its importance for modern business.
2. Perform a theoretical analysis of the labour productivity concept.
3. Assess the effects of digital connectivity on the intra-industry and inter-industry components of labour productivity in Sub-Saharan Africa.
4. Evaluate the contribution of digital penetration on the intra-sectoral and intersectoral components of labour productivity Sub-Saharan Africa.

The object of the research is business digital transformation in Sub-Saharan Africa; the subject of the research is digital transformation effects on sectoral labour productivity growth.

In order to show how digital transformation – which is defined here as the "dissemination and use of digital technologies (Internet, mobile phones, and other tools and systems) to digitally collect, store, analyse and exchange information" (World Bank, 2016) – affects labour productivity growth, the ordinary least squares method is used to efficiently regress measures of digital transformation (connectivity and digital penetration) on the inter- and intra-industry components of the growth of labour productivity. The system generalized method of moments is utilized to analyse the robustness of the results of the research.

The results of the research would be used by governments to understand and formulate policies for promoting the digital economy, as well as by firms in different sectors for increasing their productivity through digital technology.

The given the research is supervised by Dr.sc.administr., Professor Yulia Stukalina.

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TALENT MANAGEMENT PERFORMANCE ASSESSMENT FOR BUSINESS

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Keywords: Talent management, talent acquisition, performance assessment, human resource, recruitment, turnover rate

Nowadays companies are not competing for money or a product, they mostly compete for a talented and professional human capital. A pool of wise, productive, and motivated employees is like a treasure for any company today. Professional workforce brings money for a company. This may rise the question of how to recruit and engage employees properly and effectively, how to provide retention for top-talents; how to decrease the percentage of employees that leave an organization and lower the turnover rate in general.

Human resource management is the force that deals with human capital in a company. Talent management is one of the HRM policies (Adler, 2007), which covers responsibilities of managing talents and retain them in the company for as long as possible. Studies (ResearchGate, n.d.) have revealed and suggested that paying attention to employee's potential, performance and talent, prolongs employee lifecycle, maximizes company's returns and meets the investments. One of the functions of talent management (www.td.org, n.d.) in order to prevent employee outflow and rise the productive workflow is monitor employee's engagement and complete performance assessment. A proven way to encourage employees to stay within the company, keep advancing their skill sets and career tracks is to maintain consistent, organized performance review, which may directly impact the turnover rate.

The *aim of the research* is to develop a framework for employees' performance assessment in talent management.

The *subject of the research* is employee performance assessment framework. The *object of the research* is talent management.

To achieve the aim of the study, the following *research tasks* are formulated:
1) To study the nature of talent management.
2) To identify the most problematic issues in talent management process.
3) To compare different employee performance assessment methods and tools.
4) To determine criteria for employee performance assessment in talent management.
5) To create a framework for employee performance assessment to improve talent management policy in a company.

Various *research methods* are used in the study:
1) Qualitative analysis of literature on talent management.
2) Comparative analysis of methods in performance assessment and outcomes.
3) Semi-structured interview with experts in talent management.
4) Content analysis.
5) Survey.
6) Visualization of the framework is done by using a multi-dimensional array of values – data cube.

The following *research questions* are formulated:
1) What are the methods and tools of employee performance assessment in talent management?
2) What criteria are used in to identify employee performance assessment in a company?
3) How does employee engagement impact the turnover rate?
4) What employee performance assessment framework can be effective in preventing human capital outflow?

The result of the research would be development of an employee performance assessment framework to ensure employees proper engagement in order to prevent employee outflow from the company.

The given research is supervised by Dr.sc.administr., Professor Yulia Stukalina.

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FACTORS RESPONSIBLE FOR AIRPORT COMPETITIVENESS

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Keywords: Airport competitiveness, statistic model, Baltic Region, competitiveness factors

In the modern world, for doing business, it is necessary to take into account many factors, indices and criteria, since the conditions of the open market and many competing companies, not only within the country, but also abroad, teach you to constantly develop, look for new ways to promote and maintain your reputation, update an already forgotten product and introduction of new products.

This also applies to airlines and airports: since it is not easy to enter this market, it is considered a more closed industry, but this does not mean6 that competition is no less fierce here: it costs nothing for passengers to change the airline or fly through the airport, where there are more favorable conditions: for the price, service, cleanliness, infrastructure. In this case, the principle is no different from any other business - the client goes where it is better. Also, if your development is hampered, it is always a chance for someone else to increase their passenger and freight traffic. On the other hand, the updated regulations on aviation standards are also putting pressure, since this is a priority for the industry, but if these rules are not followed, the airport and the airline can face big troubles and difficulties.

Therefore, it is very important to be able to analyze competitiveness and understand in which aspects you are lagging behind the rest, and in which you are superior.

The purpose of this study is to build a statistical model of the competitiveness of airports based on data for the Baltic region and to identify the level of competitiveness of Riga airport among airports in the Baltic region.

Object of study: Airports of the Baltic region.

Subject of study: Competitiveness of airports in the Baltic Region Tasks:

1. Identification of factors affecting the competitiveness of the airport.
2. Analysis and grouping of factors affecting the competitiveness of the airport.
3. Building a statistical model to determine the relationship between competitiveness and various factors.
4. Giving recommendations on the use of the model.

Methods:

1. Study of literature.
2. Collection, analysis and sorting of statistical data.
3. Building a statistical model.
4. Consultations and interviews with a specialist from the field.

Restrictions:

1. Regional: research area limited to the Baltic Region.
2. Time frame: data for the study were taken for 2007-2022 inclusive.

The research is supervised by Dr.oec. Associate Professor Jelena Popova.

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CREATION OF BUSINESS STRATEGY FOR FLIGHT SCHOOL DEVELOPMENT

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Keywords: aviation, flight school, strategic management

The aviation industry has proven resilient repeatedly, despite major external and macroeconomic shocks. This historic persistence is driven by global commerce and business travel, as well as people's desire to visit family and friends and to explore the world.

As an effect of COVID-19 pandemic (ICAO, 2023), air passenger flows worldwide have dropped significantly. Report from ICAO states that in 2020 compared to 2019, there was an overall reduction of 2,703 million passengers (-60%). This resulted in major lay-offs in many airlines across the world. In 2021-2022 demand for air travel started to grow again and in June 2022 the average of passenger numbers raised by 230% (IATA, 2022). Growing numbers of passenger flow mean development for the airline – increasing fleet, routes and of course number of employees. According to Boeing (Boeing, 2022), in the next 20 years a total of 602 000 of new pilots will be needed on the market. However, many flight schools are facing difficulties in development due to various reasons – lack of training personnel, financial difficulties, and strong competition. Identifying this problem raises the need for guidelines for successful business strategy development for flight school.

For successful business development, specific and correct strategy should be chosen. This requires obtaining a clear vision on what should be the future of the company, available resources at the moment and identification of areas for improvement. Once the strategy is set, clear actions should be provided for the employees on all levels of organization. Often, the biggest problem is the fact that flight school grows too fast – starts to intake more students, fly more hours, but is not ready for it operationally.

The aim of this research is develop a strategy for successful flight school development. The object of the research is AirBaltic Pilot Academy. The subject of the research is business strategy for flight school development.

This paper provides literature review on strategic planning (Armstrong 1982), management, followed by theoretical background of developing a business strategy and evaluating it. Author of this thesis also considers it necessary to look at the difference between business strategy and business plan.

Fundamental and applied research methods were used in order to identify the challenges of flight school development and create a strategy for implementation. Quantitative and qualitative analysis of secondary data was used, such as literature review and financial data analysis. In-depth interviews with industry representatives – heads of training organizations, CAA, airport authorities helped to understand the nature of the challenges and identify possible solutions.

Results of this study showed that developing a business strategy is a complex process that requires deep internal and external analysis (Porter, 1980) of the organization and its operating environment. Developed business strategy proposes various development paths for the flight schools based on its location, size, financial performance and other internal and external factors. Suggestions for further research might include adaptation of created strategy to more flexible template that could be used by flights schools with different geographical locations and operation capabilities.

The given research is supervised by Dr.oec., Professor Inna Stecenko.

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