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CONTENTS

Open Workshop: Education in Digital Era

E-Learning Game-Based Technology for Training and Education of Transport and Logistics Specialists

Igor Kabashkin, Aleksandr Grakovski 11

Session 1. Computer Problems of the Information Society

Evaluation of the Importance of Ethical Requirements in AI Solutions Using an Empirical Approach

Aleksejs Vesjolijs 15

Different Practices Of Integration UI/UX Design Methodologies in SDLC Models

Sergejs Ivanovs 17

Improvement of Energy Consumption Regulation in Smart Homes

Hamza Rauf 19

Comparative Analysis of AutoML Tools

Eugene Ostapkovich 21

Finding Fake Information and News Detection Using Deep Learning

Akhilesh Kola 23

Benchmarking Techniques for Agile Project Management Tools

Tintu Terrance 24

Investigation of the Algorithm for Finding the Shortest Path in Markov-Modulated Networks

Antons Kolodinskis 26

Research on AI Application for Optimization of the SQL Queries

Bharath Kumar Venukanti 28

Research of Optical Camera Distortion Problem and Methods for ITS Effective Compensation in RGB Images

Bhagya Lakshmi Palani 30

Human Face Transformation from Single Photo Using Generative Adversarial Network

Aleksandr Palko 32

Research of BI Instruments for Implementation of Analytics as a Service Model

Jekaterina Gruzdeva 34

Tracking of Ambulance Vehicles Movement in Traffic from Video Streaming: A Machine Learning Approach

Manu Saju Oommen 36

Learning Control Policies for Legged Robots Using Deep Reinforcement Learning

Sergei Rubtcov 37

Research of Methods of Reconstruction of a 3D Model of the Surface of Human Fingerprints Based on Digital Photos

Anton Pletnev 39

Development of Data Strategy Framework

Aleksandrs Selickis 40

Session 2. Innovations and Smart Technologies in Transport and Logistics

INTELTRANS Project: Training Activities in Central Baltic region on Intelligent Transport and Traffic Management <i>Igor Kabashkin</i>	45
Trends and Tendencies in Ports Digitalization: Case Study of Port of Klaipėda <i>Lukrecija Kavaliauskaitė</i>	46
Scenario Analysis of a Forwarding Agent’s Workflow Based on Simulation Modeling <i>Marina Denisova</i>	48
Digitalization in Road Transport: Innovative Solutions in Transport Management <i>Lisbeth Kõiv</i>	50
Free Public Transport Policy: Modelling of and Conditions for Successful Implementation <i>Yury Voronin</i>	51
Evaluation of Factors Affecting the Green Logistics for Road Freight Transport <i>Akhil P Babu</i>	53
The Role of Technical Developments in the Improvement of the Logistics and Supply Chain Management of Multinational Companies <i>Aswin Sam</i>	54
Implementation of E-Logistics in Supply Chain Operations <i>Ronald Madavana Joy</i>	56
Efficiency Evaluation of a Transport Company Based on Specific Indicators <i>Vera Starichenkova</i>	58
Evaluating Customer Satisfaction from the Third Party Logistics Service Providers <i>Micheal George</i>	60
Session 3. Market: Research, Projects, Technologies and Problems of the Modern Economy	
Recruitment and Selection Procedures in a Manufacturing Company <i>Mehnaz Akhtar</i>	65
The Analysis of Online User Experience Through Flipkart (An Online Shopping Platform in India) <i>Sreelal Sidhu</i>	67
The Assessment of Covid-19 Impact on Tourism Industry (A Jet2 Holidays Case) <i>Amal Sebastian</i>	68
The Impact of Social Media on Marketing Decisions in Remote Companies <i>George Puthenveetil Josy</i>	70
Impact of Green Marketing on Consumer Purchasing Decision in Kerala, India <i>Jaison Kuriakose</i>	71
Mentoring as a Method of Adaptation and Professional Growth for Teachers in Education (Case Study on Montessori Schools) <i>Marina Rozhdestvenskaia</i>	72
Trends of Online Shopping and Their Impact on Consumer Buying Behaviour in Pakistan <i>Muhammad Adil Bhatti</i>	74

Разработка концепции стратегического развития частных детских садов <i>Ольга Кочкина</i>	76
Assessment of the Perspectives for the Use of Artificial Ice for Non-Professional Sport Services <i>Daniil Kulikov</i>	78
Formation and Management of Securities Portfolio Based On an Active Investment Strategy of the Kazakhstan Stock Exchange <i>Madi Tolebek</i>	80
Business Organization and Business Risks of Foreign Companies in the Baltic Region <i>Aleksandrs Zebolds</i>	82
Sustainable Development Goals as Part of Corporate Social Responsibility and Its Dedication to Airline Industry <i>Ali Zeynalli</i>	84
Improving the System of Recruitment and Adaptation of Personnel in the Airline <i>Zhanat Chokin</i>	86
Airlines Fleet Renewal Planning <i>Aleksandra Nikolajeva</i>	87
Extending the Charter Airline Business Model with Booking Services <i>Aleksejs Ogorodnikovs</i>	89
Improvement of the Planning of Aircraft Maintenance Management <i>Vladislavs Tokarevs</i>	91



Open Workshop

Education in Digital Era

RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 11
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia

E-LEARNING GAME-BASED TECHNOLOGY FOR TRAINING AND EDUCATION OF TRANSPORT AND LOGISTICS SPECIALISTS

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Keywords: DIGILOG project, Digitalization, Transport and Logistics, e-learning

The modern educational environment actively uses various methods of game based learning. Self-learning methods combined with e-learning and blended learning have become especially relevant for the development of various professionally oriented competencies in many applied areas (Salmon, 2013) recently in the face of a pandemic.

In transport and logistics (T&L) the digitalisation is one of core element within the frame of European Digital Single Market strategy. It is the basis for DIGILOG (Digitally supported and virtual study practices for modern logistic systems) project. The partners of project are TTK University of Applied Sciences (Estonia), Häme University of Applied Sciences (Finland), Transport and Telecommunication Institute (Latvia), The Swedish National Road and Transport Research Institute (Sweden).

One of the intellectual outputs of the project is software application designed for the training process of new and already working specialists with the aim increasing their skills in the T&L area at various levels in the different types of educational establishments (training centres, colleges, universities).

The application allows students to acquire decision-making skills, bringing this process as close as possible to a real situation, using seven typical steps in the process of multi-criteria decision making in T&L (Kabashkin and Luchina, 2015): to define alternatives for transportation; to define criteria of efficiency; to define relative importance of each criteria; to define a scale for measuring the levels of each criterion; to determine the impact of each criterion for each alternative action for the established scale; to establish the combined impact of the different criteria for each alternative; to define the best alternative.

Students should analyse these factors in order to evaluate which of the factors for the case under consideration will be more influence on decision making. For this purpose the analytic hierarchy process as structured technique for organizing and analysing complex decisions is used for development of e-learning game-based technology (Saaty, 1995).

In the paper the different aspects of E-learning game-based technology for training and education of transport and logistics specialists are discussed and the case study for practical training used developed software application is described.

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Session 1

**Computer Problems of the
Information Society**

**Informatīvās sabiedrības
datorizācijas problēmas**

**Компьютерные проблемы
информационного
общества**

*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 15-16
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia*

EVALUATION OF THE IMPORTANCE OF ETHICAL REQUIREMENTS IN AI SOLUTIONS USING AN EMPIRICAL APPROACH

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Keywords: Ethical Requirements, Evaluation, Artificial Intelligence, Requirement Engineering

Rapid advances in the development of AI have lead to wide discussions on the problem of AI ethics. AI systems should comply with ethical principles and norms applicable with the services offered. Recently, a plethora of ethics guidelines have been elaborated which contain normative principles and recommendations aimed to adopt ethics in AI (Hagendorff, 2020). However, often vaguely formulated principles fail to be practical, indicating a need in multi-faceted research to develop frameworks to turn ideas into actions (Mittelstadt, 2019). Requirement Engineering (RE) techniques can be adopted in order to analyse ER to make AI system compliant with ethical principles and codes (Guizzardi *et al.*, 2020). The importance of human-centred approach implies the need of examination of ethics issues for all categories and participants. It is among the top questions to reach decision which principles and norms should developers encode in AI solutions, as well as to decide who should have the right to take such decisions (Gabriel, 2020). The complexity of the evaluation of the importance of Ethical Requirements (ER) is one of the urgent problems when developing AI.

Based on the empirical approach, the research applied RE techniques and proposed a framework for evaluation of the importance of ER in AI solutions. For this purpose, the research analysed in-depth the scope and interrelation of ethical issues when making AI. A body of ethics principles and requirements formulated in "Ethics Guidelines for Trustworthy AI" (European Commission, 2019) and in ISO Standards (ISO, 2017) was analysed, as well as ethics guidelines for responsible AI of some leading AI companies were investigated. Accountability, liability, and the rule of law are basic requirements that must be validated in the face of AI. The analysis showed the necessity of ER to establish trust in AI solutions through the pitfalls such as transparency, controllability, explainability, as well as to achieve privacy, safety, security, accuracy, availability and reliability in AI solutions; norms and values are interrelated; they can conflict with each other. The advance of AI puts up prime questions, such as what values AI systems should align with. Evaluation of the importance of ER in AI solutions is a principal staging post to fix out practical issues facing AI; effective frameworks are needed to identify missing or unnecessary contents in the requirements. However, it seems impossible to formulate a unite practical framework which all AI developers must hold to. Various scenarios are required to reflect specific qualitative information; new ideas on applicable frameworks for reliable AI solutions are of actual request. The research can help developers deal with the complexity of practical implementation of ER in AI solutions.

This research is supervised by Professor Savrasovs Mihails.

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Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia

DIFFERENT PRACTICES OF INTEGRATION UI/UX DESIGN METHODOLOGIES IN SDLC MODELS

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Keywords: UX, UI, Software development, SDLC, Usability

Nowadays, we can observe that the scope of applications is widening and these applications become available to billions of users because of mobility and portability. In order to succeed in the tough competition, companies are developing their own applications to attract and retain customers and increase conversion by providing positive user experience. For these purposes, companies, management, and development teams should define the procedures and re-evaluate the existing software development methodologies in order to enhance them with further development. Therefore, software development companies are increasing the capacity, quality and functionality, for example, in mobile software development (Islam *et al.*, 2010). During planning the software development project, it's required to evaluate all aspects of the project-specific, implementation area and finally, understand how to achieve positive user experience. The functional part of the product is significant, but it's also essential to consider all non-functional aspects, such as performance, reliability, maintainability, usability, and many others.

Agile and more classical SDLC (Software Development Life Cycle) models offer different approaches to handling tasks related to non-functional requirements such as product usability, visual and interaction design, and information architecture. Consequently, each model has a set of advantages and limitations. For example, as is claimed the Agile includes the opportunity of changing implementation at very low cost because of the frequency of new increments that are produced (Iqbal H. Sarke *et al.*, 2015). At the same time the traditional SDLC model such as Waterfall assumes clearly defined phases and well understood deliverables (Shylesh S, 2017). Any advantage or limitation may have a crucial impact on UI (User Interface) / UX (User Experience) processes. So, every aspect of the SDLC model matters, because finally it affects the end product and the end-user experience. The right integration of UI/UX methodologies into different SDLC models is highly important for getting users' satisfaction. The evaluation and analysis of its integration should help to define a better solution for different types of projects.

This paper provides an overview of existing SDLC models used on the software development projects. Also, based on the research, it shows the existing situation related to the integration of UI/UX design methodologies in different SDLC models and determines cases when integration UI/UX design methodology is more efficient. This research is based on such methods as literature review and analysis; performing interviews and questionnaires; analyzing, interpreting, and summarizing results.

The research is supervised by As. prof., Dr.sc.ing. Mihails Savrasovs, Nadezda Pizika, Mg.sc.Math.

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 19-20
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia*

IMPROVEMENT OF ENERGY CONSUMPTION REGULATION IN SMART HOMES

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Keywords: Knapsack; Demand response; Smart grid; Energy management; Particle swarm optimization; Peak to average Ratio

The main goal of the research study is to improvement of energy consumption regulation in smart homes. For this purpose, the energy consumption of the users' is modeled as the function of energy consumption cost, and this cost is depending on the three factors: electricity price at a time slot, user comfort as a function of appliance waiting time and PAR reduction to maintain the grid stability, reliability and minimize the standby power plant cost.

Due to growing energy demand, a lot of research efforts have been going on to investigate new energy sources to balance between energy supply and demand. For this purpose, renewable energy sources including, wind energy and solar energy along with grid energy are utilized to schedule home appliances in varying energy pricing environment. Incentive based demand response strategy is proposed in (Vivekananthan, Mishra, Ledwich, & Li, 2014) Customers are given incentives upon the shifting of load to avoid high peaks. Following are the research questions.

- How to increase user comfort in terms of appliance waiting time.
- How and what enables user to modify its energy consumption pattern.
- How grid stability is achieved using demand side management scheme.

For this purpose, we have characterized the considered load into various categories and choose best optimal algorithm named as Binary Particle Swarm Optimization algorithm for scheduling of different objective. For validation of proposed algorithm numbers of simulations are conducted with random inputs.

The subject of the research Improvement of Energy Consumption Regulation in Smart Homes To achieve the aim of this study, a series of steps are performed which are:

- Data set collection.
- Knapsack problem formulation technique.
- Particle Swarm Optimization algorithm.
- MATLAB simulation.
- Validation of model.

The data set is collected directly collected from Energy Management Controller (EMC) via communication technologies such as, Wi-Fi, Zigbee, etc. Knapsack problem formulation is used to model the electricity consumption as a function of its consumption cost and also helps to model the electricity consumption limit for any particular time slot to obtain PAR reduction. Simulations results are conducted in MATLAB software. Since, the duty cycles of all the appliances are variable rather than the static. Finally, for validation of the scheduling algorithm, extensive simulations are conducted and compared against different scenarios.

The research result PSO algorithm for our problem to obtain the optimized solution. The PSO algorithms minimize the electricity cost consumption, waiting time reduction and PAR reduction. we will obtain the efficient energy pattern by which the end users are satisfied in terms of their bill without compromising its comfort. Moreover, by modifying the energy

consumption pattern the PAR is also reduced which helps at utility side by reducing standby power plan cost for peak load compensation and also grid stability is enhanced by avoiding the overloading.

The research is supervised by Dr. Aleksandrs Kraņņukovs.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 21-22
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia

COMPARATIVE ANALYSIS OF AUTOML TOOLS

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Keywords: machine learning, automated machine learning, machine learning software, tuning hyperparameters, neural architecture search, machine learning pipeline

In recent years, the growth of machine learning has demonstrated the strengths of the technology and benefits for industries and businesses using it. However, the rising demand for more applications, computational complexity, and lack of highly skilled specialists still leaves the potential largely untapped.

Automatic machine learning tools are designed to solve that problem by automating the machine learning pipeline at different stages. What are those tools, which specific stages do they cover, and how usable the produced results are is what this research is focused on. As an introduction, we will review the regular Machine Learning project development workflow and typical elements of the pipeline. Then, the state of the art of AutoML solutions today with more details on solutions and their specific features will follow. And finally, the practical part simulating some real-life scenarios: chosen solutions tested with rather typical datasets and results evaluated and put against human-generated algorithms designed specifically for the task.

While AutoML could potentially be a solution to open machine learning to wider audiences, reduce complexity and allow professionals to save time, understanding what exactly it can do, at what cost, and which solutions to choose for which application scenarios still might be challenging. Therefore this work not just analyses product features and user interface but rather focuses on how those can impact the AutoML pipeline in general. Which stages can be handled by these tools, and how to fill the gaps when they are not.

The variety of the AutoML and lack of maturity of this technology makes it hard to comprehend for many people. And sometimes, even objective criteria like prediction accuracy of the certain solution are not the most important when deciding, leaving it to the product ecosystem and integration with other company systems or cloud services. And yet, it is important to understand industry trends and solution features and continue exploring this exciting and rapidly progressing technology.

The research is supervised by Dr. sc. ing. Jelena Kijonoka.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 23
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia

FINDING FAKE INFORMATION AND NEWS DETECTION USING DEEP LEARNING

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Keywords: Fake news, social media, deep learning, convolutional neural network

The use of social media and the improvements in technology have led to a number of advantages and disadvantages too. The spreading of fake news is a major concern nowadays since it has a lot of negative impacts in the society. To avoid the spreading of fake news, the automatic detection techniques has been introduced, which will filter the fake information from normal information. The automating detection techniques can be implemented using a number of techniques such as artificial intelligence, machine learning and Deep learning. Also, deep learning that is growing in popular now can be deployed to improve the algorithms and detection can be more accurate. The model can be tested individually or taken as hybrid or ensemble models that will produce better results. One such work is carried out in (Abdul Nasir, *et al.*, 2021). In this work a novel hybrid architecture which combines convolutional and recurrent neural networks has been proposed. The model was tested on fake dataset too which gives the best out of all the models. The results were compared and performed good compared to all other non hybrid models available in different researches. In another work which is carried out by Zubiaga *et al.* (2018) which talks about the spread of fake information in the social media platforms. They proposed a classification methodology which classifies the different types of fake or false information. Upon the review of works, my research problem is focusing on finding the fake information using convolution neural network classifier which is a deep learning algorithm. Credbank and Fakenewsnet are two popular data sets which were implemented in my research work. The packages such as Tensor flow in python were used (KDnuggets, 2016). The research work was carried out in a python framework using natural language processing. To have a better understanding of data the sentiment analysis is done. Sentiment analysis has to be done which concretes the use of natural language processing, processing of text, doing classification of text and other different types of algorithms are described in the above URL and the methodologies were implemented using the language python with several built packages available. Obtained results, applied new advanced deep learning algorithms which yields more optimised results than the existing ones.

This research is supervised by Assistant Professor Ilya Jackson.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 24-25
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BENCHMARKING TECHNIQUES FOR AGILE PROJECT MANAGEMENT TOOLS

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Keywords: Agile project management, usability evaluation, Mining software repository, Agile software model

Information technology is one among the rapidly and widely growing technology, which is the use of computers to store, retrieve, transmit and interpret data. By proper project management, several IT products and services are delivered to the users by planning and managing an organization's IT goals. Adopting effective techniques are crucial in selecting project management tools in agile domain as it affects the quality of the product, efficiency in the development and timely delivery. In this work, an analysis of the techniques used in agile project management tools are made and put forwarding another technique or its combinations to improve the process or product for better results. The existing project management tools had been compared and the challenges, benefits and limitations it costs to the project management are recognised by Alok Mishra *et al.* (2019) and (Tirena Dingeldein, 2019) studied. This have given the base to concentrate on the effective method to select agile project management tools. Effective usability evaluation method suggested by (Saad Masood Butt, 2004) improve the relationship between usability experts and agile software experts. Development of the advanced agile planning tools as a support to the agile project planning activities (Sultan Alyahya, 2016), study on the JIRA repository data set by Marco Ortu *et al.* (2015), benefits shown by Edivandro Carlos Conforto *et al.* (2008) on visual and agile techniques combined with the traditional Project Management practices are giving the foundation to the work. In the work, a benchmarking criteria is proposed for the agile project management tools. By the analysis of the data collected for the proposed criteria, conclusions and recommendation are made to make the agile project management tools effective.

This research is supervised by Professor Savrasovs Mihails.

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 26-27
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INVESTIGATION OF THE ALGORITHM FOR FINDING THE SHORTEST PATH IN MARKOV-MODULATED NETWORKS

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Keywords: Network, shortest path, random environment

The issue of optimization is one of the most pressing issues of the 21st century, when any action, from production to logistics, runs into the problem of optimization to reduce costs. One of the most popular optimization problems is finding the shortest path. Finding the shortest path is a classical problem, for which a large number of algorithms have been proposed, such as: Dijkstra's, Bellman–Ford, Floyd–Warshall, Johnson's algorithms and many other algorithms. The classical problem acquired a second wind when, to obtain more realistic models, the problem was considered taking into account influence of randomness. Many researchers have done lots of work on stochastic shortest path problem. Frank (1969), Mirchandani (1976) and Sigal et al. (1980) studied the probability distribution of the shortest path length in which arc lengths are random variables. Loui, Murthy and Sarkar (1997) considered the different types of cost functions to study the variations of the shortest path problem in stochastic networks. Hall (1986) and Fu (1998) studied the expected shortest paths in dynamic and stochastic networks. Liping Fu and L. R. Rilett in their work (1998) proposed a heuristic algorithm based on the k-shortest path algorithm. Xiaoyu Ji (2005) has done a lot of work in this area proposed a hybrid model using stochastic modeling and genetic algorithm.

The algorithm proposed by Alexander Andronov (currently in process of publication) is analytically new and requires studying the effectiveness of its application. The algorithm assumes work in the finite network, where each network's link has a constant length. The network operates in a random environment, which is described by a continuous time irreducible finite Markov chain. Transition's velocity along links depends on the state of the random environment. The goal of algorithm is to reach the destination in the shortest possible time. Considering all the conditions, the time is calculated as average value, and the corresponding path with minimal time is called the shortest.

The task of this research was to compare the insufficiently explored algorithm with existing solutions and identify its strengths and weaknesses by placing it in different environments and changing various network parameters and among.

At the beginning of the study, it was hypothesized that the presented algorithm would perform better than classical solutions (without probabilistic approach) when the traveling speeds on the links are dependent random variables. To test this hypothesis, a program was created to describe the network and its characteristics, states and parameters. Further, classical algorithms were imported into the developed environment. For comparison, the metrics of the time to find the result, the size of the network, the number of states of the network, the frequency of state changes, and the size of the smallest path were taken. The results of this study show under what conditions the presented algorithm demonstrates better results than its closest analogs.

The research is supervised by Dr.sc.ing., professor Nadezda Spiridovska.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 28-29
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RESEARCH ON AI APPLICATION FOR OPTIMIZATION OF THE SQL QUERIES

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Keywords: Query Optimization, Deep Neural Network, Reinforcement learning, SQL, Artificial Intelligence

Optimization of SQL queries defines transformation of queries into physical execution plans with best performance and its widely studied topic in database system (Wang *et al.*, 2015). Query Optimizers uses feedback from query executions to calculate cardinality estimates (Surajit, 1999) and adaptive query processing system (R. Chirkova *et al.*, 2019). Past optimization of queries has been focused on mathematical models of database operator (Jiexing Li *et al.*, 2012) and training models based exclusively on plan-level information (Shivaram *et al.*, 2016). These methods depend on feature extraction which generally requires significant effort from human and its scales poorly with increasing complexity of SQL database.

There has been lot of work presented for optimization of SQL query using deep neural network (DNN) capable for prediction of query eradicating human intervention. AI process like Deep Neural Network (DNN) automatically rewrite the innovative SQL statement, mirroring human expertise and offers alternative version of SQL to improve performance of query (T S Anisha *et al.*, 2019). Reinforcement learning integrated with deep learning model to optimize continuous feedback with the help of DNN gives good result for SQL query optimization (Jurgen Schmidhuber, 2015). Reinforcement Learning (RL) with DNN has been considered best in optimization of join SQL query and dynamic SQL query which enable developers to build SQL statements dynamically at runtime (Sanjay Krishnan *et al.*, 2017).

As per the literature review, we have found out that there are lot of research gap in SQL query optimization. SQL query can be optimized by significantly reducing training time for given SQL database file, capturing query in a form of tensor and vector semantics, processing tree based query structure, managing training overhead cost, and increasing the security backup protocols. It's proposed in this research that SQL query is optimized for its run-time, training overhead parameter with automatic query generation system. To solve the proposed problem, we are using different AI technique. We are planning to integrate Q-learning model which is RL algorithm to optimized the run time of query; specially for the data structure which can be in a form of structure on un-structure way. As we will need data-base to test the model we will utilize the IMDB data set, which can be scrapped using R-vest function in R analytics. This dataset will be training using Neural network model using Keras for Tensorflow for the modeling of query to get optimized in training overhead cost (A. Gulli *et al.*, 2017). This model will be integrated with Q-learning RL technique to make the SQL enable to design it's query by its own. Thus, once we have fully optimized SQL query it can be checked with existing query optimizer powered with Oracle or Microsoft. We will also compare the various SQL libraries like MYSQL and SQLite performance; when they are integrated with our current infrastructure of AI system for optimizing SQL query.

This research supervised by Mihails Savrasovs.

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 30-31
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RESEARCH OF OPTICAL CAMERA DISTORTION PROBLEM AND METHODS FOR ITS EFFECTIVE COMPENSATION IN RGB IMAGES

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Keywords: Distortion, Symmetric, Optical Camera, Retinex-based Adaptive Filter, Polynomial Model

Images taken from optical camera sometimes leads to the distortion problem. Since Images provide an essential and natural communication medium, whatever the medium they are taken, one of the most critical functions of image processing is shape recognition and pattern recognition. Some researchers have developed a number of techniques known as image compensation methods to retrieve image details (Zakaria *et al.*, 2010; Vishwakarma *et al.*, 2012). The purpose of this research will enable the distortion problem occurring in optical camera image to reduce its error and will have great applications in remote sensing, satellite imaging and even in medical imaging. This work focuses on the image compensation process in RGB images embedded in the final image enhanced by the optional weight-loss option that is not compatible with Sobel's 4-edge detector (Gonzalez *et al.*, 2016). The proposed work improves the stability and performance of the method. The methods available are not suitable for all images or functions, and the performance of the parameter is complex; therefore, the application itself cannot be satisfied (Yue Liu *et al.*, 2021). The best method can be applied to distorted images in various forums and gain adequate compensation for RGB images by using some advanced filtering techniques. The proposed process is based on the Retinex-based Adaptive Filter (RAF), its first step in implementing a global map creation in image capture (Lan, Xia *et al.*, 2014). The insert image is then converted to a YCbCr color space where only Y (luminance) is handled. A new Y-object output and dual chrominance (CbCr) are integrated back into the RGB color space. Finally, the RGB image is limited to the dynamic range of the output device using histogram measurement. The difference between this process and other Retinex techniques is that this process is only used in the Y-section, while other Retinex methods use the Retinex algorithm in all colors. This study aims to see whether distortion models are still accurate when two or three orders of magnitude raise precision specifications (Tang *et al.*, 2017). Photos with a minimum order of 1000*1000 are produced by today's optical cameras, which generate images with millions of pixels. For images of this scale, this study aims for an average precision of around 102 pixels. The polynomial and rational models place fewer limits on distortion at the expense of a larger number of model parameters (Claus *et al.*, 2005). They will be able to deal with both radial and non-radial symmetric distortions this way (Jean-Philippe Tardif *et al.*, 2006). When optimizing for high precisions, we found that numerical problem needs to be integrated with distortion modelling. In fact, of all the model generated, polynomial models involve non-linear parameter eradication which hampers the numerical modelling. Thus, calculation for the polynomial distortion model simplified the system into linear problems which reduces the computational ability for system to generate faster precision model. We thus concluded, though high degree polynomials were required for higher precision; computational numerical adaptive modelling can easily produce and estimate the distortion for effective compensation in RGB image in optical camera; thus bringing the novel approach to solve the problem in distortion problem.

This research supervised by Aleksandrs Grakovskis.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 32-33
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HUMAN FACE TRANSFORMATION FROM SINGLE PHOTO USING GENERATIVE ADVERSARIAL NETWORK

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Keywords: face rotation, artificial intelligence, generative adversarial networks, image processing

Face rotation is challenging problem when only single input face image is available. An efficient solution would have wide application in various computer vision tasks.

Two main approaches for solving this problem are geometry-based and learning-based. Earlier methods were 2D/3D geometry-based approaches and they have an advantage that they need minimal amount of training data. The 2D geometry-based methods based on constructing PCA model for face shape to manipulate yaw rotations (Feng *et al.*, 2017). 3D methods tends to generate faces with various poses using 3D morphable face model (Zhu *et al.*, 2016).

With the outstanding result of Generative Adversarial Networks (GANs) introduced by Goodfellow *et al.* (2014), in recent years many learning-based solutions were proposed for face rotation task, which are based on GANs. There are various state-of-art network architectures like TP-GAN (Huang *et al.*, 2017), CR-GAN (Tian *et al.*, 2018) and DR-GAN (Tran *et al.*, 2017). However, mentioned architectures have drawbacks when working with single face image as an input. Moreover, some methods requires additional information (conditioning labels, head pose indication, etc.) in training data. Today, a deep learning based methods are capable to produce face images with various angles from the single input image by transferring information from pose variant inputs to a frontalized view (Zhu *et al.*, 2013), or using synthesized images to disentangle pose and identity representation by cross-reconstruction (Zhu *et al.*, 2014; Peng *et al.*, 2017). However, usually such methods work with labelled data, leading to limited performance, especially with unseen inputs.

This work attempts to address aforementioned problem. The main goal of this work is to implement general adversarial network architecture that is capable of producing face images with various angles from the single input image and to make comparison of implemented architecture with existing ones in terms of performance. Especially, attention will be paid to evaluating results from the “unseen” data.

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

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 34-35
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RESEARCH OF BI INSTRUMENTS FOR IMPLEMENTATION OF ANALYTICS AS A SERVICE MODEL

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Keywords: Business Intelligence (BI), Cloud Computing, development, AaaS, analytics, digitalization.

Nowadays, every manager faces the problem of operational and well-grounded decision making. There is usually a lot of accumulated data from internal and external sources, but in spite of that the majority of organisations lack the systematic approach of the way how to appraise, optimize and define the value of the data analytics. The way of solving the problem with analytics, forecasting, and also with data modelling in order to make a decision on the activity of the company, is the introduction of Businessintelligence (BI) class system (Adair, 2021).

The application of BI instruments allows automatization of the process of data processing and company's strategy formation, both for the short- and long-term periods (Sabherwal and Becerra- Fernandez, 2011; Grossmann and Rinderle-Ma, 2015).

To conduct business successfully and make well-grounded decisions, most enterprises need inexpensive and simple decision with the minimal involvement of additional resources while introducing BI instruments.

The aim of the conducted research has been the development of the methodology of comparison of BI instruments taking into consideration the model Analytics as a Service (AAAS) for the companiesoccupied in different activities.

Tasks of the research:

- conduct the analysis of BI instruments;
- develop the methodology of BI instrument criteria choice from the AAAS model for the companies having various activities;
- analyse and find out advantages and disadvantages of the AAAS model;
- conduct a comparative efficiency analysis.

As a result of the conducted research of BI instruments, the methodology of BI instrument criteriachoice has been developed. It takes into consideration the AAAS model for the companies with different activities; the advantages and disadvantages of the AAAS model have been shown and analysed.

The results of the research have been proved by practice, as a result of the differences' analysis in the course of creation and introduction of BI decisions in the sphere of business analytics for the enterprise working in the sphere of production, from the point of view of the model AAAS and the model of the analytical department creation at the enterprise.

In the course of conducting the given research it has been proved that:

- The introduction and implementation of BI instruments, as a complex decision in order to exercise the control over all main strategic directions in the company on the uniform platform, having visual analytics, will make it possible to accelerate the speed of making well-grounded decisions, and will directly affect the company's profitability, becoming its competitive advantage.
- The company diminishes its spending on services, while applying the model AAAS, as the payment is charged for the service provided in the definite fixed period of time.

- Application of the model AAAS infrastructure, adapted according to the client's demands, makes the service provider more attractive for the client, and there is a greater probability that the client will continue business with the provider.

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

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 36
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TRACKING OF AMBULANCE VEHICLES MOVEMENT IN TRAFFIC FROM VIDEO STREAMING: A MACHINE LEARNING APPROACH

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Keywords: Video Streaming, Object detection, Feature extraction, Learning Methods (ML), Prediction

One of the numerous issues that the world countenances with expanded populace and fast development in the quantity of vehicles is gridlock. In developing nations, the pace of street extension is only 33% the vehicular development rate. Hence the possibility of emergency vehicle to be a part of the gridlock is high. Our research focuses on identification of ambulance transport in the traffic flow from video stream. Once such identification is made it can be guided to reach the destination in time and avoid getting delayed (Shuvendu Roy, 2019). The whole purpose of the research is the detection of ambulance from the video streams. To meet this challenge a thorough research is to be done on finding the suitable machine learning/deep learning model and extracting features from input. Another challenging task here is to research out suitable data sets to achieve maximum result.

Generally object detection can be classified into two-stage object detectors and one-stage object detectors. Accuracy of former is always above 80%. But complexity is high for former than the later. Emergency vehicle detection algorithm first detects the colored beacon using sophisticated feature extraction techniques and then the vehicle as a whole will be detected using training data. We collected various traffic image data with ambulance from various locations. The prediction is performed on traffic video data. The videos extracted from traffic intensive locations are used for testing the trained model. From the video data the images can be retrieved frame by frame for this purpose.

The research methodology is the following. Image dataset will be split into training data and subsamples with the ratio of 80:20. From the videos, images will be extracted frame by frame and object detection will be done using algorithms like CNN (Convolutional neural network) or YOLO (You Only Look Once). Using training data, a supervised learning model is created to detect the presence of ambulance transport in the traffic and classify the image frame as existence, partial existence and does not exist (ambulance identification). Using various evaluation matrices like Precision, Recall, F1-score, etc., we analyse various learning methods for given videos. After evaluation, we will predict the result as existence, partial existence and does not exist (ambulance identification) from the image frame obtained from the video stream.

This research is supervised by Dr.Sc.ing. Aleksandrs Grakovskis.

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LEARNING CONTROL POLICIES FOR LEGGED ROBOTS USING DEEP REINFORCEMENT LEARNING

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Keywords: Deep reinforcement learning, Physical simulation, Control methods

Learning the complex locomotion skills of legged robots is a challenging task. Some progress has recently been made in developing model-based robot control methods. These methods usually use a pipelined approach, which involves dividing the control process into stages as state estimation, predictive control, trajectory optimisation and space control to achieve fast and robust locomotion (Kalakrishnan *et al.*, 2010).

These are classical methods involving the building of complex dynamic models that require a lot of expertise. The more the legged robot has degrees of freedom and movement dynamics, the more difficult it is to maintain its balance and to build the control policies for its movement.

Control policies based on finite state machines simplify the work on the model and do not require to search for predefined dynamic equations of motion control (Lee, Kim & Lee, 2010).

But it should be noted that they require a large amount of domain knowledge. For the same reason, such solutions are usually tied to a narrow area and they are poorly generalised.

In contrast, reinforcement learning assumes the search for optimal policies automatically and, in some cases, there is no need in prior knowledge on the dynamic characteristics of agent what makes the reinforcement learning paradigm based on Markov decision process applicable where exact methods are infeasible.

Deep reinforcement learning algorithms have recently advanced in search of control policies. A physical robot is an expensive equipment operating in real-time, therefore it is preferable to perform training operations in a simulated environment. Then the policy obtained can be successfully transferred to a real robot (Hwangbo *et al.*, 2019; Li *et al.*, 2021).

In addition, Peng *et al.* (2020) has demonstrated the ability to train a legged robot in complex skills by imitating the animals' movements. We could use motion capture data this way to train robots to move by mimicking animals' movements in the simulation, transfer it to the physical robot and control it in real time.

On the downside, the process of training a randomly initialised network, even for the simplest policies, is time-consuming and requires days of training on powerful computers and tens of millions of iterations (Peng & van de Panne, 2017). Therefore, to apply this approach practically it is necessary to find ways to accelerate this process and make it more accessible for use.

In this paper, the bottlenecks in training legged robots using deep reinforcement learning algorithms are investigated. Moreover, ways how to combine this technique with simulation learning techniques are being explored to accelerate the overall learning process.

The task itself is formulated as a typical reinforcement learning problem when the agent acts in the simulated environment according to the policy of finding the best possible action for minimising expected penalisation and maximising the reward.

An open physics engine was used for simulation, and the reference animations generated from motion capture animations are also widely available in the public domain. As result, it is reported a method for learning complex locomotion skills of legged robots, such as walking, running, jumping, and recovery.

The research is supervised by Dr. Aleksandrs Krainukovs.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 39
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RESEARCH OF METHODS OF RECONSTRUCTION OF A 3D MODEL OF THE SURFACE OF HUMAN FINGERPRINTS BASED ON DIGITAL PHOTOS

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Keywords: fingerprint recognition, image processing, computer vision

The problem of fingerprints scanning requires the use of special scanning technical equipment. The solution that allows to scan fingerprints without contact with finger and without the use of special scanners will find wide application. Especially in the context of the spread of viral infections.

The problem can be solved by building a 3D model of the fingerprint based on images. The approaches that can be used to construct 3D fingerprint models are similar to those used to reconstruct a 3D model of a human face: shade reconstruction, laser scanning, and 2D photo reconstruction (Panchuk, Grakovski, 2018).

The purpose of this work is to implement an algorithm for constructing a 3D model of a fingerprint from several photographs of the fingerprint obtained with different angles.

Since the reconstruction by shades (Prados, Faugeras, 2006) and using laser scanning (Heritage, Large, 2009) requires special equipment, the method for reconstructing 3D models of objects from several photographs looks preferable. To combine photos with each other and build a 3D-model, certain points that coincide in different photos are required. It was assumed that the special points calculated by angle detectors can be used to build a 3D-model and at the same time correspond to the features necessary for fingerprint identification.

An algorithm for constructing a 3D model of a fingerprint has been developed; it includes the following steps:

- highlighting key points in images;
- comparison and composition of photos using the special points obtained in the previous step.

To validate the algorithm, the results of the Harris, Shi-Tomasi and SURF angle detectors were compared with the results of proprietary feature detection technologies for fingerprint identification. As a result of the comparison, it was found that the result of the Harris detector includes up to 86% of features, the result of the Shi-Tomasi detector up to 84%, the result of SURF detector up to 73%.

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

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DEVELOPMENT OF DATA STRATEGY FRAMEWORK

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Keywords: Data Strategy, Data Quality, Data Governance, Data Management, Digital Transformation, Data Driven

Data is changing our world and the way we live and work at an unprecedented rate (Bernard Marr, 2017). In the past few years volumes of data have significantly increased and will continue to do so, due to digitalization and technology development. Because of these changes Data became one of the most important assets of the organization. Nowadays, organizations do not have a problem in having a data or data gathering, instead the problem exist with gathering right data for the organization, with quality of data. Data is crucial for business process automatization, for analytics, AI/ML solutions, therefore quality of data is a key factor to succeed in business transformation.

For organization to succeed in modern economy it is necessary to align business strategy with data strategy and to prioritize its goals around the most pressing operational needs of the organization (M. Fleckenstein and L. Fellows. 2018). Working without a data strategy is analogous to a company allowing each department and each person within each department to develop its own financial chart of accounts (Adelman, S., Moss, L., & Abai, M. 2005).

The Data Strategy does not have one framework that fits all various organizations and all various businesses. There are a lot of methodologies, frameworks, approaches, and opinions on how to build the Data Strategy. Some of them listed below:

- “What’s your data strategy?” (Dalle Mule, L., & Davenport, T. 2017).
- Modern Data Strategy (M. Fleckenstein and L. Fellows. 2018).
- Data Strategy: How to Profit from a World of Big Data, Analytics and the Internet of Things (Bernard Marr, 2017).
- An Outcome-Driven Enterprise Data Strategy (Rosario, T., Villar, M. 2019).
- Developing Your Data Strategy: A practical guide (Nelson, Gregory. 2017).
- A Data Strategy Framework: How to Implement and Scale for Success (Tableau).
- Data Strategy: What it is and how to achieve it (Stitch).

Therefore, it is very challenging for organizations to choose the right Data Strategy that fits organizations’ goals and to begin to develop the right Data Strategy.

Aim of the research is to identify the most significant and important Data Strategy components for organization, based on their criteria, and therefore provide initial framework for Data Strategy development and adoption.

This study uses the systematic analysis approach to reviewing Data Strategy frameworks and comparative research method. This research analyses current Data Strategy frameworks and different approaches, as well as identifies components that Data Strategy consist of. It identifies what is in common and what are the differences, why they differ. It provides systematic review of Data Strategy frameworks and their components, as well as methodology for Data Strategy implementation.

The result of research can be used by the top managers and decision makers that are planning to develop and adopt Data Strategy in their companies and organizations. It can act as a skeleton, initial framework, or a guidance on how to develop and adopt a Data Strategy for a

particular companies and organizations on the base of the suggested initial framework. As well as this research highlights the important components of the Data Strategy that should be addressed during implementation.

The research is supervised by Dr. sc. ing. Jelena Kijonoka.

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Session 2

**Innovations and Smart
Technologies in Transport
and Logistics**

**Inovācijas un viedās
tehnoloģijas transportā un
loģistikā**

**Инновации и умные
технологии в сфере
транспорта и логистики**

*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 45
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INTELTRANS PROJECT: TRAINING ACTIVITIES IN CENTRAL BALTIC REGION ON INTELLIGENT TRANSPORT AND TRAFFIC MANAGEMENT

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Keywords: Intelligent transport systems, mobility, traffic, higher education curricula, learning process

The transport system of the Central Baltic needs better integration to accommodate the growing mobility needs of the entire Baltic Sea Region. We need to increase traffic safety, efficiency, mobility and customer satisfaction across national borders, while reducing environmental impact.

The transportation and traffic sector in Finland, Estonia and Latvia face common challenges in linking the region's transport sectors even closer together. Cross-border cooperation is an excellent way to reduce fragmentation in regional transport and traffic planning. With cooperation across national borders the best solutions can be identified and shared.

Cooperation facilitates the search for solutions to the common educational needs of transport and traffic safety enterprises as well as public organisations operating in the Central Baltic region.

The INTELTRANS project aims to contribute towards transport system that is safe, resilient, seamless and environmentally friendly for citizens, companies and society as a whole. The partners of project are TTK University of Applied Sciences (Estonia), Häme University of Applied Sciences (Finland), Transport and Telecommunication Institute (Latvia).

To achieve the goal of the project partners want to modernize transport and traffic management professional higher education curricula, learning processes, and learning environments.

The main tasks, work packages and outputs of the INTELTRANS project are discussed in the paper. Project results will be achieved in well-based combination of traditional, e-learning and using simulation environment. In order to tackle challenges posed by new technologies significant emphasis will be on integration of IT and telecommunications into transport and traffic safety management programmes. The expected outcome of the project is transport and traffic management education that better matches the needs of the Central Baltic enterprises and public sector where a greater number of employees will possess the skills and competences needed in the current international labour market.

RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 46-47
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TRENDS AND TENDENCIES IN PORTS DIGITALIZATION: CASE STUDY OF PORT OF KLAIPĒDA

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Keywords: digitalization, ports, trends, indicators, evaluation, analysis, framework

Digital transformation has had an impact in several sectors of economy, one of it being – port and maritime industry. Antikainen et al. in (2018) wrote that digitalization boosts the transformation to sustainable economy. Digitalization is the process of moving to a digital business and it can also enable more efficient processes; can help minimize waste and costs.

These days there are many trends in port digitalization and one of them is – the concept “Smart Port”, that means an idea to join a wider network of hubs, which are highly digitized, and receive benefit from it. As technologies evolve, the performance of the ports must evolve also. Innovations like the Internet of Things, cloud computing, cyber-physical systems, robotics, additive production processes, machine learning, augmented reality, blockchain, etc., allow new ways to communicate and new intellectual approaches as well as new business models. Digitalization is a key factor in environmental, social and governance topics which helps to monitor risks and can even reduce carbon footprint in the marine transport.

Maritime transport is one of the main modes of transport in the supply chain and in international exchanges. As in all economic sectors elements of supply chains are scrutinized, improved, and interlinked by means of technological innovations.

This research’s aim is to clarify and understand the concept of digitalisation specifically in application to port and embracing the role of maritime port in the 4th Industrial revolution and to examine current level of digitalization of the Port of Klaipeda in order to evaluate how the port could carry out a digital transformation.

In theoretical part of research, the author while analysing scientific literature and European projects answers to following research questions:

- *What is port digitalization and how the digitization would affect the port development?*
- *What are the driving forces behind and what challenges are being faced because of the digitalization of the port?*

European ports are the leading ports in digitalization and they try their best because most of them are inner ports and are suffering from congestions and can no longer compete in size alone, which means a shift towards smarter operations is imperative. Digitalization in European ports can be found in various forms: inter-connecting technical components, quay walls and roads with sensors that gather multiple data streams. In the research the author analyses the Klaipeda port and answers these research question: *How can a digital transformation process be organized in Klaipeda Port: how to evaluate the current level of digitalization and how could the Port carry out a digital transformation?*

Klaipėda is the third biggest city in Lithuania in the amount of people and the territory and there is the only one major port of Lithuania – Port of Klaipėda. Klaipėda is currently the location of testing, component manufacturing, and small - scale extraction for the oil and gas industry – making it a natural competence center for oil and gas. More than 800 companies are directly involved in the activities of Klaipeda port, over 58 thousand workplaces are being

created by the companies and 6.13% of the total GDP in Lithuania is generated there. Cargo dynamics had good tendency from 2013 to 2018 and were growing, however in 2019 amounts of cargo were very similar to 2018 (Port of Klaipėda, 2020).

The vision of Klaipėda city economic development strategy in 2030 is to become a city which offers the best place to live, work and invest in the Baltic region. According to the United Nations Conference on Trade and Development the future plans affect various elements, one of them – COVID-19, but technology will only increase in the ports and COVID-19 only led to this growth quicker. Digitalization and information sharing became even more important in order that all operations in maritime industry would be accomplished.

While collecting data from various statistical sources and analysis – these conclusions will be accomplished – how digital transformation process can be organized in Klaipėda Port. The author suggests a set of digitalization level indicators, analyses the Port of Klaipėda indicators values and develops specific framework for improvement of Port of Klaipėda digitalization level.

Digitalization in maritime transport and especially in ports is really significant in order to fulfil the market's need for the quick and high quality product/service. To conclude, all the trends and tendencies are supported by digitizing and automation.

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

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 48-49
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SCENARIO ANALYSIS OF A FORWARDING AGENT'S WORKFLOW BASED ON SIMULATION MODELING

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Keywords: freight forwarding, transportation, freight forwarder's workflow, trucks, simulation modelling, AnyLogic

In the market of logistics services, transport companies occupy one of the most important places. In logistics, flexibility, and the ability to quickly adapt to different situations are very important. Such skills are possessed by forwarding agents who can quickly find a truck to transport goods. This study highlights the full workflow of a forwarding agent. One of the main tasks is to consider various problems encountered in the process of the freight forwarder's work. Despite the fact, that the process of freight forwarding is quite clear, and the algorithm of the forwarder's work is quite simple, very often in the process of carrying out the transportation of goods, various problems arise that must be solved immediately. Such problems can be a truck being late for loading; overloading a truck and improper loading of cargo; theft of cargo during parking and rest of drivers; truck breakdowns; traffic jams; weather conditions and much more. In addition to these major external problems, there are internal problems in the freight forwarder's work. For example, problems with communication between colleagues within the company; problems with communication between the forwarder and the client (cargo owner); problems with communication between the forwarder and the carrier. All this can significantly affect the process of transportation of goods and lead to material losses for the company. Various uncertainties often arise in logistics. For instance, weather conditions could be a cause of the uncertainties of demand. The demand forecast of various transportations will not always be 100% correct. When transport managers rely on a demand forecast in a certain region and send all trucks there due to the forecast, a large demand is expected in that region - this strategy is called as a push-strategy. This means that production happens based on a demand forecast. But what if this forecast will wrong or something will prevent it? In this case, it is necessary to use a supply chain pull- strategy, as it is demand-driven, not forecast-driven.

The goal of this research is to compare different scenarios of a forwarding agent's workflow and understand what strategy is more suitable for forwarding businesses: push or pull supply chain strategy.

For a detailed consideration of various scenarios of the forwarder's work, this study uses simulation modelling of the process of delivering goods from the cargo owner to the consignee. The main tool for building a model in this study is the AnyLogic program. This program allows to visualize; to predict; and to reproduce any process with the least cost of money and time. The simulation method allows to simulate the execution of the process as it would happen in reality, but in the accelerated time mode. This is the main reason why this tool was selected for this research. Why do we need simulation modelling? The main task of simulation modelling is to effectively solve problems without risks. All complex systems, workflows and processes can be perceived more easily and understandable if they are reflected in the simulation modelling. This study compares two different scenarios for a freight forwarder's workflow: push and pull supply

chain strategy. Visualization of the process will make it possible to understand which of the scenarios is most convenient and beneficial for the company. Also, it will help to determine at which stage of the forwarder's work process congestion and difficulties are encountered, which will reduce costs and simplify the process.

This research is supervised by an Assistant Professor Ilya Jackson.

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DIGITALIZATION IN ROAD TRANSPORT: INNOVATIVE SOLUTIONS IN TRANSPORT MANAGEMENT

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Keywords: digitalization, road transport, transport management, smart solutions

Changes in technology and its development are changing the processes of road transport. Innovative and smart solutions in transport management are helping logistics service providers in daily tasks but are also challenging the companies to keep on track with new requirements in their field. Digital startups and platform services are shaking traditional transport industry and pressure trucking companies to step towards digitalization.

Road transport is the main mode of transport in Baltics and in Europe. Baltic companies are rather open to new technological changes and solutions. Possible change in European Union's legislation to cabotage loads opens up new business opportunities to many Baltic trucking companies in Western Europe where competition and customers demand to follow certain technological adaption such as real time GPS tracking or automated order forwarding is required. Therefore digitalization in road transport is crucial for logistics service providers.

The aim of the research was to bring out innovative solutions in transport management and to build a best practice frame work for transport companies to help them take next steps towards digitalization. The focus was on companies origin from the Baltic States.

An object of the research was smart solutions available for transport management and companies that are providing logistics services. The subject of the research was to evaluate available smart solutions in logistics sector and offer possibilities to implement those solutions in their daily activities and transport management.

In theoretical part of the research, the author answers to the following research questions:

- How will European Union's legislation influence transport management?
- What is the role of technological changes in transport management? The author completed following research tasks to achieve the goal:
- Analyzed the influence of legislation on transport management and logistics;
- Analyzed technological changes and its role on transport management;
- Analyzed Baltic regional market changes of transport management;
- Conducted a survey of transport and logistics companies to analyze the situation in the field of digital transformation in the Baltic market of road transport;
- Composed framework of digital transformation of the road transport sector based on best practices.

The main results of the study are discussed in the paper. On the basis of the analysis performed, recommendations for enterprises engaged in the considered transport market segment are formulated in the paper.

Digitalization in road transport is essential for meeting changing market demands. Technological development and availability of different applications in transport management are supporting transport companies to move towards digital transformation.

The research is supervised by Dr.hab.sc.ing., Professor Igor Kabashkin

RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 51-52
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FREE PUBLIC TRANSPORT POLICY: MODELLING OF AND CONDITIONS FOR SUCCESSFUL IMPLEMENTATION

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Keywords: public transport, fare-free, urban transit, case-studies, analysis, modelling, implementation

Modal shift towards public transport is a long-standing goal for many urban development plans. It is one of the primary targets on the way to reduction of congestion on the city streets, equalising access to transport and enhancing mobility of the underprivileged groups and is overall considered one of the primary ways to reduce greenhouse gas emissions from transport within cities.

Since the early 1970s, several urban areas in Europe and the USA have experimented with a novel way to encourage the city-dwellers to use public transport more actively. This method is the fare abolition – or what we will refer to as the Free Public Transport (FPT) policy. Keblowski (2020) outlines several methods by which it can be done. It can be either fully free – i.e. with no ticketing system altogether, and any and all passengers being allowed to travel for free – or with limitations:

- spatial - certain routes/areas
- temporal - only at certain times – typically off-peak
- social - only certain groups, like retired or disabled persons

Since Aubagne in 2009, Tallinn in 2013, and Luxembourg in 2020 have implemented fully free, or free with minor limitations, public transport policies, the results and whether they have achieved the stated goals have been a subject of limited critique (Fearnley, 2013). This, however, also brought several municipalities and parties across the EU back to discussing the possibility to implement such a policy in their home regions.

Purpose of this research is to investigate common practices and use them to develop a plan for implementing FPT within the Latvian capital city of Riga. Since several parties in the local elections have returned to the idea, it is timely to consider which way of implementing FPT may work for Riga, if at all, without adding further strain onto the budget and the existing network.

In the theoretical part, author aims to examine three primary case studies, with reference to which goals were set when implementing FPT, and how well they were achieved. After that, the following questions are examined:

- Are there any unifying factors between the regions and their approach to FPT?
- Can any of their practices be noted as particularly (un)successful?

Following that, the research examines the city and existing Riga public transport network. Home to almost 630 thousand people, it is the biggest city in the Baltic States, and is reasonably close to the currently biggest city with free transport for its' residents – Tallinn, Estonia. The local public transport company closed the 2019 financial year with a profit, while the 2020 COVID-19 pandemic has temporarily reduced the load on the system (Rīgas Satiksme, 2021)– which implies that the system works reasonably well, but changes to current way of running will not be felt as harshly by the passengers. Riga already has limited free transport for certain social groups (elderly, disabled, most of school students, and others) – the research focuses on using existing experience as a model to determine the possibility and best method of expanding FPT in Riga to further social groups.

The policy, despite the reports questioning its' effectiveness as anything but a political tool, should nonetheless be examined as an option. With more and more cities aiming to make urban transportation more environmentally friendly, it can be a valuable tool to assist with the modal shift away from cars and enhancing urban mobility for all. Such actions may both help even the most vulnerable groups to access social and working opportunities otherwise inaccessible to them, and improve the prestige of public transport to the general public.

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

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 53
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EVALUATION OF FACTORS AFFECTING THE GREEN LOGISTICS FOR ROAD FREIGHT TRANSPORT

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Keywords: Green Logistics, Freight Transportation, Critical factors, Analytic hierarchy process (AHP)

Eco-logistics, also known as green logistics, is a series of ecological strategies and initiatives aimed at reducing the environmental effects of industries operations. It will evaluate and reduce the environmental effects of logistics operations. For environmental concerns such as uncontrollable pollution rates, traffic congestions, road crashes, transportation costs, and so on, it is unavoidable to bring the idea of green management strategy into the area of logistics. The impacts of freight on the atmosphere are broken down by mode of transport, including marine, air mail, trucking, road, pipelines, and intermodal terminals. In order to achieve long-term natural, cultural, social gains, green logistics can reduce environmental impacts in logistical operations.

The reserach's main goal is to shed light on how to enforce green policies in freight transportation by looking at the different factors that affect the implementation of green behavior. Society demands more care for environment sustainability, it has resulted the business actioners in giving preference to green logistics as well as green business. The factors affecting implementation of green logistics in road freight transport are evaluated from literature review and are validated with expert's opinion from this field. The direct interview is conducted with experts working in the field of road freight transport organizations in Kerala. Analytic Hierarchy Process (AHP), a multi criteria decision making tool on the basis of relative weight or priority was used to rank the specified variables in this study. It is a method for arranging and evaluating complicated decisions. It offers a systematic and logical mechanism for structuring a decision challenge, representing and quantifying its components, linking them to general priorities, and assessing alternative solutions. The factors are analyzed through AHP, a precise method of measuring the weights of decision parameters.

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

*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 54-55
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THE ROLE OF TECHNICAL DEVELOPMENTS IN THE IMPROVEMENT OF THE LOGISTICS AND SUPPLY CHAIN MANAGEMENT OF MULTINATIONAL COMPANIES

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Keywords: Technical development, Logistics, Supply Chain Management, Multinational Companies, Procurement, Growth, Machine Learning, Artificial Intelligence

Logistics and Supply Chain Management is the process of interacting with the suppliers and distributors to meet the requirements of end users. Basically, Logistics is a process that was carried out on the basis of operational demands. With the passage of time the Logistics service providers have recognized that it needed to be revolutionized on the basis of latest technology and digitalized innovations to create competitiveness (Chrisopher, 2001). The technological advancements have affected the Logistics and SCM's and accurate implication of these advancements have raised the core functions of Logistics and Supply Chain Management (Coye, 2003).

The factor of globalization has enhanced the business operations and this factor has increased the need of adopting latest techniques and ways of accessing end users and consumers. That is the main reason that for MNC's the role of technical developments has increased (David, 2000). These developments include using automated unmanned vehicles, drones, robotics, automated inventory management system, using algorithms under Machine Learning for the proper implication on SCM within these organizations. The main objective of this study is to assess the impacts of these technological advancements on Logistics and SCM of MNC's

Purpose of Research

The aim of research is to find out how technical developments have been bringing sustainability in the L and SCM of MNC's and to find out how these organizations are using this evolved information system in their operations.

For this purpose, the following questions will be observed:

- What do we mean by evolved information system, sustainability in the business operations and why these concepts are important in today's modern world?
- How multinational organizations are using evolved information system to bring sustainability in their operations?
- What is the role of these technical developments in Logistics and SCM of multinational companies?
- How will these advancements effect the Logistics and SCM in future?

The object of the research will be Amazon, Kellogg's and Ford and the object will be implementation of technical development of SCM on these organizations.

To advance the study a hybrid technique will be used containing both qualitative and quantitative approaches.

For quantitative approach, some multinational companies will be selected, and these will be Amazon, Ford, and Kellogg's. Amazon is the retail giant; Ford is an American automaker

and Kellogg's is an American food manufacturing company. There are several SCM metrics like on-time delivery, inventory to sales ratio, DSI, inventory carrying rate and stock rotations that will help in following up sustainability in the operations of these MNC's. To better check the sustainability their previous financial data from 2017 to 2019 will be evaluated.

The results that are supposed to be obtained are positive in terms of using these technical developments. There are multiple latest technologies like Kiva Robots and drones used by Amazon for inventory management and delivery process have shown multiple advantages for the business in terms of gaining efficiency, time saving processes, sustainability in operations and getting competitive advantage.

The obtained results will help in assessing the core impacts of these technical developments along with having an insight into their future implications on these MNC's.

The research is supervised by Asoc. Professor Dr. Sc. Ing., Gennady Gromov.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 56-57
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia

IMPLEMENTATION OF E-LOGISTICS IN SUPPLY CHAIN OPERATIONS

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Keywords: E-logistics, E-logistics in supply chain operations, implementation, Delivery companies

E-logistics is characterized to be the system of digitizing logistics measures and giving an incorporated start to finish satisfaction and production network, from the executive's administrations to the players of logistics measures (Chung, P, *et. al.*, 2015). Those logistics measures that are automated by E-logistics give production network perceivability and can be essential for existing online business or Workflow system. The commonplace e-logistics measures incorporate Request For Quotes (RFQ), Shipping, and Tracking. E-Logistics usually collaborates with the business cycle (Pulevska-Ivanovska, *et. al.*, 2013). Delivery measure is likewise summoned by the business interaction chief and upon culmination refreshes the purchasing order. Whenever products are transported, the tracking number is given to the client and that tracking number is planned to the purchasing order number in an online business system. Customers can follow their shipment with the assistance of tracking number (Zhang, *et. al.*, 2001). E-Logistics is yet a moderately novel idea. Due to its infancy stage e-logistics is still in infancy stage by event communicated interest. Frequently referred to as e-satisfaction, e-logistics is the calculated interaction that oversees everything identified with the online commercial center (Logifint, 2017).

The *aim of this research* is to develop an E-Logistics model for the implementation of supply chain operations in Delivery companies in India.

The *object of the research* is E-logistics of shiprocket company in India.

The *subject of the research* is "Process of Implementation of E-logistics in supply chain operations to increase efficiency"

The following research tasks to reach goal:

- To review the literature of E-logistics, supply chain operations, implementation of E-logistics in supply chain.
- To analyze the advantages and disadvantages influence supply chain of E-logistics.
- To analyze the data collected from surveys.
- To understand the E- logistics and its implementation in supply chain operations.
- To conduct survey to understand the challenges facing in the implementation of E-logistics.
- To make proposal of “the best way of implementing E-logistics in delivery companies of India”.

The research methodology consists of quantitative and qualitative methods are used for the analysis of E-logistics systems. The questionnaire to conduct a semi structured interview and online survey to understand E-logistics implementation and requirements in supply chain. Analysis of the survey results to conclude the positive or negative impact of E-logistics in supply chain operations. Successful shippers should remain sharp and keep on testing themselves. Execution estimation ought to be viewed as a reason for all cycles. Robotizing all cycles could be expected under the circumstances is similarly as significant as this saves additional time that can be put resources into better serving customers (Logifint, 2017). Request

handling is a fundamental piece of the online deals measure. Rethinking the inventory network empowers you to fulfill your customers by conveying merchandise on schedule and in great condition.

The research is supervised by Professor Dr.Sc.Ing., Genadijs Gromovs.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 58-59
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EFFICIENCY EVALUATION OF A TRANSPORT COMPANY BASED ON SPECIFIC INDICATORS

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Keywords: Logistics scheme, effectiveness, optimization, KPI, evaluation, universal indicators

Logistics is responsible for the rational delivery and storage of goods and for the customs clearance of goods (Tracey, 1998). The effectiveness of logistics schemes directly affects the success of the business, so the evaluation of the results of logistics is of paramount importance.

As part of strategic planning and management, logistics is concerned with cost minimization, and long-term corporate planning. To assess the efficiency of logistics, it is necessary to assess the level of costs and find opportunities to reduce them, identify problems in process management, and control the implementation of basic technological operations (Fugate *et al.*, 2010).

The problem is that a wide variety of aspects of the organization's activities are subject to evaluation, and there are some difficulties in determining common parameters for evaluating the results obtained.

The assessment of the quality of the logistics scheme always retains an element of subjectivity, the interpretation of the results of the study conducted by various methods can give rise to the problem of unambiguity of the assessment (Krauth *et al.*, 2005). Overcoming the problem consists of applying standard criteria for evaluating effectiveness.

The purpose of the research is to evaluate the effectiveness of a transport company using Key Performance Indicators (KPIs), which will help us measure the degree to which the company's goals are achieved, thereby helping to optimize the supply and transportation process, offering new options and opportunities. And also to analyze the entire logistics chain in order to identify those points where it is possible to minimize transport costs, reduce costs and increase the profitability of the business.

There are universal indicators for evaluating the effectiveness of the organization of logistics in the enterprise, they include:

- Total costs;
- The duration of the logistics cycle;
- The quality of the logistics service;
- The productivity of the logistics.

These indicators in the most general form allow one to evaluate the logistics of the enterprise and identify certain problem areas that require optimization (Clarke and Gourdin, 1991).

The assessment of transport logistics, in addition to universal indicators, should also take into account such parameters as:

- Reliability and productivity of the cargo delivery planning system;
- Optimal choice of the vehicle;
- The degree of traffic congestion;
- The amount of irrational mileage, downtime, and efficiency of vehicle use.

We will use the key performance indicators (KPIs) to evaluate the effectiveness of a transport company based on specific indicators. The primary purpose of using the KPI-indicators

system in logistics is to monitor, control and evaluate the effectiveness of the logistics system as a whole (Gozacan and Lafci, 2020).

To correctly calculate the KPI of transport logistics, first of all, a decision maker has to check the correctness of the data that was collected during the work.

In specific situations, it should be emphasized that it may be necessary to supplement KPI estimates with cognitive and simulation models that will contribute to the interrelated reflection of the factors that determine the logistics process (Ginis *et al.*, 2017).

This research is supervised by Assistant Professor Ilya Jackson.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 60-61
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EVALUATING CUSTOMER SATISFACTION FROM THE THIRD PARTY LOGISTICS SERVICE PROVIDERS

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Keywords: Third party Logistics(3PL), Market demands, Customer Satisfaction, Tier planning

Third Party Logistics (3PL) is a business model where the logistic company acts intermediary between the producers/manufacturers/wholesalers/retailers and the final end user. In recent studies by Liu Aolin (2017) 3PL firm primarily involves warehousing, inventory and delivery to the end customer. In a typical scenario the 3PL system is an outsourced entity which performs the logistical functions for a business. We can represent the 3PL an advantageous pool of logistical expertise. Much of previous research have focused on improving end consumer satisfaction and few have been addressed regarding relationship between a 3PL and its customer, the results (Ivan Russo *et. al.*, 2014) were quite striking. Earlier (Yemisi A Bolumole, 2001, Sze Hui Chin, *et. al.*, 2013) we described a systematic evaluation that using means of 3PL can achieve higher efficiency in logistical operations to the company and helps them focus more on developing better products to consumers rather than trying to resolve the logistical issues. Customer satisfaction can give added value to a 3PL provider in terms of quality services, reputation, and cost management, therefore introducing flexible solution as adding tiers to meet specific customer demands is vital. In a developing country as India, where products are of wide array, it is important for a 3PL to retain its customer satisfaction ratings by adding flexibility, value added services; tier planning which in return also strengthens the business model and improves ratings.

The *aim of this research* is to develop a model to analyse and improve customer satisfaction for 3PL companies in India.

The *object of this research* is typical business processes between customers and third party logistics service providers in India.

The *subject of the research* is evaluating customer satisfaction of 3PL providers and improving them by implementing tiers of flexible operation.

Following research tasks to reach goal:

- Review literature on 3PL provider operation, advantages and disadvantages, customer demands and satisfaction criteria.
- Analyse customer satisfaction and demands by means of survey in Google forms.
- Detailed study of data obtained from Survey.
- Implementing an adaptive technique of tier systems to improve customer ratings and satisfaction.

We are choosing both qualitative and quantitative research methods to obtain our final goal of improving customer satisfaction ratings. Survey data are preparing and analysing for commenting out existing issues and improving the operational sectors as means of tiers and channels on an adaptive technique.

The research is supervised by Professor Dr.Sc.Ing., Genadijs Gromovs.

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Session 3

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

**Tirgus: pētījumi, projekti,
tehnoloģijas un mūsdienu
ekonomikas problēmas**

**Рынок: исследования,
проекты, технологии и
проблемы современной
экономики**

*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 65-66
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RECRUITMENT AND SELECTION PROCEDURES IN A MANUFACTURING COMPANY

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Keywords: HRM procedures, Recruitment, Selection, Hiring-model, Manufacturing Industry

Considering the strategic perspective of Human Resource, it is a necessity for a modern manufacturing company to strive in the market with a competitive edge to outperform the competition (Brian, 2001). Companies try to develop a cost effective competitive edge. In this regard, management of a business entity focuses on Total Quality Management (TQM), which is implemented across all functions of the organization including Human Resource Management (HRM) (Sim, 2002). The process of talent acquisition starts from recruitment and selection of the right candidates for the job that come up with cost effective solutions for the organization's forth coming Human Resource needs (Gupta & Kumar, 2001). In the highly competitive business world, a keen attention is given to all the elements that may influence business results, for example, for continuous improvement of all processes across the organization including the HR process that starts with Recruitment and Selection of employees (Beardwell, 2007). Fruitfulness of an HR Department is notified with its timely identification and coping Human Resource need of the company (Gupta & Kumar, 2001). In this process, not only cost and time is focused, but legal aspects of every job are also considered. Therefore, recruitment and Selection are essential HRM procedures.

With this above stated context, this research aims to identify and evaluate the recruitment and selection models and procedures, which are used in the Manufacturing Industry. For the operative evaluation, three different companies from manufacturing industry of Pakistan 1) Active Apparels International Pvt Ltd, Lahore, Pakistan, 2) Crescent Textile Mills, Faisalabad, Pakistan and Power Chemical industries, Punjab, Faisalabad, Pakistan are taken as sample for this research. The research involves the assessment of the recruitment and selection methods, challenges, procedures, as well as affective models applicable for a manufacturing company. Therefore, the object of research is a manufacturing company; the subject of the research is recruitment and selection procedures in a manufacturing company. Theoretical literature review, case studies, a survey and experts' interviews present the research methodology.

The study also covers the impact of recruitment and selection procedures on the future outcomes. Thus, the output of the research would be recommendations for the HRM managers responsible for recruitment and selection in a manufacturing company.

There are numerous studies have been conducted on this topic. Hence, in this stage of research, previous studies are a help to foresee and match the results of this research. As an anticipation of results, it is assumed that the Manufacturing Industry is to some extent following the right procedures of recruitment and selection. Many organizations are still following a traditional approach of sourcing potential candidates, i.e. word of mouth for a job or nepotism and this compromises the effectiveness of selection procedures in the longer run for the company's outcome as a brand.

The research is supervised by Professor Yulia Stukalina.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 67
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THE ANALYSIS OF ONLINE USER EXPERIENCE THROUGH FLIPKART (AN ONLINE SHOPPING PLATFORM IN INDIA)

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Keywords: Marketing; User experience; Online Shopping; Decision Making; Consumer behavior

Emergences in technological innovations had altered online user experience, therefore, customer decision making, pre-and-post purchase behaviors, etc., became more complex. Businesses are adjusting and pledging marketing strategies for long-term customer retention and experiences.

Over the years, marketing has become an influential tool to engage with customer and influence pre-and-post purchase behaviours. Achieving targeted goals requires successfully conducted marketing campaigns. Moreover, a strong financial support is needed to control persuasive marketing communications.

The focus of the research is to investigate the problems faced by the online users through FLIPKART online shopping platform. Flipkart. Ltd. is India's largest e-commerce firm located in Bangalore. It was founded by Sachin and Binny Binny Bansal in 2007. The company initially concentrated on the sale of books and eventually transitioned to lifestyle products, electronic products, and apparel.

Due to Covid-19, online purchase patterns dramatically increased. Many businesses were not ready to combat with such a huge online demand. FLIPKART customers online shopping experience faced difficulties too. The bad user experience leads to poor brand loyalty, customer satisfaction, and customer retention.

The aim of the research is to explore the problems faced by Flipkart customers through online user experience. To accomplish research goals, following tasks were formulated: first, define the problems faced by online customers; second, explore link between the demographic factors affecting complexity of user experience and lastly, analyze customer satisfaction for developing solutions.

The subject is to examine Flip Kart customers online user experiences. **The object** is a Flip Kart, online shopping platform in India.

The theoretical basis is consumer behavior and decision-making theories. Qualitative and quantitative methods were used during the research process. The study started with exploratory research to examine findings through secondary data. Literature review provided information on existing problems faced by Flipkart online users experience. Therefore, it set cornerstone to develop survey and interview questions. Survey study with open and closed-ended questions were created. Additionally, in-depth interviews with Flipkart customers were conducted. Moreover, SWOT analysis of FlipKart and its competition explored pro's and con's for better marketing management and for building long-term customer relations.

Lastly, the research based on analytical data contributes to better understand the online user experiences through Flipkart and provide suggestions to better decision-making and marketing managerial skills.

The research is supervised by Dr. Ioseb Gabelaia.

RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 68-69
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia

THE ASSESSMENT OF COVID-19 IMPACT ON TOURISM INDUSTRY (A JET2 HOLIDAYS CASE)

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Keywords: Tourism; Destination marketing; Hospitality management; Sales; Covid-19

Tourist industry is at the epicenter of the novel coronavirus crises. Prior to covid-19, tourism industry was concentrated on developing destination marketing, business endorsements and market research. However, today, many are dealing with a few new guidelines, incentive packages, and procedures. Moreover, uncertainty around tourism industry arises questions on demand forecasting, sales projections, resource management and decision making.

The tourism industry was one of the fast-growing trends before covid-19. The efficiency and effectiveness of the tourism business heavily depends on how soon airports will reopen. To recover, tourism industry will need agile framework across private and public sectors. Factors such protection of workforce and tourists, financial relief, communication, and demand fostering, and tourism industry relaunch requires a delicate strategies and engagement.

According to tourism industry experts' calculations for tourism to return to 2019 heights will demand three to five years. Therefore, to sustain and relaunch industry across the globe invites to reevaluate current trends. SMEs need to create a revenue-pooling structures that enables effective management of variable costs and losses. Moreover, governments need to redefine and become liaisons between businesses to facilitate domestic, inbound, and outbound tourism.

The aim of this research is to analyze the impact of covid-19 on industry sector, based on Jet 2 holidays, therefore, to provide suggestions for further growth and recovery in post-pandemic environment. The study is based on Jet2 Holidays which experienced decline in sales, while expenditure has risen. Consequently, affecting its development and growth amongst competition.

The object of the study is Jet2 Holidays. Subject is the developing mechanisms assisting sales efficiency in the uncertain tourism industry.

To achieve the research goal, the following tasks are formulated. First, explore economical aspects of tourism business; second, investigate the role of destination marketing into tourism industry; third, analyze current circumstance of tourism industry (covid-19 impact); fourth, explore potential developments into post-pandemic tourism industry and its dynamics. And lastly, explore 6As of tourism destination to increase destination competitiveness, therefore increase potential sales.

The study employs mix methodology. Qualitative and quantitative methods are used to explore current market environment through secondary and primary research. Exploratory research is utilized to investigated impact of covid-19. Based on secondary data, survey study was designed with multiple choice, drop down, Likert scale and open-end questions. Further, the study created a semi-structured interview. Moreover, the study will conduct SWOT analysis while doing comparison studies with top competitors in tourism industry. And lastly, PEST analysis used to scan external, macro environment.

The study attempts to present current situation and its impact on sales in tourism industry, studying Jet2 Holidays. The study describes benefits of tourism industry for further development and growth, and the impact of transportation, accommodation, hospitality, entertainment and all other connected industries in post-pandemic growth. The study highlights the latest trends in tourism industry and provides tips to deal with emerging technologies in tourism.

The research is supervised by Dr. Ioseb Gabelaia.

*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 70
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THE IMPACT OF SOCIAL MEDIA ON MARKETING DECISIONS IN REMOTE COMPANIES

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Keywords: Social media; marketing decisions; remote companies

Social media marketing is considered to be crucial for businesses as they offer promotion of products and services at relatively low costs. Social media have also been used as platforms for distinguishing products and services from competitors on the market. Therefore, social media have a direct impact on marketing decisions regarding sales, niche management, customer management and PR. Recent times have witnessed the emergence of remote companies or companies mostly operating online, which have been adopting social media not only for external communications with the outside market but also for internal communications, such as idea sharing and problem-solving within a specific team, for the purposes of management of internal operations, including marketing operations. Given the fact that such a decision bears strategic characteristics, this paper aims to determine if there is an impact of using social media for internal communications related only to operation- and sales-related decisions in marketing departments in remote companies. The subject of this study, therefore, is the role of social media in influencing the marketing decisions of the remote companies, while the research object is the marketing department of remote companies. The functions of internal communications and operations of the marketing department will be one of the primary targets of research. The research base is the Buffer company. This company was chosen because of its well-known software framework for managing social media accounts and assisting consumers in building their own brand with a remote team in 15 countries. The research methodology has included a survey, interviews and case study. Data analysis has included qualitative and quantitative approaches. The study sample was 50 respondents who were working with remote platforms including the Buffer employees. Interviews were designed with open-end and close ended questions. The outcomes of this study is such that it proves the impact of social media on marketing decisions in the remote companies while providing suggestions how remote companies can utilize better marketing tools for taking right decisions.

Research results will contribute to the discipline as they will show how social media platforms can be used for internal communications for marketing decisions in marketing departments in remote businesses. Such communications will be shown to be effective and potentially more cost-effective.

The research is supervised by Dr. Kristīne Užule.

RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 71
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IMPACT OF GREEN MARKETING ON CONSUMER PURCHASING DECISION IN KERALA, INDIA

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Keywords: Green marketing, Sustainability, Green product, Green Packaging

Green marketing is viewed as the process of promoting environmentally friendly services, products and packaging, which informs customers about green benefits (Chang *et al.* 2019) and ethical benefits of purchasing such products (Dangelico and Vocalelli, 2017), while aiming to attain specific business goals (Mahmoud, 2018). In the current era this concept is gaining popularity at a faster pace because the concept of green businesses is attracting and engaging more and more customers (Khan *et al.* 2020). This type of marketing can be costly for businesses in the long run, however, it can also bring favorable results due to rising demands (Groening *et al.*, 2018). Considering some business and financial drawbacks associated with green products in the short term, the aim of the current research is to investigate the impact of green marketing on the consumer purchasing decisions in some supermarkets in the State of Kerala, India. The outcomes of this research will help to determine if green marketing is effective or not in terms of boosting sales volume and brand publicity level and the ways in which it influences the purchase decision of customers on the target market.

In order to attain the aim, first, there have been proposed the research subject and object. The research subject is the factors of green marketing impacting the consumer behavior. The object is More supermarkets in Kerala, India. Second, the research methodology has included the analysis of the secondary data obtained from the literature review and the analysis of the primary data collected from the survey of 100 customers of More supermarkets. The data will be analyzed using a qualitative approach, thematic and content analysis.

The contribution of this research is the identification of factors of green marketing that have and that do not have an impact on consumer behavior. This will help further shape more effective marketing strategy that focuses on eco-friendly aspects of the business.

The research is Supervised by Dr. Kristine Uzule.

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 72-73
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MENTORING AS A METHOD OF ADAPTATION AND PROFESSIONAL GROWTH FOR TEACHERS IN EDUCATION (CASE STUDY ON MONTESSORI SCHOOLS)

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Keywords: Montessori schools; Mentoring; Education; Teachers; Management

Mentoring is a method of support and development implemented in many organizations (Carter, 2010). The key focus is the development of the mentee through active communication between the mentor and the mentee (Aubrey, 2011). The Montessori method is a precise child-centered technique of education. The idea of the method lays in the balance of discipline and freedom (Standing, 1959) Moreover, academic skills develop through a child's inner curiosity and energy that is pushing him to explore the world carefully endorsed by teachers.

Every organization implements and modifies its own mentoring program, therefore, adapting the mentoring structure for its needs (Aubrey, 2011). The class environment leads the teacher and teacher's assistant to learn from the lead teachers. If this process is organized successfully assistants develop a professional attitude and become more competent to lead classes (Montessori, 1964). This makes the educational process stable and high quality.

It necessitates understanding how the teacher resolves existing and reoccurring issues. The main flaw is a non-existing teacher support system to encourage adaptation and professional growth (Kahn, Dubble, Pendleton, 1999). The problem that new teachers face is change in role, and attitudes to knowledge from formal theory to practice (Aubrey, 2011). New teachers may find themselves in vulnerable situations where they must demonstrate skills that are not developed yet. This results in higher teacher fatigue, eventually leading to leaving jobs.

The aim of the research is to develop a mentoring program for the adaptation and professional growth of teachers in Montessori schools. To achieve established objective, the following tasks were identified; first, explore the concepts, theories, and forms of mentoring; second, examine Montessori methods and schools to present pros and cons; third, identify the needs and expectations of teachers; further, analyze identified problems and present solutions; lastly, to develop an action plan to build a school mentoring plan for Montessori schools.

The object of the research is Montessori schools. The subject is developing a mentoring program for teacher adaptation and professional growth.

The mixed methodology is used to explore and review theoretical and scientific information. Through exploratory research method Montessori schools in Russia, Estonia and Latvia will be examined. Consequently, presenting currently existing trends and gaps for future developments. Semi-structured interviews will be conducted with current teachers and assistants who have worked within the system for more than one year in the same location. Interviews will question teachers to highlight why they have changed or quitted the job within a year of employment. Further, the survey study will highlight in-depth issues related to Montessori schools. Therefore, presenting teachers various patterns for teachers' adaption and professional growth. Factor analysis will be used to analyze and present data. The sample populations are teachers and assistants at Montessori schools.

The Montessori approach has more than 100-years history, however the mentoring itself was not developed within the Montessori approach (Standing, 1959). Nowadays leading

countries of the world are characterized by tremendous interest in the human capital of the organization. It becomes more and more important to invest in and to develop the human capital of the company. The scientific value of this research is analyzing the experience in this area in order to implement the knowledge for improving the work with human capital in Montessori approach. The expected contribution of the research is to develop a mentoring program for teacher's adaptation and professional growth at Montessori schools. The research would provide recommendations and solutions to the Montessori school management. It should convey how to deal with risks, traits, and opportunities associated with teachers' performance effectiveness and workplace longevity.

The research is supervised by Dr. Ioseb Gabelaia.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 74-75
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TRENDS OF ONLINE SHOPPING AND THEIR IMPACT ON CONSUMER BUYING BEHAVIOUR IN PAKISTAN

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Keywords: e-commerce, online shopping, garment, consumer behavior, trends, affirmative characteristics

Shopping related behavior is significantly affected with the rapid growth of information and communication technology (ICT). The advent of social media platforms such as Facebook, Twitter and Instagram has further fuelled the growth of internet usage and related technologies (Pitta and Gur, 2012). One of the major shifts witnessed among the behavior of the population across the globe is the shopping as the shift from traditional shopping to online shopping has been enormous (Lim *et al.*, 2016). In the countries where internet penetration is growing and information and communication technology (ICT) infrastructure is booming, the potential of e-commerce (or online shopping) is very high. Pakistan's e-commerce market is largely contributed by the fashion industry (mainly, garments products). However, recent COVID-19 pandemic situation has increased the consumer's interest in online shopping and hence, the growth in online shopping is expected to enhance further in coming years (Melović *et al.*, 2021).

This research study aim is to identify and evaluate the trends and factors that may have an impact on the consumer buying behaviour towards online shopping of garments products in Pakistan. The object of the research is online garments (clothing) market segment in Pakistan. The subject of the research is the trends and factors that may have an impact on the consumers buying behaviour while purchasing garments through social media platform.

This research is based on the social media platform and online (e-commerce) portals available in Pakistan; Facebook, Twitter, Instagram, YouTube, Daraz.pk, affordable.pk and pakstyle.pk etc. The study will focus on the pre-purchase behaviour of the customers who buy garment products online either through websites or mobile applications. The reason for choosing the most popular social media platforms (e.g. Facebook and others) is their dominance in Pakistan.

In this research, quantitative and qualitative methodology was adapted to explore the current market through secondary and primary research. Secondary data were collected from the online library sources and other databases (university digital library and other free access available online resources, such as Google Scholars, etc.), textbooks, monographs, research papers, encyclopaedia, etc. Primary research involved data collection from the selected respondents, i.e. online shoppers of garment (clothing) products in Pakistan. Data collection was conducted using a survey questionnaire available to the respondents via an online link (Google Forms). Once the questionnaire was developed using a survey instrument based on the Likert scale, it was routed to the target respondents via online medium such as email. The responses to the questionnaire (survey) were automatically recorded over online portals, such as Google Forms. The sampling strategy was based on the non-probability convenience sampling.

The expected contribution of this research is both academic and industrial in nature. The academic contribution includes the identification of the risks and barriers associated with online shopping, affirmative characteristics and the role of subjective norms on online consumer behavior. The industry contribution includes the identification of the most important factors that positively influence the purchase intentions of consumers in Pakistan while purchasing garments products online.

This research would provide recommendations to the companies that are selling their products over social media platforms in Pakistan. These recommendations would help such companies develop a targeted marketing approach.

The research is supervised by Professor Yulia Stukalina.

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 76-77
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РАЗРАБОТКА КОНЦЕПЦИИ СТРАТЕГИЧЕСКОГО РАЗВИТИЯ ЧАСТНЫХ ДЕТСКИХ САДОВ

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Ключевые слова: стратегическое развитие, франчайзинг, малый бизнес, частные детские сады, управляющая компания

Актуальность исследования обоснована относительно новым форматом бизнеса – открытием частных билингвальных детских садов на территории России посредством франчайзинга. В условиях быстрорастущей отрасли франчайзинг является эффективным инструментом расширения сети с целью опережающего захвата наиболее привлекательных рынков (Зими́на, 2009). Однако одностороннее фокусированное на темпах роста открытие новых точек без надлежащего подбора будущих франчайзи недостаточно, ибо лишь финансово ориентированный контроль деятельности действующих детских садов создает угрозу деловой репутации управляющей компании и, как следствие, потере конкурентных позиций.

Целью представленного исследования является определение инструментов и процедур, применяемых для разработки конкурентной стратегии современной компании. Объектом исследования является управляющая компания, занятая развитием сетей частных детских садов. Предмет исследования - инструменты и процедуры, связанные с франчайзингом, для разработки конкурентного развития сети частных детских садов.

В процессе исследования были использованы такие методы как анализ научной литературы в области стратегии развития, применения франчайзинга и др., изучение документов, интервью персонала и др.

Проведен ряд исследований для определения составляющих, оказывающих наибольшее влияние на результаты деятельности франчайзи, восприятие этих результатов глазами потребителей и формирование общего имиджа компании:

- определено, в чем должен состоять контроль деятельности хозяйствующего субъекта;
- выявлены наиболее значащие услуги для потребителя;
- расставлены акценты на личностных и профессиональных качествах, предъявляемых к персоналу и максимально способствующих реализации услуг высокого качества (Белая, 2016);
- рассчитаны финансовые показатели для реализации разрабатываемой концепции контроля качества и эффект, полученный от её воплощения и др.

В работе предложены рекомендации, способные повысить доходность детских садов, принадлежащих партнёрам, а также выявлены методы и процедуры, наиболее значимые аспекты работы франчайзи, на которых следует сосредоточить основные ресурсы и уделить максимальное внимание при разработке конкурентоспособной стратегии компании. Результаты исследования, по мнению автора, будут интересны руководителям и специалистам, занятым в области частных детских садов, а также компаниям, использующим в своей практике франчайзинг как инструмента расширения сети на территории РФ.

Представленный материал отражает ход исследования, проводимое под руководством Dr.psych., asoc. prof. И. Ишмухаметова.

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 78-79
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ASSESSMENT OF THE PERSPECTIVES FOR THE USE OF ARTIFICIAL ICE FOR NON-PROFESSIONAL SPORT SERVICES

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Keywords: sport services, non professional sport, artificial ice, energy consumption, Co2 emission, environmental upgrade

In recent years the ice skating has become a popular event in many different countries, and this activity can be characterized as a physical activity, which forced by the implementation standards of a healthy lifestyle, an increase in the number of sports and physical education organizations, improving the quality of services provided to the population. The commercialization of the sports industry is becoming an important feature of modern society as well as modern approaches in the environment sector. (Cotts, D.G, Roper, K.O, Payant, R.P. 2010) Interest in new technologies in the construction of new sports centers, expansion, and renovation of ice rinks. Since the sports industry is a rapidly growing sector of human entertainment, and all these factors bring to our generation devastating environmental impact and affect our sustainable environment in a negative direction. Some of the authors in their research have measured the impact and consequences of ice rink maintenance on the environment (Karampour, 2011; Schulz, 2012; Kretzschmar, 2020). However, when examining the impact of a hockey ice rink on the environment, we can encounter following issues:

- In the already published scientific thesis's there is extensive amount of information regarding how much can ice rink consume resources yearly, but there is no clear information within the area how to split the ice time between professional and non-professional groups of players or just public skaters, so further there is no clear decision making methodology regarding that unexplored area of ice rink management.
- There is not enough reliable and independent information from the elite ice hockey players and their professional opinion regarding the opportunity to substitute natural ice to artificial ice during the training time in the summer.
- There is not enough independent professional opinions if artificial ice can be a good solution for the young players who has lacks of training ice time all year round.
- No data regarding the question how potentially can general public perceive the idea of changing the natural ice surface to plastic ice rinks for the non-professional group of athletes (Gallant, 2010).

The purpose of this research is to study the adaptation of non-professional groups of the population and the opinion of professional hockey players to the possibility to substitute natural ice surface to the plastic ice, and to analyse the potential impact of this concept on the environment as well as players development. The object of the research is the organizational issues of resource management in the ice rink. The subject of the research is to substitute the usage of natural non-renewable resources to artificial resources within the ice rink.

The project aims to define a possibly modern approach how to reduce, non-renewable human resources - water, energy, and fuel in the ice rink, by substituting the natural ice to the synthetic (plastic) ice surface and maintain a good quality of winter sport activities primarily for

non-professional group of people who aims to live a healthy lifestyle by using more ecologically friendly resources.

To succeed in this challenge, three points will be analysed:

- Is it possible to maintain the quality of the training and leisure for a non-professional group of ice skaters with the synthetic ice surface?
- How non-professional group of people will perceive the opportunity to use synthetic ice (artificial) all year round to help us save energy?
- How professional group of athletes will perceive the opportunity to use a synthetic ice rink during the off-season?

This study is going to determine if, replacing natural ice with synthetic ice will keep the quality of sports activities for a non-professional group of population. Upon completion of scientific work, we plan to develop recommendations for leaders of winter sports in the development of sports areas on ice, as well as the possibility of developing the direction of year round mass events on ice, and further discussion of the implementation of the program to support the environment and the development of winter sports on ice, using plastic ice.

The research is supervised by Dr.psych.. I. Išmuhametovs.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 80-81
Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia

FORMATION AND MANAGEMENT OF SECURITIES PORTFOLIO BASED ON AN ACTIVE INVESTMENT STRATEGY OF THE KAZAKHSTAN STOCK EXCHANGE

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Keywords: Active strategy, Investment, Securities portfolio, Multipliers

In economic literature financial investments' portfolio defined as "a specific set" of different types of financial instruments with varying degrees of return of profit and risks. By the opinion of Askinadzi and Maksimova (2011), the main objective of portfolio investment is "to improve the investment conditions by giving a set of securities such investment characteristics that are unattainable from the position of a single security and are possible only if they are combined".

The paper investigates the theoretical aspects of the analysis of securities portfolio formation. The stages of formation and structure of issuers in the securities market of the Republic of Kazakhstan are analyzed. We consider the multipliers necessary for the formation of the market portfolio. The analysis of approaches on building the investment portfolio, including the stock valuation model, was conducted in the thesis. The stock portfolio of companies was built by that are listed according to state standards on the Kazakhstan securities market. To accomplish this, the beta coefficient was calculated and analyzed, and the valuation of the stock was conducted by means of the multiplier method of estimation. The stock, being the most underestimated, that is, the most attractive for investments, were selected on the basis of the obtained results.

The *object of the research* is the Kazakhstan securities market. The *subject of the research* is a portfolio of securities.

The *aim of the research* is formation and management of the effectiveness of the securities portfolio on the Kazakhstan securities market based on active investment.

The *problem statement of the research* is that the problems of forming a securities portfolio occupy one of the leading places in modern financial theory and practice. Portfolio investing improves investment results, reduces risk and increases income. The success of investing depends on the correct decision making when forming a securities portfolio.

To achieve the aim of the study, the following research tasks are posed:

- 1) Analyze approaches to the formation of a securities portfolio.
- 2) Analyze stock valuation models.
- 3) Create a securities portfolio based on an active investment strategy.
- 4) Evaluate the profitability of the portfolio under various scenarios of economic development.

To solve the tasks, various research methods were used, such as literature review and research questions development; Comparable analysis of an active and a passive strategies; Valuation of securities based on multipliers; Development of conclusions and recommendations.

During the study the author will receive the answers on the following questions:

- 1) Why do I need a portfolio of securities?
- 2) What are the advantages and disadvantages of an active investment strategy?
- 3) How to use evaluation multipliers correctly?
- 4) What other methods can you use when investing?

The result of the research is formation of an effective portfolio of securities based on an active investment strategy, which provides the investor with the required stability of income with minimal risk.

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

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 82-83
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BUSINESS ORGANIZATION AND BUSINESS RISKS OF FOREIGN COMPANIES IN THE BALTIC REGION

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Keywords: Business organization, Internationalization, Business strategy, Risks, Baltic Region

In the conditions of globalization, business development is experiencing an increasingly growing business internationalization, when large business entities further expand their cross-border operations, including (re)location a part of business to the new markets and jurisdictions. The main reasons for that include: horizontal integration for penetration to the new markets, cheaper human and financial capital of the local market, tax considerations, strategic location and logistic optimization, and favourable business environment.

By expanding internationally, a company gets new opportunities, such as cheaper resources, economy of scale, and geographic diversification of its business risks, but it also faces a number of challenges pertaining to the need to adapt to local legislation and culture, additional investments and risks of the new business environment.

The research topic is important to the broader community, but especially to the top managers and business analysts, as it is significant to assess and to compare the risks and opportunities, pertaining to such business internationalization as well as the choice of the best geographic location of business, based on a set of criteria for economically grounded and rational decision-making.

In academic context, the importance of the research is the approach to the evaluation of business expansion rationale in certain conditions, taking into account the given risks and opportunities, developed by the author. From professional point of views, it represents a list of recommendations for company's owners and managers, including decision-making and necessary changes in company's strategy to adapt its business to the new geographic market.

Numerous authors have studied various aspects of the problem of international expansion of business. For example, there is opinion that export-oriented companies have faster growth; they have a higher productivity. At the same time, expansion of business internationally exposes the company to new risks. According to Farhang (2001), the way how companies enter international arena is closely connected to their marketing activities. Numerous changes in international business environment have made the selection of a foreign market for penetration extremely complicated. Some author for the choosing of country market for international expansion apply criteria-based methods for decision-making (Górecka&Szalucka, 2013).

Most of the previous studies either contain a complicated mathematical and statistical apparatus, that requires very special knowledge and has little practical value for business managers, or/and are oriented on large multinational corporations that have already grown and have considerable resources and capabilities for further expansion.

Research subject is business strategy for a multinational company.

Research object is a multinational company specializing on the solution for parkways and road covers. The research aim is to develop business strategy for a multinational company operating in Baltic region.

The research questions are:

1. What are the most critical criteria for choosing a place for company's business location internationally?

2. How to assess and compare risks versus opportunities pertaining to local markets in cross-border business operations?
3. What are the most significant aspects of changes in company's strategy are to be made as a result of business expansion to foreign market?

The research will include both qualitative and quantitative analysis aspects. Qualitative analysis will be applied to reveal and assess the criteria for international expansion and choosing business location place. Quantitative analysis aspects will be used to the extent the financial data (e.g. financial statement items, costs issues, etc.) of the company in question will be used to justify or assess its performance.

The research provides a practically applicable approach, which has an economic rationale, but is comparatively simple and appropriate for use by business managers and applicable for small and middle enterprises.

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

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 84-85
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SUSTAINABLE DEVELOPMENT GOALS AS PART OF CORPORATE SOCIAL RESPONSIBILITY AND ITS DEDICATION TO AIRLINE INDUSTRY

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Keywords: Aviation industry, Corporate social responsibility, Sustainable development goals

Nowadays the aviation industry currently in a environment of high competition, and Corporate Social Responsibility is one of the many causes of competitive advantage. The aviation industry is a reason of numerous negative consequences such as high level of noise, emissions of carbon dioxide into the atmosphere, pollution, etc. Corporate Social Responsibility is concept that can raise the sustainability of the aviation industry.

Corporate Responsibility is a discipline where corporations are considering the interests of society and making themselves responsible for their activities on the market and other public stakeholders. There has been a significant increase in awareness of the impact of human activities on the environment. The world has become more attentive to the social, environmental consequences of their consumption habits. Taking responsibility for its impact on society means that the company acknowledges responsibility for its actions and keeps records of them. This is an important element of CSR that describes the relationship between the social and environmental impacts of a company's economic activities on certain interest groups and on society.

Corporate Social Responsibility is a very large concept to investigate, and since CSR includes the Sustainable Development Goals, the author decided to focus on researching the SDGs concept.

The goal of the study is to identify the impact of the selected three SDGs *affordable and clean energy, industry, innovation, and infrastructure and climate action* on airport business processes. The study is based on investigating impacts of selected SDG goals on two airports. The study selected **Istanbul international airport is the global hub while the second Dubai International Airport airport** has potential to become a global transport hub. To achieve the research goal, the following tasks are formulated. **First**, investigate how big transport hub (first) implements selected SDG concepts and what benefit does it bring. **Second**, investigates how second airport uses selected SDG concepts and find out the potential impact of new concepts.

To mean set objectives the study formulated following tasks. The first, to define the Corporate Social Responsibility, and sustainable development goals. Second, explore EU aviation strategy and general economic benefits. Further, examine the existing literature on theories related to Corporate Social Responsibility and Sustainable Development Goals and lastly, illustrate conclusions and recommendation through detailed analysis and discussions on findings.

The study selected qualitative and quantitative research methods. The author uses an exploratory method describing the nature of SDG in the aviation industry. Secondary data is used to gather and explore aviation industry through scientific journals and publications. The study will identify the specific characteristics of implementing SDG goals.

The expected result will be the maximum positive impact of the SDGs on becoming an airport as a major transport hub.

The methodological basis of the research is a theoretical analysis of SDG concepts and its impact on the aviation industry. Semi-structured interviews will be conducted with aviation industry representatives from various international airports. The study is based on identified SDG goals and created interview questions. A semi-structured interview consists of 15 open-ended questions. The design of the qualitative study allows for the analysis of demographic data and the level of satisfaction with SDG goals. Finally, the study offers a comparative analysis of selected airports and presents data to draw conclusions.

The research is supervised by Dr. Ioseb Gabelaia.

*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 86
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IMPROVING THE SYSTEM OF RECRUITMENT AND ADAPTATION OF PERSONNEL IN THE AIRLINE

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Keywords: recruitment of personnel, adaptation system, HR management, HR policy, airline

At the present time, any company is interested in attracting and retaining highly qualified employees. It is for this reason that the procedure for hiring and selecting staff for vacant positions is considered one of the main issues in the concept of human resources management. A well-organized process of selecting the necessary specialists will allow the organization to close all vacancies in a short time and attract personnel who will meet all the requirements of the company (Reznikova, 2017).

The issue of personnel adaptation is also important for attracting and retaining staff, because it is the adaptation system that most often affects the employee's decision – to stay in this company or to look for a new place to work in similar companies. The adaptation process is aimed at facilitating the entry of a new employee into the life of the organization. As statistics show, 90% of those who quit in the first months of their stay in the company explain their departure by the lack of appropriate conditions for adaptation (Kudymova, 2016).

The purpose of the author's research is to study the existing system of recruitment and adaptation of personnel in the airline “Air Astana” to develop recommendations for improving human resource management and the activities of the airline's personnel department in this area. The object of the study is the human resource management of Air Astana. The subject of the study is the system of recruitment and adaptation of personnel. The objectives of this work are to study the theoretical and methodological foundations of personnel selection and adaptation, to study the system of personnel selection and adaptation in the company “Air Astana”, to develop measures aimed at improving the system of personnel adaptation and to predict the expected effect of the measures taken to improve the system of personnel selection and adaptation. By studying the regulatory documents, reports and regulations of the personnel department, personnel surveys, an analysis of the existing system of recruitment and adaptation of personnel, as well as the personnel policy, will be carried out.

The results of the study, as well as recommendations for improving the recruitment and adaptation system, according to the author, will be useful not only for the management of the personnel department and the airline “Air Astana”, but also for the heads of other organizations to improve human resource management.

The research is supervised by Dr. psych. I. Išmuhametovs.

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RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 87-88
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AIRLINES FLEET RENEWAL PLANNING

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Keywords: fleet renewal, environment, fleet planning model, pandemic, key performance indicators

Fleet renewal is a pressing issue for an airline striving to run its business efficiently (Carreira *et al.*, 2017). The reasons for the renewal of the aircraft fleet can be large financial costs for aircraft maintenance, which is associated with an insufficient level of provision of the aircraft with on-board diagnostics and monitoring of its technical condition (Bellamy III, 2019). Other important reasons may be that the aircraft does not comply with the standards of the International Civil Aviation Organization (ICAO) on the level of noise and environmental pollution by negative emissions, i.e., environmental aspect (ICAO, 2020).

All these and other reasons require planning for the renewal of the aircraft fleet. Existing fleet renewal planning models explain the principle of aircraft selection, from predicting demand, then calculating the required number of aircraft, and ending with the choice of an aircraft type (Dozic, Kalic, 2015). However, it should be noted that these models do not take into account critical situations that may arise, for example, during a pandemic, economic crisis and other unfavorable conditions for business (Bellamy III, 2020).

This study proposes improvements to existing fleet renewal models, taking into account the business impact of adverse factors such as a pandemic. The research will reveal the principle and possibilities of the anti-crisis model for choosing an aircraft fleet, as well as the necessary financial costs for its implementation, using case study for the selected airline. For the model improving, the necessary Key Performance Indicators (KPI) were identified, which are aimed at increasing the stability of the business in adverse conditions. (Yuga *et al.*, 2015).

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 89-90
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EXTENDING THE CHARTER AIRLINE BUSINESS MODEL WITH BOOKING SERVICES

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Keywords: Airlines, Booking, Check-in, IT Platform, Vertical Integration, Lateral Marketing

A business model describes the rationale of how an organization creates, delivers, and captures value (Osterwalder, 2010, p. 280). Charter business considered as a separate category of an airlines business where six informal categories generally recognized by aviation society (Frank Fichert, 2020). Charter Business determined as a model with secured cash flow provided by agreements with tour operators signed before each season. Current charter business models do not consider distribution channels. Opportunities emerged by the implementation of IT platforms dramatically change a landscape of the charter business model.

The main problem of charter carriers is to obtain profitable contracts with tour operators. Supply quite often exceeds marked demand. Therefore, this pushed charter market players to the high competition within B2B market. The issues of vertical integration and horizontal interlinkages seem to be the most challenging. Author considers this part as unutilized opportunity (Kotler P, 2003, p. 197). The author considers research relevant both from practical applicability of result for business (profit generation) and from the view of scientific exploration (developing of methodology).

Analysis takes necessity to disassemble the charter business in terms of its functioning. For that purpose - the methodology (decomposition) of *The Canvas Business Model* has been applied (Osterwalder, 2010, p. 280). Drilling down within this business model defines the role of the booking system. Based on *The Canvas Business model* - one of the most important specific of charter airline business model is that Revenue Stream (RS) is fully secured because of entire aircraft is always being sold. Therefore, B2C demand is equal to 100% for confirmed contracts within solid customer segment (CS). Where CS for even big charter airlines is short-listed. The research part is based both on an empirical approach (Eisend, 2019, p. 238) – a survey of charter business experts (six charter airlines of the Avia Solutions Group), and on statistical models using the Octave GNU modelling environment (gnu.org, 2020). The model represents airline industry Charter airline. As separate part of research – two options of booking system implementation for Charter Company have been analysed - “outsourcing” vs “in-house”.

Result of the study provides assessment of vertical integration for charter companies, supported by booking system. Giving a methodology for finding optimal relationships with B2B partners while maximizing own profit. All those leveraged by utilization of the new sales channels and generation of direct B2C products or services. Usage of lateral marketing combined with IT sophisticated techniques - shapes new B2C and even B2B products (as act of innovation process). Showing benefits of “in-house” approach for the booking within charter airline. Case study demonstrated the excellent forecasting ability of the statistical model coincident with empirical data, collected from the industry experts.

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

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*RESEARCH and TECHNOLOGY – STEP into the FUTURE, 2021, Vol. 16, No. 1, 91-92
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IMPROVEMENT OF THE PLANNING OF AIRCRAFT MAINTENANCE MANAGEMENT

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Keywords: Aviation, Planning, Maintenance, Modeling, MRO

In crises situations, airlines and Maintenance and Repair Organizations (MRO) significantly lose profits (Cooper *et. al.*, 2020) due to bankruptcy of airlines and the small number of orders for MRO, since most of aircrafts sit idle (Boeing, 2020). In addition, there are difficulties in ordering and receiving parts, which negatively affects both the MRO and the part manufacturers. Therefore, maintenance planning management should be taking into account the impact of negative factors.

To reduce the impact of negative factors on MRO, studies have been carried out and are being conducted, in which, firstly, the risks from the impact of negative factors on the continuity of the order supply chain should be analyzed more. Secondly, preventive maintenance of spare parts and assemblies to reduce the need for their replacement. Thirdly, finding alternative options for the purchases of spare parts or their processing (Yorkman, 2020).

The results of these studies led to the fact that MRO began urgently change the strategy and model of planning and maintenance management. For example, Lufthansa has adopted a strategy of leveraging the enforced ground time, in which expensive operations are postponed due to unnecessary, and fleet grounding procedures are performed first (Schauenburg, 2020).

However, the analysis of existing approaches and models shows that they are not flexible and effective enough in crisis situations.

This research proposes analysis of aviation industry during crises situations and bankruptcy avoidance proposals, as well as suggests improvements to existing planning and maintenance model that works better in stable economic environment. Such model has a constant dynamics of profit growth, and also protects MRO from a severe loss of finances and qualified personnel. Author will interview experts in this field to validate the proposed improvements to existing model.

The thesis uses a simplified planning and maintenance model called “receiving an order – issuing an aircraft”, executed in BPMN notation. An maintenance and repair organization is used as an example.

The results of the study is a workable and flexible structural model that will take the desired form of planning and maintenance management, depending on the world situation and taking into account external factors. In addition to, this model was unloaded and balanced the responsibilities of aircraft maintenance personnel using KPI performance indicators.

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