8th International Conference

INNOVATIVE (ECO-)TECHNOLOGY, ENTREPRENEURSHIP AND REGIONAL DEVELOPMENT (IECOTERD)

October 11, 2022

e-Book of Abstracts

KAUNAS
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Kaunas, 2022

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INTRODUCTION

Innovative (Eco-)Technology, Entrepreneurship and Regional Development (IECOTERD)

Advanced technologies are becoming more common in our daily lives, as a number of innovative solutions are applied in business, manufacturing and public sectors. Entrepreneurship fosters innovation, and as a result, new goods, services, and procedures are likely to emerge faster.

The fourth industrial revolution spread into all areas of industrial production. Furthermore, alongside with upcoming fifth industrial revolution, implementation of the principles for a sustainable circular economy requires a new attitude. Thus, the questions like how to make the economy sustainable? How to restore and regenerate the environment? How to turn environmental challenges into opportunities? How to foster innovation in regions? How to create future-focused business models? And similar issues need to be addressed.

The annual conference, for the eighth time, invites scholars, practitioners, and experts from Europe and all around the world to discuss the issues of technological innovations, eco-innovations and technology-based entrepreneurship as drivers for economic growth and social change in regions. Exclusive attention is paid to technological solutions and inter-organisational cooperation for sustainable regional development.
This event is organised by Kaunas University of Applied Sciences in collaboration with the Manufacturing Innovation Valley (Lithuania).

Major topics of the Conference include:

- advanced technologies, smart cities and regions (in line with economic, social, health and environmental transformations);
- (eco-) technological innovations (renewable energy, healthy nutrition, etc.) and change in a region;
- the good practice of technology-based entrepreneurship.

On behalf of the IECOTERD Scientific Committee
Irma Spūdytė

INNOVATIVE (ECO-)TECHNOLOGY, ENTREPRENEURSHIP AND REGIONAL DEVELOPMENT (IECOTERD) VIRTUAL CONFERENCE PROGRAMME

09.00–10.00 **REGISTRATION**

10.00–10.20 **Welcoming Address and Opening of the Conference**
Paulius Baltrušaitis, Director of Kaunas University of Applied Sciences, Lithuania

10.20–13.00 **Parallel Sessions**

13.00–13.30 **LUNCH**

13.30–14.00 **Innovative Collaboration in the Regional Development**
prof. dr. Volodymyr Rodchenko, V. N. Karazin Kharkiv National University, Ukraine

14.00–14.30 **LOW Code Development in Business: Why it's Important? Our Journey with Power Platform Technologies**
Nerijus Legis, Head of General Applications, FESTO Lithuania

14.30–15.00 **Translating Knowledge into Practice for Societal Impact**
dr. Vivek Sakhrani, Head of Applied Data Science, Atlas AI, USA

15.00–15.15 **COFFEE BREAK**

15.15–16.00 **FINAL SESSION**

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INNOVATIVE TECHNOLOGIES FOR COMPANY MARKETING PROCESS – FROM 4P TO 4E: CASE OF LEGO GROUP

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Abstract

Relevance of the presentation topic: The article is devoted to the experience of using the marketing mix 4E model. The focus of this marketing complex has been redirected from the product to solving the consumer's problem. Companies shifting from the 4Ps to the 4Es are the ones that will maintain or develop a competitive edge. In this regard, it is very important to study the experience of introducing this concept into the practice of companies: the problems, challenges, and successes of these organisations in applying new marketing methods are an essiantial source of knowledge and experience that will be interesting and useful for other companies. This aspect is important to the authors related to the LEGO GROUP – as a market representative focused on teaching children through play and expanding its capabilities as well as in the field of adult education.

Methodology: Authors focus on consideration of the 4P model and its transformation into a more appropriate modern business environment – 4Es. There are considered in detail the key characteristics of both models and the use of the latter in the practice of the LEGO GROUP.

Results: The LEGO brick is the most important product. The path of LEGO Group to the 4Es will be presented as follows: 1. Product becomes Experience. For LEGO Group the game process, building skills (creativity, technical, technological, communication, etc.) during the game and getting emotions are the main types of products provided by the company. 2. Place becomes Everyplace: the company develops online approaches to the game, uses multi-instrument approaches, opens special points where anybody can try different sets, and goes through virtual 3D tours. That is, LEGO becomes available everywhere and for new target groups. 3. Price becomes Exchange. Opening family-friendly workplaces from the company, the use of sustainable materials and packaging, the possibility of tours and games in factories and special points of the company allows payment and exchange for commitment, promotion, interest, etc. 4. Promotion becomes Evangelism. The company's use of the "children-smiles-sustainability-safety-care" approach, as well as children's pictures, bright colours and recognizable objects have long turned the usual promotion into a special approach. And the use of slogans such as "Everyone is awesome" and "Our future includes everyone" reinforces this approach.

Conclusions & practical implications: The authors systematised the LEGO GROUP approaches to the formation of social responsibility and sustainability policies based on organisational values and strategies. The main result of the work is the presenting the path of LEGO Group to the 4Es. Any component of the chosen marketing mix model should be the responsibility of the marketing department.

Keywords: marketing, marketing mix model, 4Ps of marketing, 4Es of marketing, LEGO SERIOUS PLAY methodology.

INTEGRATION OF SELF-ORGANIZING MAPS AND GREY WOLF OPTIMIZATION MODEL FOR PORTFOLIO DIVERSIFICATION

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Abstract

Relevance of the presentation topic: An analysis of the most popular traditional portfolio selection models shows that they give investors a theoretical probable result, but they do not always work well in practice. Because of the shortages in the models, scientists and investors continue to try to improve traditional models or look for alternatives. The way we propose is to combine the increasingly popular method of screening the equities by the Self-Organizing Maps (SOM) with the genetic optimization algorithms.

Methodology: In this research, we rely on screening the shares in the investment portfolio by the Self-Organizing Maps (SOM) and design the genetic optimization algorithm for determining optimal weights of the equities, allowing to get the highest return with minimal risk. The framework of this proposal can be split into three steps: 1. The initial selection of equities from stock exchanges. 2. The final stock portfolio equities screening. 3. Allocation of investment capital to portfolio shares.

Results: The performance of Grey Wolf Optimization (GWO) algorithm depends on the number of iterations, wolf-pack size and weight limits of stocks. The relevant estimation of these parameters have a high influence on investment outcomes. In the paper, we found the best values of these parameters and calculated the stock weight distributions to obtain max return, adequate risk level, and optimal risk-return portfolio. It was shown that a naive portfolio, when capital is divided equally among shares, does not meet the criteria of a profitable investment strategy. The advantages of the proposed method for portfolio formation were checked on actual data (S&P500, September 22, 2019 to December 20, 2019). We have noticed a 3.52% higher profitability than in case of direct investment to the S&P 500 index.

Conclusions & practical implications: When forming an investment portfolio, it is very important to evaluate its optimality using the Mean-Variance method. This allows us to achieve an optimal balance between the expected profit and the possible risk level. The research presents an innovative method for selecting stocks for a portfolio and optimizing it according to the Mean-Variance principle using the nature-inspired GWO algorithm. Our study confirmed the assumption that it is inefficient to consider a naive investment portfolio with equal capital allocation for all shares. The application of the GWO algorithm lets us increase the return and minimize the investment risk.

Keywords: Grey Wolf Optimization (GWO) algorithm, self-organizing maps (SOM), Portfolio diversification, Mean/Variance stock portfolio selection.

CROWDFUNDING INTEGRATION TO THE FINANCIAL LOAN MANAGEMENT MODEL

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Abstract

Relevance of the presentation topic: The lending and borrowing processes are common and efficient means for employing financial resources and supporting businesses and non-profit initiatives. However, a large number of cases of breaching loan contracts prevent many potential lenders from investing money and ensuring fundraising for emerging projects. The financing model of crowdfunding, based on complex information systems and financial technologies, opens new opportunities for reducing risks of collecting substantial financing for businesses and persons and supports their time management. The research explores the model and processes of crowdfunding and intelligent data analytics for managing crucial risks by collecting a sufficient number of lenders and reducing the time of collecting funds.

Methodology: The research is based on the analysis of financial data of the crowdfunding platform operating on an international basis for financing persons and companies in countries with further development of their economies and poverty index. The analysis is based on exploring and designing indicators with the highest power of observing, evaluating and providing insights for reducing financial risks of the crowdfunding platform. The experimental data of the Kiva crowdfunding platform (kiva.org) are used to substantiate the proposed model.

Results: The intelligent analysis enabled to reveal the weights and importance of the indicators characterising the borrowers representing different industries and various purposes of taking loans. The relationship between these characteristics and reducing risks of duration of the fund collection process, and forecasting the necessary number of lenders is explored and evaluated.

Conclusions & practical implications: The financial schemes of crowdfunding, their fundamental concepts and application to various industries are explored. The technologically advanced crowdfunding platforms, ensuring communication and deals among the lenders and the borrowers are analysed. The potential for reducing risks is evaluated by the scientific research overview and exploring experimental data of the crowdfunding platform. The proposed data-driven risk management is researched by intelligent analysis of experimental data.

Keywords: crowdfunding, crowdfunding platform, data-driven analysis, financial risk.

EVALUATION OF STUDENTS' FINANCIAL LITERACY KNOWLEDGE IN KAUNAS UAS

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Abstract

Relevance of the presentation topic: Financial literacy is one of the most important person's competencies in today's world. The quality of a person's life, well-being and financial security depends on the available financial literacy knowledge. Financial literacy is included in the programs of primary and secondary education schools in Lithuania. Therefore, Kaunas UAS students should have basic understanding of financial literacy. However, research shows that financial illiteracy is relatively high. So, the purpose of this study is to evaluate the financial literacy knowledge of Kaunas UAS students, determining the level of financial literacy.

Methodology: After the analysis of the scholarly articles, a questionnaire was created to assess the level of financial literacy of Kaunas UAS students according to the main areas: budgets, credits and debts, savings and investments, and financial responsibility. The questionnaire consisted of 37 questions. A targeted survey was conducted in 2022 May – June. 339 students of the I – IV year of the Faculties of Technology and Business were interviewed.

Results: The results of the Kaunas UAS student survey were processed using statistical methods. The following statistically significant results were obtained:

● Financial literacy is most dependent on savings-investment knowledge ($r=0.745$, $p<0.001$) and credit system knowledge ($r=0.608$, $p<0.001$).

● Financial literacy is less determined by responsible management of the budget ($r=0.524$, $p<0.001$) and financial responsibility ($r=0.567$, $p<0.001$).

● International Business students are the most knowledgeable about saving and investing, while Financial Technologies students are the least knowledgeable.

● Men are more knowledgeable about budget management issues than women ($r=-0.160$, $p=0.018$).

Conclusions & practical implications: The results of the Kaunas UAS students' survey showed that the financial literacy level of Kaunas UAS students is insufficient. Students' financial literacy depends mostly on the acquired knowledge of saving and investing, as well as knowledge of the credit system. Those who understand how to manage a budget, know how to save and invest. It was noticed that Kaunas UAS students lack knowledge about investing. Students of International Business are the most knowledgeable about saving and investing, while students of Financial Technology are the least knowledgeable. Lower financial literacy is determined by the students' ability to manage the budget and their financial responsibility. Knowledge of financial literacy should be improved in primary and secondary education schools' programs and higher education institutions.

Keywords: financial literacy, level of financial literacy.

RESEARCH OF METHODS FOR EVALUATION OF CULTURAL ORGANISATION AUDIENCE ENGAGEMENT

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Abstract

Relevance of the presentation topic: Cultural organisations apply a wide variety of online and offline tools for reaching their audience with the goal of increasing engagement. The lack of efficiency of methods and models proposed by managerial research for audience engagement (AE) motivated to explore data-driven quantitative analysis for this purpose. Q sort methodology creates an opportunity to systematically evaluate the subjective opinion of the audience by using qualitative and quantitative analysis and reveal the essential factors influencing audience engagement.

Methodology: The Q-sort methodology is applied to determine differences among the audience groups, to investigate which engagement tools and approaches are the most essential in the theatre, and to suggest the most suitable tools to influence engagement. The Q-sort methodology includes several major stages of the research: survey design by refining the statement database, collecting data by applying specific structured algorithms and constrained choice of options. The factor analysis and data-driven research is further applied. The statement database is built of primary and secondary sources resulting in a total number of 258 statements, addressing different aspects of engagement. The six categories of engagement tools are defined based on the research works. They include Daily media, Participatory engagement, Measures of experimenting with the environment, Cooperation and partnerships, Context expanding, and Virtual tools. Types of audience engagement: active, passive, and creating. The refined and validated survey consists of 48 statements, and was fully completed by 40 respondents from May 13 to June 14, 2021. The survey data was processed according to the Q-sort methodology.

Results: The Q sort methodology can be applied by cultural organisations to customise their effort and manage a variety of tools of audience engagement, as it combines qualitative surveying of the audience with the quantitative evaluation of the output data and detecting unique features of the audience segments for understanding their response to the engagement tools. The experimental analysis and data-driven discovery of audience segments enabled them to determine the essential tools for engagement designed by the theatre for addressing different audience groups and making an impact to the passive, active and creating modes of engagement.

Conclusions & practical implications: Five factors were defined during the factor analysis of processing the output of Q-sort survey data. They were used to denote five particular segments of the audience, to characterise their specific features, and to reveal differences in their response to the engagement tools of the theatre organisations. The analysis of the statements identified a new category of audience engagement tools, which was not revealed by either the theoretical analysis or the previous study of the tools – tools to promote social interaction.

Keywords: audience engagement, audience engagement tools, cultural organisations, Q-sort methodology, factor analysis.

AUTOMATION TECHNOLOGIES IN ESCAPE ROOM INDUSTRY

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Abstract

Relevance of the presentation topic: The term industrial automation always steps with three main areas for automation: factory, process, and building. Factory automation deals with robots, conveyors, automated machines, and moving hydraulic, pneumatic, and electric drives that make mechanical equipment move. Process automation comes with reactors, mixers, valves and control of technological processes. Building automation includes lighting, ventilation and conditioning tasks in building facilities. The entertainment industry is also being automated, with one of the most exciting fields – the escape room industry. The escape room industry has experienced steady growth during the last 8 years all over the globe.

Methodology: The escape room industry includes the same sensing, and control technologies as in industrial automation. The need for sensors, actuators, and lighting control is apparent. While factory, process and building automation has its own standards for communication, control, software and hardware, the escape room industry follows its path toward control. There is no unified hardware for control tasks. Market analysis shows a wide usage of 'black box' control units with custom-made PCB control boards with widely used microcontrollers, Arduino boards, and Raspberry Pi microcomputers. A majority of escape room control boards include a 12VDC power supply, flexible I/Os, PWM or servo outputs. Unique control feature is sound and video control capabilities that require an SD card, sound, video modules in hardware. Lithuania's escape room industry is also evolving very fast. Installed control hardware is also custom-made, and the complexity of the board is unique. It includes PWM outputs, RFID inputs, RS485 communication modules and sound control modules.

Results: A special control system was designed and implemented for different complexity games. It included 15 custom made unified control boards. All boards communicate with master board using standard RS-485 interface in master-slave mode via customized 40 bytes data transfer protocol with CRC. 16-bit microcontroller PIC24FV32KA304 implemented in every board. Board consists of MP3 and RS485 modules, 2 x relay outputs, 2 x 12V 0,5A outputs, 16 x GPIO 5V, 16 x 12V PWM outputs, 2 x encoder inputs, 12V sound amplifier module, and a microphone analogue input. Control boards are used to manage many unique games and puzzles with simple push buttons, RFID readers, PIR, Hall sensors and voice, interactive video and lighting control.

Conclusions & practical implications: Escape room industry uses custom-made control boards due to a lower price compared to industrial controllers and unique sound and video control requirements. Although sensor and actuator techniques are similar to industrial automation, programming software, the language is different.

Keywords: escape room, automation, microcontroller.

THE EVALUATION CRITERIA OF E-SHOPS

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Abstract

Relevance of the presentation topic: The website's platform receives much attention from developers and users. During the global pandemic, the popularity of e-shops increased significantly. The e-shops do not have a uniform model for evaluation. Therefore, many criteria do not allow for an objective assessment. The paper aims to verify the e-commerce evaluation model, determining the hierarchy of evaluation criteria for e-shops.

Methodology: The report presents semi-structured interview data conducted in 2022. The Analytic Hierarchy Process (AHP) methodology is used in the reserach, as it aims to identify the critival evaluation criteria for the website (e-shops). Web development experts who created and edited websites participated in the interview.

Results: The most important evaluation criterion for the e-shops is the interest compatibility of the website development and users. On the other hand, the decision of website visitors to continue browsing and to visit the website again are also important aspects of evaluation.

Conclusions & practical implications: When evaluating e-shops, it is necessary to provide an integrated evaluation model based on the user's first impression, user retention and willingness to visit again.

Keywords: website, e-shop, evaluation criteria, communication.

CONCEPTUAL ASPECTS OF ENSURING THE ECONOMIC SECURITY OF SMALL AND MEDIUM-SIZED BUSINESSES

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Abstract

Relevance of the presentation topic: In recent years, business entities have been exposed to the continuous crushing impact of socio-economic threats. The coronavirus pandemic, which has dominated the world over the past two years, has dealt a merciless blow to the stability of the functioning of economic entities in Ukraine. Armed aggression and the conduct of active hostilities on the territory of the country have become a new, larger-scale threat to Ukraine at the current stage. The current state of small and medium-sized businesses is analyzed. It is established that today the restoration of business and ensuring its stable development are hindered by the threat of destruction of enterprises and the inability to ensure the safe work of personnel, the lack of a sufficient number of solvent customers, limited financial capital and in general the unpredictability of further development of the situation in Ukraine. Taking into account the growing new threats and risks to the stable functioning of small and medium-sized businesses, it is proved that today the formation of conceptual provisions for ensuring the economic security of subjects in this sphere is of crucial importance, taking into account transformational changes in the business environment of their development.

Methodology: Analysis of the current state of small and medium-sized businesses in the context of increasing challenges to their functioning environment.

Results: The small and medium-sized business sector is not ready for new turbulent fluctuations, and is in a tough state today. As a result of active hostilities, a significant number of enterprises were destroyed, while others almost stopped working or were forced to relocate their businesses to safer regions. According to the business survey data for 25.05-10.06.2022, 19% of subjects were forced to relocate. Only 33.4% of respondents point to gradual adaptation to work in war conditions and implementation of their development strategies by new realities. Along with this, there was also a negative trend of staff reduction (about 20% of employees of the surveyed enterprises were dismissed, including due to involvement in the ranks of the armed forces of Ukraine), downtime (20%) and optimising labour costs (27% work on terms of wage cuts).

Conclusions & practical implications: Thus, a new test for Ukraine, which led to increased socio-economic instability and market turbulence in the business environment, was armed aggression and active military operations on the country's territory. The current state of small and medium-sized businesses is analyzed, and it is established that today the restoration of business and ensuring its stable development are hindered by the threat of destruction of enterprises and the inability to ensure the safe work of personnel, the lack of a sufficient number of solvent customers, limited financial capital and in general the unpredictability of further development of the situation in Ukraine.

Keywords: conceptual provisions, economic security, small and medium-sized businesses.

MANAGERIAL FACTORS OF INTER-ORGANIZATIONAL SUSTAINABLE COOPERATION

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Abstract

Relevance of the presentation topic: In a dynamic and competitive environment, in the face of ecological challenges, achieving sustainable development in the region requires long-term, consistent and sustainable cooperation of organizations from various fields. Only by focusing and strategically focused cooperation can we achieve the sustainable development goals and provide innovative solutions to overcome challenges.

Methodology: Review of scientific literature.

Results: Inter-organizational sustainable cooperation is a long-term process that leads organizations towards the formation of a culture of sharing. It is also an approach to the use of resources that provides opportunities to rethink operational methods - how to achieve more significant benefits than acting alone. Inter-organizational cooperation is characterized by shared values among cooperating participants. During sustainable cooperation, a synergistic effect is obtained, competitive advantages are strengthened, risks are shared and learning from participating organizations is also created, as well as benefits are created not only for the organizations participating in the process, but also for the environment and society.

Conclusions & practical implications: Inter-organizational sustainable cooperation can be considered a part of the management philosophy, which must be supported between the organizations participating in the cooperation process. Sustainable inter-organizational cooperation creates a win-win scenario, promoting co-creation. The main managerial factors of inter-organizational sustainable cooperation are the alignment of values and goals, the sharing of resources and knowledge, and the creation of benefits by overcoming the challenges of a dynamic environment.

Keywords: sustainable cooperation, inter-organizational, managerial factors.

BETWEEN FAST AND SUSTAINABLE FASHION: THE ATTITUDE OF YOUNG LITHUANIAN DESIGNERS TO THE CIRCULAR ECONOMY

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Abstract

Relevance of the presentation topic: The textile and fashion industry is the second industry (after aviation) that pollutes the planet the most and uses natural and human resources excessively and irresponsibly. Fast fashion has a negative effect on the environment. Fast fashion means low quality, low price, constantly updated range and high consumption of natural resources and chemicals. Today, we are witnessing a shift from a fast and unsustainable fashion to a sustainable and circular economy. Representatives of the fashion industries pay more attention to corporate social responsibility, business ethics and the implementation of the principles of the circular economy, the technological transition from linear production to the circular economy. The relevance of the research is related not only to the fact that changes in the fashion industry are essential but also to the understanding that changes depend on the fashion industry developers, in particular young fashion designers.

Methodology: Scientific literature analysis, qualitative research using a semi-structured interview method, qualitative content analysis.

Results: The analysis has shown that the move of the textile and fashion industries towards a circular economy is a rather complex process, requiring knowledge, significant financial investment in technological change, and greater purchasing power of the consumer in the production based on the circular economy. In addition, new brands in the fashion industry do not always have sufficient information to start a business in the fashion industry from the circular economy. A qualitative study conducted in Lithuania using the interview method showed that young Lithuanian fashion designers are very optimistic about fashion sustainability solutions, seeking to link their developing fashion brand with sustainability. Still, their efforts are more occasional rather than consistent. As designers state, they lack the profound knowledge and adequate funding to create a brand in a circular economy. To sum up, it can be stated that young fashion designers strive for sustainable fashion brand, but their contribution to the circular economy is limited.

Conclusions & practical implications: For the fashion and textile industries to become sustainable, it is necessary to ensure the entire product life cycle change, from agriculture to the secondary use (recycle) of the manufactured product. For small participants in the fashion industry, it is not easy to implement, as it requires reviewing the product value chain, searching for new suppliers, creating dignified conditions for employees, managing the sales process, and analyzing the possibilities of secondary use of the product.

Keywords: fast fashion, sustainable fashion, slow fashion.

EMPLOYEES' INVOLVEMENT IN HEALTH CARE AND REHABILITATION SERVICE QUALITY MANAGEMENT

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Abstract

Relevance of the presentation topic: Managing and improving the quality of health services and rehabilitation are becoming increasingly important for improving the quality of life in an aging society. International conferences on health services and rehabilitation discuss the need to examine the quality of health services in a broad sense to understand how the values of a healthcare organisation motivate employees to engage in quality assurance and how the consumer evaluates the outcome. The research aims to determine the dependence of the quality of health care and rehabilitation services in Lithuania on the values of the organisation and their impact on employees' involvement.

Methodology: The sampling method was applied to research consumer opinion about the quality of rehabilitation in Lithuania. The questionnaire was developed using adapted and validated scales of employees' engagement, service quality, and values. During the research, 405 filled questionnaires were received. Reliability analysis showed 0.955 Cronbach Alpha of 47 items. SPSS 28 programme was applied for the data analysis.

Results: Research results revealed that Lithuanian consumers associate the quality of the performed service with the values of an organisation. Even more, research results indicated that the curtain organisation's values impact employees' engagement and perceived service quality of healthcare and rehabilitation in Lithuania.

Conclusions & practical implications: Research results filled the gap in empirical knowledge lack about health care and rehabilitation service quality in Lithuania. Adapted and validated questionnaires could be used in separate health care and rehabilitation organisations to measure their consumers' perception of service quality and its dependence on employees' engagement and organisational values.

Keywords: consumer behavior, organisation values, quality of service, hospitality, rehabilitation.

PICTURE OF WORLD LITHUANIAN IN THE STORIES CREATED BY THE LRT LITUANICA CHANNEL

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Abstract

Relevance of the presentation topic: This presentation analyses the historical narrative presented on the LRT LITUANICA channel about (e)migrants with Lithuanian roots from the First World War to the present day. Theoretical research uses the concept of identity, the background of migration, influenced by the laws of "push" and "attraction", the concept of media, the specifics of media framing and the definition of storytelling. The analytical research consists of content analysis (publication text and channel as a tool), document analysis methods to identify Lithuanian image, registered in 2020 in the "Istorijos" ("Stories") rubric of the LRT LITUANICA portal. Since 2020, LRT LITUANICA has been changing the technological principle of operation, in recent years going on an intensive dialogue with Lithuanians from over the world. This provision is included in the LRT channel strategy and the Lithuania state progress strategy activities and implementation, therefore it is important to find out the content of the channel in period of change. The research identified forms of perception and explanation of the world's Lithuanian national identity, and prepared personal and family histories covering the 20th and 21st centuries.

Methodology: Media content analysis, document analysis.

Results: By analysing the content of the "Istorijos" ("Stories") rubric of the LRT LITUANICA channel and the documents of the Republic of Lithuania and LRT, the goal was to reveal the image of Lithuanians in the world. The results were obtained according to the following logical components/sections: LRT LITUANICA dissemination environment, LRT LITUANICA media content: topics, genres specifics, storytelling in the contexts of economic principles of "pull" and "push" and identities from personal practice. After studying the specifics of the LRT LITUANICA channel's activities and analysing the documents, it was found that the image of a Lithuanian in the world presented on this media platform is based on retellings of stories from other channels and this channel was merged into the LRT channel package to strengthen communication with the Lithuanians of the world by responding to the national broadcaster's strategy in the country.

Conclusions & practical implications: After analysing the contents (publications) of the LRT LITUANICA rubric "Istorijos" ("Stories"), it was found that the stories are framed by revealing real historical events and economic laws that dictated the waves and directions of Lithuanian migration. The expression of identity is carried out through family and personal experiences. The heroes take on different roles and identify the nurturing of the native language and country's traditions as the main factor for maintaining and strengthening identity. These roles are grouped into the images of economic migrant, world seeker, intellectual, entrepreneur, love migrant and historical hero. These frame pictures can be helpful for the country in inviting Lithuanians to return home and integrate into the regional labour market, strengthening the concept of mixed families.

Keywords: Lithuanian of the world, identity, LRT LITUANICA, media, storytelling.

GREEN, ENVIRONMENTAL OR ECO MARKETING?

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Abstract

Relevance of the presentation topic: When using various categories, it is easy to lose the proper definition and understanding. A category is a symbol or set of symbols which should draw a particular picture in the knowledge of everyone who receives the message. There is nothing special in the managerial categories of marketing. It is possible to get some significant misunderstandings while using them to transmit a desired message to the target audience through marketing communication. The perception of green, environmental and eco marketing by young people is analysed in this research.

Methodology: The object of the research is the perception of green, environmental and eco marketing. The main goal of the research is to identify the categories of green, environmental and eco-marketing as perceived by young people. The objectives of the research: 1) To reveal the theoretical understanding of the categories analysed; 2) To describe what kind of understanding young people put into the categories green, environmental and eco-marketing; 3) To prepare the recommendations for the marketing message formulation using categories green, environmental and eco marketing. A special questionnaire has been developed for the research.

Results: The theoretical background of green, environmental and eco marketing categories was presented. In addition, empirical research on the perception of the categories was carried out. Finally, the recommendations for the marketing message formulation using categories green, environmental and eco marketing were proposed.

Conclusions & practical implications: Young people's perception of green, environmental and eco marketing categories are different in comparison to the scientific definitions. Marketers should pay more attention to the analysis of the target audience, in particular its different perceptions, in order to create an effective message.

Keywords: green, environmental and eco marketing.

THE ROLE OF SOCIAL ACCOUNTABILITY IN THE SUSTAINABLE DEVELOPMENT OF ORGANISATIONS

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Abstract

Relevance of the presentation topic: The aim is to investigate the role of social accountability in order to provide objective information on the organisation's practical sustainable development activities to achieve the goals set out in the UN Agenda 2030. Issues under consideration: (1) to analyse the documents, regulating social accountability; (2) to reveal usefulness of social reporting to the organisation; (3) to present the results of the social reporting study of Lithuanian Universities of Applied Sciences (UAS), the members of the UN network.

Methodology: Analysis of legal documents and scientific publications; the research of social reports by implementing quantitative methods: grouping of social information, analysis of content scope and structure, and data generalisation in an MS Excel spreadsheet.

Results: The legal documents regulating social accountability in Lithuania and EU were analysed. The significance of social accountability for organisation itself and for external partners was revealed. The research of the social reports of three Lithuanian state UAS (Kaunas, Panevėžys, Vilnius) was performed.

Conclusions & practical implications: Social accountability is less regulated than financial, and there is a lack of uniform methodology in social reporting and a lack of research on social accountability and reporting in Lithuanian organisations. The research of the social reports of three Lithuanian state UAS identified the differences in titles, scope, logic and form of information presentation. It is complicated to compare the information of different organisations. But despite the differences, the social reports show strategic positions of the organisations and describe their practical activities and achievements in implementing sustainable development goals and principles.
Identification of the current situation of social accountability and reporting in Lithuanian state UAS; the results can be used for comparing sustainable development practices among different organisations, and also for further improvement of sustainability reports.

Keywords: social accountability, social report, sustainable development.

DEVELOPING EMPOWERED SUSTAINABLE COMMUNITIES: GREEN LIFESTYLE, CULTURAL HERITAGE & ECONOMY

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Abstract

*Relevance of the presentation topic: A*ccording to the UN 2030 Global Goals for Sustainable Development, the priority of the EU Strategic Agenda 2019-2024 is "to build a climate-neutral, green, fair and social Europe". However, climate change and cultural heritage are interconnected. Moreover, sustainability is one of the five pillars of the Framework for Action on Cultural Heritage, highlighting its potential to enhance social capital, boost economic growth and ensure environmental sustainability. Although the issue of sustainability is the focus of many researchers, the context of sustainable community development is insufficiently coordinated, especially in European countries.

Methodology: Analysis of scientific sources, questionnaire survey, descriptive statistical analysis (percentage distribution, mean, min, max), t-test, variance analysis, regression analysis, needs analysis. 705 respondents from Lithuania, Ireland, Turkey, Italy, Spain and Greece took part in the needs analysis survey.

Results: The paper identifies the needs to empower communities to become more sustainable while integrating interrelated aspects of “Green LifeStyle, Cultural Heritage & Economy”. The article presents the theoretical research and survey results.

Conclusions & practical implications: The survey shows that people are involved in some green activity in their lives, and respondents are linked to focus on preserving different types of culture. However, people lack time, financial resources and entrepreneurial skills to be involved more actively in these activities. Therefore, there should be more research in the field conducted in order to solve the mentioned issues related to developing sustainable communities, combining all the interrelated aspects of green lifestyle, cultural heritage and economy.

Keywords: green lifestyle, cultural heritage, sustainable communities, economy.

A COMPARATIVE STUDY OF DIFFERENT SOLAR PHOTOVOLTAICS TECHNOLOGIES

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Abstract

Relevance of the presentation topic: As the consumption of electricity resources increases and resource costs grow, the challenge of energy security, supply reliability and energy poverty are inevitable in Lithuania as in the rest of the world. Moreover, as can be seen from the events of the last months in Eastern Europe, the price of energy is becoming one of the main reasons for influence to achieve geopolitical goals. In case of high costs of energy resources or lack of energy, the country's industries and households face difficulties in production, services, logistics, and other limitations. For these reasons, alternative methods of energy supply are being sought, one of them being solar energy. However, to assess the suitability of different technologies, it is important to carry out energy production efficiency studies.

Methodology: To evaluate the efficiency of different solar modules, three solar panels - two of them mono facial and one bifacial were used for the research. Solar panels were installed in Lithuania, in the city of Kaunas, on the roof of a building, oriented in the southwest direction. During the research, parameters were summarized and compared at different time intervals - current strength, voltage, power, temperature, and the efficiency of produced electricity were compared. To find out the dependence between different parameters, statistical methods are used.

Results: The research identifies that all the analyzed solar modules rarely reach the nominal generated power. The highest electrical parameters are generated on sunny days and characterized by a lower temperature day. It was also noticed that when there is a slight cloudiness, the amount of electricity produced is significantly reduced. When comparing monofacial solar panels with bifacial solar panels, it was found that bifacial solar power plants produce more electricity but do not reach the total values of two mono facial panels.

Conclusions & practical implications: The study presents that the efficiency of solar power plants is mostly determined by direct solar radiation. To compare different solar modules, a bifacial solar panel produces slightly more electricity compared to a monofacial monocrystalline solar panel.

Keywords: renewable energy, bifacial solar panels, climate change.

THE POTENTIAL AND POSSIBILITIES OF THE USE OF BIOWASTE IN ENERGY: THE CASE OF LITHUANIA

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Abstract

Relevance of the presentation topic: Lithuania's energy position strongly depends on imports. The use of fossil fuels still dominates in the country compared to all energy resources consumed. As a result, CO2 emissions increase. To solve these problems, plant and animal waste generated in agriculture and forestry waste can be used to produce bioenergy. This study aims to make an overview of the domestic potential and possibilities using biowaste for energy production in Lithuania.

Methodology: The methodology is based on methods of statistical analysis, interpretation and relevant comparisons of selected indicators. The data cover the period from 1990 to 2020. Statistical data from Eurostat, and Statistics Lithuania was used. Applied research methods: Statistical data analysis, induction and deduction, and interpretation.

Results: Lithuania has been energy dependent on imported energy since the restoration of independence – the level of dependence on imports of energy resources was 75%, and it was well above the EU-27 average (57%). The contribution of renewable energy resources to Lithuanian energy is increasing. In Lithuania, bioenergy is the primary source of renewable energy. In gross inland energy consumption, bioenergy amounted to 89.5% of all renewable energy resources and 19.2% of all energy resources in 2020. In Lithuania, firewood and wood waste are traditionally used as the leading carriers of bioenergy. The development of other types of biomass for energy began in 2002 with the introduction of agricultural waste for energy production and the production of biogas from wastewater sludge. Lithuanian agriculture generates about 10 million tonnes (2020) of biomass from plant and animal waste, which can be used to develop bioenergy. The amount of agricultural plant residues in the country is on an upward trend, while the amount of animal waste is declining. Most of the agricultural waste is consumed by the farms themselves, and the rest is sold or transferred to other consumers, including biogas producers.

Conclusions & practical implications: The findings indicate that the share of energy produced from biological waste in Lithuania is small but has grown rapidly in the last decade. The country has great potential to develop bioenergy from biowaste generated throughout the food supply chain. Biowaste should be used for energy production only when there are no alternatives to use it for the production of higher added-value products.

Keywords: biowaste, energy, renewable energy.

SIMULATION OF TECHNOLOGICAL PROCESSES AND TECHNICAL EQUIPMENT IN INDUSTRIAL AUTOMATION

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Abstract

Relevance of the presentation topic: Industrial automation deals with complex systematic project design and integration in different technological processes. The most important part of it is building a control program for a programmable logic controller, industrial PC, programmable automation or motion controller. Prior to the implementation of the algorithm into the equipment operation phase, automation engineers have to prepare fault-free program code. This determines the commissioning time. However, the diversity of equipment and control technologies leads to challenges in this area. Simulation of technological processes and technical equipment allows the creation of a simplified digital twin of controlled systems and test algorithms.

Methodology: Industrial-based programmable devices use programming software to implement control algorithms. The software depends on device manufacture as programming methodology is similar or the same corresponding IEC61131-3 standard. Almost every software allows stimulating program logic without real hardware allowing access controller digital or analogue I/O and memory. However, a programmer has to interact with simulation as s/he needs to activate required input or memory bits, etc. This requires enormous concentration, knowledge on controlled equipment, also it's time-consuming. On the other hand, programming software is not suitable for creating objects that could react like real-life devices. The market offers various software for building simulated objects that react to controller program actions. Simulink® PLC Coder lets users generate hardware-independent IEC 61131-3 structured text and ladder diagrams, and together with Simulink models and Matlab functions test models of complex systems. It supports widely used IDEs, including 3S-Smart Software CODESYS, Rockwell Automation® Studio 5000, Siemens® TIA Portal, and OMRON® Sysmac® Studio. Factory IO allows the creation of a virtual factory using a library of industrial parts, including sensors, conveyors, elevators, sorting stations and control objects with Allen-Bradley, Schneider, Siemens, CODESYS software build programs. Controlled scenes have 3D objects and sound effects. PLC-Lab allows the creation of simplified digital twin. While building virtual system objects can be assigned with different physical properties, which influence the behaviour during simulation (gravity, magnetic feature, material density, surface friction, elasticity).

Results: Factory IO and PLC-Lab virtual objects were tested with PLC programs created using Siemens TIA portal V15. The first application included the testing of algorithms for goods sorting conveyor control system, second - test of control program for wood industry equipment with pneumatic drives. Simulink PLC Coder was tested with Festo Codesys build PLC program to control electrical drives.

Conclusions & practical implications: Tests on the above-mentioned software showed great opportunities to create own virtual controlled object or system. They can be used for PLC training aims and higher education studies.

Keywords: digital twin, PLC, training, testing.

PECULIARITIES OF THE APPLICATION OF ENERGY EFFICIENT DATA COMMUNICATION TECHNOLOGIES

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Abstract

Relevance of the presentation topic: The European Commission's priorities for 2019-2024 include the European Green Deal, the digital future, an economy that works for people, and the the promotion and strengthening of European democracy. Although the optical fiber infrastructure is sufficiently developed in Lithuania, the majority of the Internet users receive its traffic via copper wire cables (especially in private homes). Only 7 internet service providers offer the optical access technology out of 133 registered in Lithuania; there is no regulation of energy efficiency for data communications equipment. There is no regulation of energy efficiency for data communications equipment. The goal of the research is to compare the amount of electricity consumed to transmit 1 bit of information in varying scale local area networks that use copper cable and optical cable technologies as well as provide recommendations to network developers.

Methodology: The research employed the method of mathematical calculations, which used the data provided in the technical specifications of the IT equipment. Various local optical access structures, which can be created while meeting the requirements of telecommunication standards, have been analysed. Electric power options from renewable energy sources were proposed; the energy efficiency of each was calculated, and a comparison was made.

Results: During the research, it was found that at a distance of 10 km using optical technologies energy efficiency reached 3pJ/bit, while using conventional technologies, energy efficiency is no less than a few thousand pJ/bit. This result is achieved by replacing copper cables-based network elements with optical elements that do not require energy such as splitters or passive multiplexers/demultiplexers. Combining optical technologies with green energy technologies improves the energy efficiency by less than 2 pJ/bit.

Conclusions & practical implications: Network energy efficiency significantly depends on data transmission technologies. Given distances are up to 100 metres, data transfer energy efficiency is less dependent on the used technology. Optical access advantages become apparent in suburbs and rural areas.

Keywords: fibre-optic communication, green energy, power supply efficiency.

INFLUENCE OF CO_2 LASER PARAMETERS ON PLYWOOD DESIGNED FOR THE ADVERTISING PRODUCTS

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Abstract

Relevance of the presentation topic: CO_2 gas lasers are widely used in the processing of various materials and in the production of advertising products. Their principle of operation is based on the effect of a concentrated laser beam, which destroys the surface structure of the material. Carbonisation process occurs in the course of wood engraving. Colour changes are influenced by the type of wood and its thickness, as well as by the speed of laser movement, power, and energy flow density. Thus, the aim of this study was to analyse the influence of technological parameters (speed and power) of CO_2 laser exposure on the surface morphology and colour of birch plywood and to identify the correlation between ΔE and Ra parameters, using the spectrophotometric comparative analysis of surface colour tones and three-dimensional (3D) measurement method of morphology.

Methodology: The computer-generated image was prepared with Adobe Illustrator and imported into the RDWorks V8 computer programme interfaced with the Bodor BCL-MU CO_2 laser (a beam wavelength of 10.6 µm and an engraving speed 0-60000 mm/min), which was used for engraving the test objects. For the analysis of changes in colour tones measurements were made with a spectrophotometer X-RITE I1 PRO. The quality of the structural properties of the plywood was evaluated with a Motic SMZ-171 optical microscope using an Invenio 5SII camera. The 3D optical system MicroCAD Lite was used capturing the surface morphology, which worked in conjunction with the ODSCADGFM 3D measurement and analysis software. The camera scanned the surface relief of the specimen and took 3D pictures. The obtained measurement results were processed using the Microsoft Excel programme.

Results: An image was obtained on plywood, after the creation of an image by Adobe Illustrator and performing an engraving process, altering the power and speed of the laser. After measurement of the colour change ΔE, it was observed that the obtained differences of the colours of produced samples by the laser speed of 600 mm/s and 100% power (600V), speeds of 200 mm/s (200V) and 240mm/s with 20% power (240V) were insignificant and fell within the limits of $\Delta E < 3$ according to the ISO standard. Based on the obtained results, the surface roughness was investigated and close values of the roughness indicators Ra and Rz were determined.

Conclusions & practical implications: The conducted study showed that applying the combinations of technological laser parameters of 600V and 240V samples, average ΔE values with minimal difference in morphological properties were obtained. The minimum change in roughness is proportional to the minimum change in colour tone. Thus it can be stated that the power change was the most significant in terms of the economic efficiency of the process. It has been found that the 240V power is cost-efficient to achieve harmony between the colour of the surface and its roughness.

Keywords: gas CO_2 laser, engraving, glued plywood, ΔE colour change, surface morphology, roughness.

APPLICATION OF THE MYCELIUM PANEL IN THE PRODUCTION OF INTERIOR PRODUCTS AND FURNITURE

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Abstract

Relevance of the presentation topic: As the human population increases and natural resources are rapidly depleting, sustainable and renewable alternatives to existing, traditional materials are being sought after. One proposed solution to this challenge is to work with biological materials. One of these materials is mycelium-based biocomposites (MBCs), which are gaining increasing attention due to their lightweight, compostable and regenerative properties, and unique texture. MBC can become one of the materials for creating interior elements and furniture. Using natural materials is a principle of biophilic design that seeks to restore the connection between nature and people in homes, hospitals, and public buildings. This improves a person's psychological well-being. The purpose of the study is to find out the application possibilities of the MBC panel in the production of interior elements and furniture. The study aims to promote the introduction of sustainable materials (MBC) in the furniture industry, integrating new materials into new product development.

Methodology: The research was based on publications and studies of foreign scientists. An experimental evaluation was performed: the adhesive properties of the MBC panel were tested according to the LST EN ISO 4624:2016 standard; A test was carried out with the MBC board, its resistance to cold liquids has been examined, according to LST EN 12720:2009+A1:2014; Compression and bending test of mycelium biocomposite until disintegration.

Results: The study showed that the adhesive properties of MBC boards are not acceptable when PVA glue is used. A better adhesive bond occurs when an adhesive with a hardener is used, in contrast, the best results were obtained when the polyurethane adhesive PUR was used during the test because Se this adhesive adapts to the surface of the MBC board, fills the micro-gaps of the surface and thus creates a larger area of adhesive contact and therefore a stronger adhesive bond is obtained. MBC panels are not resistant to cold liquids. MBC panels require specific mechanical processing.

Conclusions & practical implications: Based on the results of the research, mycelium-based composite has potential to replace conventional materials in interior and furniture production. One of the advantages of MBC composite is that its organic substrate, non-toxic, inexpensive and recyclable. It is easy to form plates and other shapes with unique textures.

Keywords: mycelium-based composites (MBC), biophilic design, eco-design, furniture, biomaterials, adhesion, product design engineering.

STUDY OF THE METHODS FOR TESTING THE QUALITY OF PRINTS USING SPECTROPHOTOMETRIC AND ABRASION RESISTANCE ANALYSIS

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Abstract

Relevance of the presentation topic: The use of printed products has a wide range of environmental conditions in which rubbing between physical products occurs. There are specific requirements for high-quality prints. One of the criteria is the adhesion of the ink to the surface of the material and intact ink layer. The study aims to analyse the influence of ink layer adhesion of prints, im particular their optical properties and to determine an appropriate methodology for the research applying an abrasion resistance test and a comparative spectrophotometric analysis of colour tones.

Methodology: To investigate the adhesion of the ink layer or its mechanical effect of resistance, special equipment is required to rub, measure and record changes in the print quality of the surface of selected samples compared to the original print sample. Equipment and measures required: samples of the offset print produced with Komori Lithrone LSX 629 + C hybrid printing machine with UV inks on the Metallized cardboard 300 g / m2 surface, a linear reciprocal flat rub tester KJ-8310 with a flat abrasion head, and a spectrophotometer eXact 2Plus to record changes in the optical properties of the print. Prior to carrying out measurements, it is necessary to select an appropriate research methodology and evaluation criteria to properly determine results. One of the criteria describing the quality of the impact of interaction on optical properties of the print is resistance to abrasion/rubbing or mechanical effect. The identification of the analysis data requires application of the international standards governing the limits of deviations of the data obtained – ISO/TS 15311-1:2020, ISO 18947-1:2021, ISO/TS 23031:2020, ISO 13655:2017, ISO/CIE 11664-4:2019, ISO/CIE 11664-6:2022.

Results: The resistance of the offset printing inks to abrasion depends on a number of various factors which are not directly related to rubbing or any mechanical effect, including paper properties, type of ink, printing technique, drying, etc. In this study, the above-listed factors are important in determining the quality of the prints. After the test, the specimen was evaluated for degree of degradation by visual assessment and by measuring the change in gloss, optical density, and colorimetry using spectrophotometer. For the selected samples, the factors affecting the course of the study were determined as follows: the format of the print cut, drying time, the necessary number of samples, rubbing time, speed, rubbing direction, ballast weight, a force equivalent.

Conclusions & practical implications: The results of the spectrophotometric and abrasion resistance analysis of the offset print with UV inks on the metalized surface indicate certain changes in quality. The test shall report parameters, conditions, results according to ISO 18947-1:2021 recommendations.

Keywords: rub resistance, offset printing, optical properties.

STUDIES OF CHIA SEEDS IN YOGHURT AS A STABILISER

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Abstract

Relevance of the presentation topic: Yoghurt is a healthy dairy fermented food. As consumers demand healthier and more nutritious yoghurt, a wide range of substances have been used to enrich the product. Chia seeds have been reported to contain abundant phenolic compounds, dietary fibre and are a potential functional food additive. The aim of this study was to investigate the influence of chia seeds on the rheological and technological properties of yoghurt.

Methodology: Viscosity measurements were obtained using a Fungilab viscometer with a No 3 spindle rotating at 150-180 rpm. The sample temperature was 20 °C. Moisture was determined by KERN MLB 50-3 moisture analyser. The pH of all yoghurt samples was determined using a pH metre Extech ExStik. The whey separation of yoghurts was determined by a centrifugal acceleration test. Each yoghurt sample (30 g) was transferred to 50 mL capacity centrifuge tubes and centrifuged at 3390×g for 15 min at 20 °C. The quantity of supernatant separated from the tubes was recorded. The weight fraction of the liquid supernatant was used to calculate the whey separation (%) of the yoghourts.

Results: Studies have shown that a higher content of dry matter was found in yoghurt with chia seeds – 20.869%, and in yoghurt without additives – 14.11%. Initially, the pH of yoghurt was 4.6 pH, yet after storing it for a while, the pH began to decrease, whereas in yoghurt with chia seeds, the pH decreased more slowly. Viscosity studies of yoghurts have shown that yoghurt with chia seeds had a higher viscosity than regular yoghurt because chia seeds improved yoghurt viscosity, syneresis, and water retention. During storage, the viscosity of yoghurt with chia seeds ranged from 21846.68 cP to 19148.26 cP. The viscosity of plain yoghurt without additives increased from 10711.08 cP during storage to 20379.33 cP.

Conclusions & practical implications: Results clearly show that enrichment of yoghurt with chia seed enhances antioxidant activity and improves the rheological and technological characteristics.

Keywords: chia seeds, yoghurt, viscosity, whey separation.

NUTRITIONAL PROPERTIES OF PIGEON MEAT

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Abstract

Relevance of the presentation topic: There has been a growing interest in meat from alternative animal species like deer, ostriches, and pigeons. Pigeon meat is considered a delicacy and is gaining popularity among consumers in Europe, mainly in Great Britain, France, and Italy, as well as in the United States and China. However, knowledge concerning the chemical composition and nutritional value of this meat is very limited. The aim of the study was to evaluate the nutritional value of three types of squab pigeon meat.

Methodology: For research, squab pigeons were used: Texaneria (TEX), Sportiniai (SPORT) and Kingai (KING). To determine nutritional value, specific parameters were measured: the moisture content was determined by the ISO 1442:1997 method, the lipid content by ISO 1443:1973, the protein content by ISO 937:1978, and the ash content by ISO 936:1998. The energy value was also measured with a C200 colorimeter and the cooking losses were measured directly.

Results: KING pigeons contained the highest protein, fat, ash and moisture values compared to other pigeon breeds. As the moisture content of KING pigeons was the highest, their cooking losses were the highest, accordingly. The nutritional values of TEX and SPORT pigeons were statistically similar. The results obtained show that pigeons have a high nutritional value and occupy an intermediate position between poultry meat and turkey meat compared to literature sources.

Conclusions & practical implications: In conclusion, pigeon meat is characterized by high nutritional value. We recommend the KING breeds as nutritionally important.

Keywords: pigeon meat, nutrition value, proteins, lipids, ash, energy value, cooking losses.

DETERMINATION OF THE QUALITY OF FRUIT AND VEGETABLE PASTILLES

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Abstract

Relevance of the presentation topic: Traditional Lithuanian apple pastille candies (an alternative to traditional apple/fruit-berry cheese) is a confectionary product containing a high amount of sugar which is unhealthy for children. To provide an alternative, the aim is to produce pastilles from raw materials such as fruit, berries and vegetables, with apples as the main ingredients. The choice of raw material is critical, in terms of the final product's consistency, taste and appearance, respectively. The aim of this study is to evaluate the organoleptic characteristics of different pastilles when produced with and without sugar.

Methodology: The moisture content is determined by drying the sample at 102 °C to constant weight in a Venticell oven. The ash content is determined by firing the sample in a muffle furnace at 550 °C for two hours. Water activity is determined using an automatic Rotronic device. The hardness of pastilles is determined with the Universal LS1 Series Metek Test Machine. The pieces of pastilles used for the study were identical, 3 cm long, 3 cm wide and approximately 1,5 cm thick.

Results: It is important to determine the moisture content of the fruit pastilles as it affects some characteristics, including appearance, taste and texture. It also affects the shelf-life of the product. The overall moisture content from the dried fruit pastilles' samples ranges from 10% up to 25%. The water activity determines the ratio between the free water molecules and the water molecules bound to the nutrients. Due to the presence of free water molecules, microorganisms propagation results in food spoilage. The water activity is measured, corresponding to the water activity of dried fruit. For the ash content determination, the samples were heated in a muffle furnace at 550 °C, where water and other volatiles evaporate, and organic compounds are oxidised in the presence of oxygen to the oxidation products CO2 and N2. The ash content of the samples varies between 1% and 3%. The hardness of the product and chewing force were determined with a texture analyser.

Conclusions & practical implications: The varieties of fruit pastilles were characterised by low moisture content, water activity and ash content. Most of the fruit pastilles were not very hard, i. e. they were easy to chew and therefore had good sensory qualities.

Keywords: fruit pastilles, moisture content, ash content, water activity, hardness.

TECHNOLOGICAL INNOVATIONS IN FOOD PRODUCTION

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Abstract

Relevance of the presentation topic: Successful innovation is based on the active promotion of innovation to consumers throughout the food chain, as well as on the active involvement of end-users in research and development activities. Product development can lead to healthier and more sustainable choices. At present, healthy and high-quality food is no longer an issue. In particular, reducing salt, sugar, trans fat, MSG intake can be an important part of food preparation, as well as the right choice of foods, such as quinoa, amaranth grain, peas, beans, chickpeas, lentils, kidney beans, soya beans, durum, wholemeal and other noodles. Avocados are beneficial for health and can be substituted with: peanut butter, ricotta, hummus, banana, or mashed soya beans. Today, it is common to consume yoghurt with beetroot, carrots or avocado, chips with roasted broccoli, pea protein, and cashew nut drinks. Unhealthy ingredients in baked goods can be perfectly replaced: wheat flour with wholemeal flour, butter with avocados and bananas, refined sugar with maple syrup, and eggs with chia seeds. Food can already be prepared in smart kitchens. Technological innovations such as decorating principles and tools, Himalayan salt ingots, printers, molecular gastronomy, dry ice, liquid nitrogen and lab-grown meat are also being applied. In the near future, insect-based protein bars and many other foods may become part of many people's daily diets.
Innovation must also be accompanied by decisive action to reduce food waste. Preventing and reducing food waste is a shared responsibility of all actors in the food chain.

Methodology: An online survey was conducted in March 2022. The aim of the survey was to find out people's attitudes towards reducing food waste, as the production of plant-based foods usually requires only some parts of the vegetable or fruit. In constrast, the rest is waste, although it can still be used to produce a wide variety of quality dishes. The questionnaire consisted of general questions related to age, gender, lifestyle, food waste, etc.

Results: It was found that fruit and vegetables account for the largest amount of food waste, followed by dairy products. When it comes to fruit and vegetables, people often do not know whether a certain part of them is safe to eat or how to prepare it. It is, therefore, clear that there is still a need to find new ways to produce waste-free products.

Conclusions & practical implications: It can therefore be concluded that there is a method to produce waste-free products, to develop new food production technologies instead of throwing away the edible parts of vegetables. Yet, if food discard is unavoidable, the best solution is to compost it.

Keywords: healthy food, high-quality food, technological innovation, food waste, waste-free products.

USE OF JERUSALEM ARTICHOKE AS NON-TRADITIONAL RAW MATERIAL IN PRODUCTION OF ETHYL ALCOHOL

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Abstract

Relevance of the presentation topic: Jerusalem artichoke is a valuable plant due to the content of inulin. It is known that inulin is fermented by yeast and ethanol is produced during fermentation. The aim of this work is to determine the yield and quality of ethyl alcohol produced from Jerusalem artichokes and to compare it with the quality of alcohol from other plant raw materials (fruit and berries).
Jerusalem artichoke can be used for ethanol production as it contains 11–20% (w/w) carbohydrate of which 70–90% is inulin. Inulin, a fructan-type polysaccharide, consists of (2 → 1) linked β-D-fructosyl residues (n = 2–60), usually with a (1 ↔ 2) α-D-glucose end group. Inulin as feedstock for ethanol production is more advantageous than conventional material, such as starch.

Methodology: Jerusalem artichokes were chopped and treated with pectolytic enzymes Distizym (Erbslöh, Germany), and the obtained mass was fermented with Saccharomyces Cerevisiae Spiriferm (Erbslöh, Germany) yeast at 23-25 °C. Other plant-origin raw materials were fermented under identical conditions. Ethanol content after fermentation was determined using official OIV methods (OIV, 2016). Fermented mash was distilled and the yield of ethyl alcohol was calculated. The content of methanol, esters, aldehydes, and higher alcohols in the distillate was determined by the gas chromatography method (Commission Regulation (EC) No 2870/2000, III. Determination of volatile substances and methanol of spirit drinks). A comparative analysis was performed to determine the composition of Jerusalem artichoke, berry and fruit distillates.

Results: During the study, the yield of ethyl alcohol from Jerusalem artichokes was determined. 10 kg of Jerusalem artichokes yields 0.98 l a.a. The qualitative composition of ethanol from Jerusalem artichoke, black currant, chokeberry, rhubarb, apple, raspberry distillate was also compared. It was found that the Jerusalem artichoke distillate had a relatively higher methanol concentration (362,95±58,07 g/hl a. a.), a lower aldehyde concentration (21,43±4,07 g/hl a. a.), and a slightly higher ethanol concentration (90,15±18,93). The quantity of higher alcohols in all samples was similar.

Conclusions & practical implications: Research shows that Jerusalem artichoke tubers can be an excellent feedstock from other plant raw materials (fruit and berries).

Keywords: ethanol, fermentation, inulin, Jerusalem artichoke, methanol, volatile compounds.

THE EFFECT OF FOOD AND ITS COLOUR ON EMOTIONAL STATE

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Abstract

Relevance of the presentation topic: Physical and mental health are determined by biochemical processes in the human body. These processes are influenced by food. Food and its colours play an important role in regulating the emotional state. Good mood is supported by food that contains essential nutrients and helps a person to feel healthier and happier. Scientists try to determine how certain food colours affect emotional state.

Methodology: Analysis, synthesis, generalisation of scientific literature and questionnaire survey.

Results: Colour is not only a human sense of sight but also a strong factor influencing human health, mood and appetite. Food colours have a strong psychological effect. They can stimulate emotions, inspire new works, reduce tension, etc. Red is the most appetite-stimulating colour, it creates positive and energetic feelings, yet it is not recommended for weight loss. Yellow-toned dishes help establish relationships and communicate, stimulate creativity, improve memory and strengthen mental powers. Orange colour helps support positive emotions, promotes optimism and can boost mood of tired people. White food suppresses negative emotions, helps get rid of depressing memories, and gives courage to make changes. Green is the colour of health and green-colored food has a calming effect, relaxes, stimulates mental activity, and doesn't cause aggression. Blue is the least appetising of all dominant colours. It doesn't occur in many natural products, so the human body doesn't have an automatic appetite response to the blue colour. It should be noted that the colour of the serving dishes also affects the sense of taste and emotional state. Red, yellow and orange serving dishes increase the appetite because they stimulate the release of gastric juice. White serving dishes help control the feeling of fullness and blue suppress appetite. The results of the research: 67.4% of respondents indicated that colours influence their emotional state; 69.5% of the respondents rated green colour food as the healthiest; the colour red makes appetising 41% of respondents, green - 25.7%, yellow - 15.4%, orange - 12.8%; black (40%), brown (26.6%), blue (22.2%) and grey (6.6%) are the most unappetizing colours.

Conclusions & practical implications: Food and its colours create a particular atmosphere which can be affected both positively and negatively. It can stimulate the feeling of hunger (red, orange, yellow) or suppress appetite (black, blue, brown, purple). In order to maintain a balance of physical health and psychological factors, it is important to realise that a variety of coloured foods are needed in the daily diet.

Keywords: food, colours, appetite, emotional state.

AWARENESS OF QUALITY LABELS AS INDICATORS OF PRODUCT EQUITY IN LITHUANIA

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Abstract

Relevance of the presentation topic: To achieve a healthier society and promote culture of eating, a wider discussion about quality labels which help distinguish valuable to consumer food products, arises around the world. Considering the abundance and changes of these quality labels, as well as various means of communication applied to the consumer, the aim of this study is to determine the change in the level of awareness of quality labels in Lithuania and the direction of its communication.

Methodology: Survey methods of quantitative research and comparative analysis have been used. A quantitative survey has been conducted in order to find out do Lithuanian consumers recognize quality labels of food products and then the results by years have been compared to monitor how this recognition changes.

Results: The results showed that even though food companies invest into making their products qualitative and mark their product packaging with quality labels as indicators of equity, consumers do not recognize many quality labels or do not pay much attention to them while making purchasing decisions.

Conclusions & practical implications: Better communication about quality labels, their meaning and equity should be adapted as consumers are not fully and relevantly aware about product marking in the food industry. Awareness and knowledge of quality labels might change consumer's buying habits and lead to a higher quality lifestyle.

Keywords: awareness, consumer, food product quality, quality labels.

POSSIBILITIES OF USING RAINWATER IN LITHUANIAN FARMS

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Abstract

Relevance of the presentation topic: As the climate changes and dry periods become more frequent, farms experience losses more and more often, especially during spring sowing and active plant growth. Rainwater harvesting for agricultural purposes is becoming an increasingly relevant research object of studies conducted by scientists worldwide. The correct use of these resources makes it possible to restore damaged aquatic ecosystems, especially overexploited aquifers, and to mitigate global climate change. In Lithuania, these systems did not attract farmers' interest for a long time; farms could use underground and surface water resources with little restrictions. However, due to changes in the legal regulation of surface and underground water use, as hydrological droughts become more frequent, farms start looking for alternative engineering solutions.

Methodology: This article discusses the theoretical possibility of collecting rainwater in Lithuanian farms, the main methods of rainwater collection, the efficiency of its use and its consequences for agriculture and the environment.

Results: There is no information on the general uptake of rainwater harvesting as this is installed at the household level. In Lithuania, farms use a primitive rainwater harvesting technology. Rainwater is collected from the rooftop into the tanks and used to meet the needs of the farm: for irrigation, spraying, washing of equipment, etc.

Conclusions & practical implications: Rational use of rainwater collected on farms is an economically perspective activity, as it reduces the need for groundwater, saves surface river waters which often cannot be used for irrigation during the dry season due to environmental discharge requirements, and does not use energy resources to bring water from distant water sources. Also, eliminating or reducing surface runoff reduces contamination of surface water with pesticides, solid particles, metals and fertilizers. The dominant factor in assessing the economic benefits of rainwater harvesting systems is reduced water and energy costs, as well as mitigated environmental damage. Rainwater harvesting has great potential in many European countries for providing non-potable water to farms, but this requires additional measures, e.g. state regulation, and support.

Keywords: rainwater harvesting systems, water use in agriculture.

BIOGAS PRODUCTION FROM ANAEROBIC DIGESTION OF MACROALGAE AND CATTLE MANURE

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Abstract

Relevance of the presentation topic: Macroalgae are gaining increasing interest as a feedstock for bioenergy and biofuels, as algae are a favorable and potentially sustainable source of biomass for bioenergy production. Swamping water bodies is an indicator of intensifying pollution. Thus, ways are being sought to solve problems related to the use of excess biomass accumulated in water bodies. Macroalgae can be a favorable and potentially sustainable source of biomass for obtaining bioenergy, and their collection and use for bioenergy production can reduce biomass growth in natural water bodies, which causes increasing problems for both aquatic life and humans. The aim of the research was to determine whether macroalgae can be considered as a useful source of biomass for biogas production together with local agricultural biological waste - cattle manure.

Methodology: The research was carried out in the course of an international scientific project "Research of methanogenesis of aquatic plant biomass in order to obtain an alternative source of energy-fuel biogas in a three-stage bioreactor". The project is financed by the Lithuanian Science Council, project Financing Agreement No. S-LU-22 and the Ministry of Education and Science of Ukraine. An anaerobic reactor with a volume of 4.6 L was used to conduct studies on the quantitative and qualitative composition of biogas. Biomass heating and mixing systems are integrated in the reactor. During the research, the temperature of the substrate was kept at 37±1°C, which is suitable for the reproduction of methanogenic bacteria. The bioreactor was loaded with different ratios of macroalgae growing in water bodies and cattle manure. The biogas yield was determined by the volume method, the biogas composition using the GFM 410 biogas composition analyzer.

Results: After conducting research, it was found that the highest biogas yield was obtained by mixing macroalgae with cattle manure. When cattle manure was mixed with macroalgae in a ratio of 84%:16% by dry weight, the highest biogas yield was 1150 ml/d. When mixing in a ratio of 50%:50%, the maximum biogas yield reached 950 ml/d. The lowest biogas yields were determined when cattle manure and macroalgae were digested separately. The highest average concentration of methane – 70% – was found when a mixture of cattle manure and macroalgae was treated anaerobically at 50%:50% by dry mass.

Conclusions & practical implications: The studies have shown that a substrate consisting of a mixture of aquatic plants and cattle manure increases the yield of biogas almost two times, and the methane concentration reaches an average of 70%.

Keywords: biogas, macroalgae, aquatic plants, bioreactor, cattle manure.

STUDY OF DIVERSITY OF GARDEN PLANTS

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Abstract

Relevance of the presentation topic: In the rural regions of Lithuania, orchards and berry orchards occupy an area of about 30,000 ha of agricultural land. In 2020, 27,519 ha of orchards and vegetable gardens were cultivated in family farms. According to the data of the Lithuanian Statistics Department, the decline of traditional garden plants is noticeable, with the expansion of the cultivation of rarer plants. Currently, walnut trees and garden blueberries are more often grown in homestead gardens. The genus and species composition of plants in Lithuania is assessed by the Lithuanian Statistics Department, but no more detailed studies related to the diversity of garden plants in rural regions have been conducted.

Methodology: The study was conducted in 2022, during which the genus and species composition, age of plants and assortment of varieties of plants grown in homesteads in different regions of Lithuania were analysed.

Results: Evaluating the variety of garden plant species in the investigated municipal homestead gardens, it was found that the most abundant ones are grown in the municipalities of Ignalina and Ukmergė. The smallest variety of garden plant species was recorded in the homestead gardens of the Šakiai municipality, where apple trees, pear trees and currant bushes are mostly grown. Apple trees are grown in all the studied orchards of residents of the municipalities, whereas pear trees are not grown in the Molėtai and Mažeikiai homesteads. Actinidia and quince are rarely grown in gardens. When evaluating the diversity of plants in different municipalities, it was found that 9 types of garden plants are grown in Ignalina municipality with the largest variety of plants, and only 3 types are more often grown in the farmers' gardens of the Šakiai district municipality.

Conclusions & practical implications: Lithuanian homestead gardens mostly include apple trees with seed rootstocks, old apple varieties prevail. Cultivation of apple trees with dwarf vegetative rootstocks is not prospective due to complex care. Other rare garden plants are abundantly cultivated in gardens: walnut trees, mulberry trees, actinidia, viburnum, blueberries.

Keywords: garden plants, genus, species, variety, assessment.

ASSESSMENT OF THE CONDITION OF WOODY PLANTS IN THE RUDAMINA MANOR PARK OF LAZDIJAI DISTRICT

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Abstract

Relevance of the presentation topic: From 2019 to 2022 the condition of woody plants of the Rudamina manor park was analysed to assess the change of 12 trees, including small-leaved linden (Tilia cordata), common oak (Quercus robur), red birch (Betula pendula), common maple (Acer platanoides), common pine (Pinus sylvestris), common ash (Fraxinus excelsior), wood pear (Pyrus pyraster), common spruce (Picea abies), common hornbeam (Carpinus betulus), blind (Salix caprea), black elder (Sambucus nigra) common holly (Ulmus laevis)), 7 species introduced (common chestnut (Aeculus hippocastanum), maple (Acer pseudoplatanus), linden (Tilia platyphyllos), rowan (Sorbus intermedia), larch (Larix decidua), spruce (Picea pungens), Canadian poplar (Populus canadensis)), and one variety (Salix alba Phytosanitary status of woody plants Tristis). As the study shows, diseases and pests were not very common, except a constant abundance of the resistant chestnut candelabra (Cameraria ohridella), whose damage reached up to 4 points. The most common leaf diseases in the park are oak powdery mildew (caused by Microsphaera alphitoides) and maple tar spot (caused by Rhytisma acerinum).

Methodology: Condition indicators like the intensity of diseases, abundance of pests, damage to tree trunks are assessed on a five-point scale. Pathogens were identified visually and by isolation of pure fungal cultures using wet chambers and identified by microscopy and using descriptors.

Results: Based on the study carried out in the above mentioned period, it can be stated that favourable meteorological conditions in the summer of 2019-2022 had a positive effect on the plants, their vegetation and state.

Conclusions & practical implications: 1. The results of the study indicate that the phyto sanitary condition of the plants in Rudamina Manor Park was satisfactory. 2. During the entire study period, there was a constant abundance of the persistent chestnut candelabra (Cameraria ohridella), the damage of which reached up to 4 points. The abundance and species of other pests vary. 3. The most common leaf diseases in the park are oak powdery mildew (caused by Microsphaera alphitoides) which damage ranges from 2 to 4 points, maple tar spot (caused by Rhytisma acerinum) from 2 to 3 points. Every year, the leaves of small-leaved lindens are covered with a mycelium of saprotrophic fungi which damage ranges from 1 to 5 points. 4. As the climate conditions change, the prevalence and species of pathogenic organisms that influence the condition of the plants in Rudamina Manor Park also change. Long-term studies of plant pathogens and pests are needed to assess their impact on plants.

Keywords: woody plants, park, meteorological conditions, assessment.

CREATION OF SPATIAL DATA SETS FOR THE IMPLEMENTATION OF LIPIN PROJECT ACTIVITIES

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Abstract

Relevance of the presentation topic: Based on the use of satellite data, it is important to create a system that will allow farmers to obtain the necessary information at minimal cost and maximally promptly, and thus reduce costs by using agrotechnical and agrochemical means, solving the quality problems of grasslands.

Methodology: During the research, an analysis of scientific literature was carried out, a methodology of geodetic measurements was prepared, land ownership plans were prepared, and a GIS specification and classifiers were developed for the analysis of spatial data.

Results: During the research, geodetic measurements were carried out using the global positioning system and a survey of the accuracy of geodetic measurements was carried out. The spatial object specification "Management of Lithuanian Grass Fodder Base Using Satellite Data and Agricultural Science Innovations" (LIPIN) defines the structure of spatial data sets, attribute information, types and formats of attribute fields, general principles of spatial information management, classifiers that are used to fill attribute fields. Land use plans are prepared in DWG format. Land use plans show land use boundaries, terrain, sampling points (with coordinates in the state coordinate system), georeferenced cadastral data located in or near the land use, other important spatial objects and elements. Land use plans were prepared in accordance with the technical requirements regulation GKTR 2.11.03:2014 "Set of topographic spatial objects and contractual signs of topographic spatial objects". For data management and analysis with spatial data, the dataset is prepared in SHAPE format. Classifiers are developed to describe standard data.

Conclusions & practical implications: During the research, geodetic measurements were carried out using the global positioning system. A study of the accuracy of geodetic measurements was conducted. Land ownership plans have been prepared in accordance with the technical regulations of geodesy and cartography. Digital terrain models were created. An outline of sampling points has been drawn up. Specific contractual signs were made separately. Specifications that meet the standards for GIS analysis of spatial datasets have been developed.

Keywords: geodetic measurements, specification, classifier, spatial data sets.

DRIVING AND ROAD CONDITIONS MONITORING TECHNIQUES

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Abstract

Relevance of the presentation topic: Transport is an integral part of our lives. Every year, traffic is becoming more congested due to the increasing number of vehicles, the presence of new cars on the roads and the use of bicycles. Despite increasing car safety, a large number of people are killed on the roads. The condition of the road surface and the management of traffic flows strongly influences these accidents. The article presents the latest technical solutions whose integration into the transport system can dramatically reduce the number of fatalities and congestion on the roads.

Methodology: A systematic literature search was conducted, and new techniques of driving and road condition monitoring techniques and measurement methods are collected in one place, which allows us to compare different approaches to make the road transportation safer.

Results: The review of different techniques allows the selection of the most effective way to collect and process the driving condition data in real time.

Conclusions & practical implications: The new techniques, such as wireless and mobile IoT sensors can be a very economical approach to use for driving and road condition monitoring within stationary sensors. The possibility to use a personal car as a mobile measurement unit and data processing center can be the next trend in driving and road condition monitoring which allows us to measure the condition in the right place at the exact time.

Keywords: IoT, measurement, road condition, traffic monitoring.

POSSIBILITIES AND QUALITY OF DETERMINING THE COORDINATES OF ENGINEERING OBJECTS BY GPS RTK MEASUREMENTS UNDER VARIOUS CONDITIONS

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Abstract

Relevance of the presentation topic: Construction planning and management activities use technologies related to various combinations of spatial data, from which significant results are obtained about the object under study. Geodetic measurements determine the geographical location of structures, roads and other engineering objects. Analysing and evaluating new and existing engineering equipment, performing monitoring of important linear engineering objects, etc. The aim is to ensure maximum accuracy and to collect complete data.

Methodology: One of the most necessary stages of construction is the geodetic marking of the building (engineering systems). With the expansion of the network of GPS reference stations, the range of measurement systems, the number of GPS satellites, etc., the possibilities to obtain optimal results accuracy, especially in challenging measurement conditions, increase. In practice, the RTK (real-time kinematic) method is most often used, applying the LitPOS RTKNet service of the state GPS reference station network. GPS RTK measurements in urban areas are usually performed under challenging conditions. Coordination of points under different geographical and measurement conditions was performed and the possibilities of measurement quality were analysed. GPS RTK measurements were performed in good (open areas with good visual horizon, absence of leaves on the trees and favourable weather conditions), real and difficult conditions (in or near forest land and under trees; in an urban area, between buildings; in hilly terrain, between rocks; in the area affected by high voltage, etc.).

Results: It was found that the largest discrepancies of coordinated points are recorded in intensively built-up and forested areas.

Conclusions & practical implications: It was found that the largest discrepancies of coordinated points are recorded in intensively built-up and forested areas. It's recommended to apply an individual solution in each situation, depending on the type of measurements and the capabilities of the GPS receiver.

Keywords: Global Positioning Systems (GPS), Real-time Kinematic Positioning (RTK), accuracy of GPS measurements.

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