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**MARKETING DEVELOPMENT OF A UNIVERSITY'S ECOSYSTEM
AS AN EFFECTIVE NETWORK PLATFORM**

Marketing development of a university ecosystem as an effective network platform the knowledge-based economy places universities at the forefront of social and economic development. However, traditional university operational models often fail to address the challenges posed by rapid technological changes, globalization, and the post-COVID world. This study examines the concept of universities as network platforms integrating educational, scientific, and socio-economic activities. It highlights the significance of marketing strategies, particularly the 4P model (Product, Price, Place, Promotion), in fostering the sustainable development of university ecosystems. The objective of this article is to elucidate the role of university ecosystems in the modern knowledge economy and to demonstrate innovative approaches to their development using the Kyiv National University of Technologies and Design (KNUTD) as a case study. The methodology includes literature review, empirical research on post-COVID rehabilitation via the REHUB COVID educational platform, and the integration of international best practices. The study emphasizes the importance of digital innovations, partnerships, and the advancement of human capital as critical components of university ecosystems. The implementation of the REHUB COVID project resulted in the creation of an integrated platform for physical, psychological, and social rehabilitation, facilitating the adaptation of students and staff to new realities. The research concludes that universities that actively adopt marketing strategies not only enhance their competitiveness but also amplify their societal impact, contributing to sustainable development.

Keywords: *university ecosystem; marketing strategies; 4P model; post-COVID rehabilitation; digital transformation; sustainable development; innovative technologies.*

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**МАРКЕТИНГОВИЙ РОЗВИТОК ЕКОСИСТЕМИ УНІВЕРСИТЕТУ
ЯК ЕФЕКТИВНОЇ МЕРЕЖЕВОЇ ПЛАТФОРМИ**

У статті розглянуто концепцію розвитку екосистеми університету як мережевої платформи, що інтегрує освітню, наукову та соціально-економічну діяльність. Обґрунтовано, що розвиток маркетингової екосистеми університету як ефективною мережевою платформою, засноваої на знаннях, визначає університети центрами суспільного й економічного розвитку. Встановлено що традиційні моделі функціонування університетів часто не відповідають сучасним викликам, зокрема технологічним змінам, глобалізації та постковідним викликам. У дослідженні проаналізовано роль маркетингових стратегій, таких як модель 4P (Product, Price, Place, Promotion), у розвитку університетських екосистем. Висвітлено роль університетських екосистем у сучасній економіці знань та проаналізовано інноваційні підходи до їхнього розвитку, на прикладі Київського національного університету технологій та дизайну (КНУТД). Методологія базувалась на емпіричних дослідженнях постковідної реабілітації через освітню платформу REHUB COVID, на основі використання міжнародного досвіду. В статті зацентровано увагу на

важливості цифрових інновацій, партнерств і розвитку людського капіталу в умовах сучасних викликів. За результатами дослідження доведено, що університети, які активно впроваджують маркетингові стратегії, здатні не лише підвищувати свою конкурентоспроможність, а й посилювати свій соціальний вплив, сприяючи сталому розвитку.

Ключові слова: університетська екосистема; маркетингові стратегії; модель 4P; постковідна реабілітація; цифрова трансформація; сталий розвиток; інноваційні технології.

Problem Statement. In the world of today, the knowledge-based economy has become a key driver of social and economic development, with universities playing a central role in this economy shaping. However, traditional models of the operations held in universities often fall short in effectively meeting the needs of modern society. Rapid technological changes, globalization, and the challenges of the Post-COVID world necessitate a transformation of universities' functions and infrastructure. The main issue lies in the fact that most universities do not fully utilize their potential as network platforms capable of integrating educational, research, and socio-economic activities. The lack of clear marketing strategies for developing ecosystems within the universities limits their competitiveness impact on society and capacity for innovation. Additionally, universities facing the task of adapting to new challenges, ensuring access to quality education through digital platforms; integrating innovations into educational and research processes; developing recreational programs to support the physical and mental well-being of members of the academic community inclusively.

This raises the next question: *how can universities become effective network platforms that ensure sustainable development through a marketing approach to managing their ecosystems?* This problem solving requires a comprehensive analysis and specific tools to be developed for effectively integrating marketing strategies into the development of the universities ecosystems.

The aim of the article is to explain the role of ecosystems in Universities as network platforms in today's knowledge-based economy. Using KNUITD as an example, it could be demonstrated how innovative solutions can support post-COVID recovery and sustainable development.

Literature Review on the Problem. Ecosystem of an university is a complex, interconnected system that includes students, teaching staff, researchers, administration, business partners, and the public authorities and their representatives, all interacting within the university's physical, social, and digital infrastructure. This system aims to create, disseminate, and apply knowledge to support the university's educational, scientific, and socio-economic activities. This is a generalized definition that aligns with the modern understanding of the term "university ecosystem" in academic and applied literature. This definition has been formulated based on an analysis of scholarly and applied works by leading researchers.

Bernard Clark describes universities as dynamic organizations that integrate academic, social, and economic aspects to fulfill their mission [1]. Henry Etzkowitz and Loet Leydesdorff view universities as a vital component of the «Triple Helix» model, which unites universities, businesses, and governments to create innovative ecosystems [2]. Gregory Vogel, Sarah Reichert, and Herbert David emphasize the role of universities as integrated systems that foster partnerships with various stakeholders [3].

The key elements of a university ecosystem are its main components that ensure its effective functioning and development. These include: infrastructure, human capital, and partnerships, each playing an essential role in creating a sustainable and innovative environment.

The main results. The university infrastructure is a fundamental component that enables the implementation of educational, research, and social functions. It comprises physical infrastructure

facilities (campuses, laboratories, research centers, and libraries) and digital infrastructure (online learning platforms, cloud services for data storage and sharing, software and analytics tools, artificial intelligence technologies). Infrastructure provides the foundation for all processes within the university ecosystem, fostering integration among students, teaching staff, researchers, and partners.

Human capital is the key driver of a university ecosystem's development. This encompasses the participants who create, utilize, and disseminate knowledge. Students are the primary consumers of educational services and active contributors to research and social projects. They bring fresh ideas to academic and innovative activities. Another critical element of human capital is teaching staff and researchers, who develop and implement new scientific knowledge and teaching methods, as well as conduct research. Results of this research support the growth of the knowledge-based economy.

Administrative staff manage resources and ensure the efficient operation of the university ecosystem. The development of human capital depends on the quality of education, opportunities for professional growth, and engagement in interdisciplinary initiatives.

University partnerships with external organizations are a crucial factor in its development, facilitating collaboration with businesses, interaction with government bodies, and engagement with international partners. Collaboration with businesses often occurs through joint projects (research, technology development) and by providing practical training and employment opportunities for students.

Interaction with the government happens through participation in shaping public policies in education and science, primarily through participation in grant competitions and securing funding for research projects.

International partners engagement occurs within the framework of international collaboration, academic mobility projects, knowledge exchange, and participation in global initiatives. International partnerships strengthen the university's connections with society and facilitate integration into the global knowledge ecosystem.

Thus, we define the key elements of a university ecosystem as the following: infrastructure, human capital, and partnerships—are interconnected, forming a comprehensive environment for learning, research, and innovation. Their effective interaction ensures the sustainable development of the university, enhances its competitiveness, and reinforces its role in the modern knowledge-based economy.

The successful functioning of any system, particularly in today's dynamic knowledge-based economy, relies on high-quality and innovative management. University ecosystems, which integrate diverse elements, from students and staff to business and government partners, require a strategic approach that effectively combines resources, fosters innovation, and adapts to changes in the external environment.

Innovative management in this context involves not only the implementation of advanced technologies and organizational methods but also the development of strategies that respond to contemporary challenges and opportunities. One of the key tools in such management is marketing activity, which enables the university to effectively position itself in the market of educational and research services, attract resources, and create added value for society.

Marketing activities serve as a pivotal instrument for strategic management, helping universities enhance their visibility in educational and scientific markets, secure resources, and contribute to social development.

Through marketing strategies, universities can build their reputation, attract new students and partners, and respond effectively to the constantly changing demands of the market. As

complex systems involving multiple stakeholders, university's ecosystems require clear marketing approaches that integrate educational, research, and social dimensions.

There are well-known marketing approaches that universities have successfully used to achieve sustainability and innovation in their development. Let's explore the key ones:

1. Digital Marketing and Social Media Presence. Universities utilize digital platforms such as social media, content marketing, and e-mail campaigns to promote their educational programs and events. This enables effective interaction with younger audiences and strengthens the university's reputation [4].

2. Partnerships with Businesses and Industries. Collaborating with businesses helps create market-oriented educational programs and supports employment of the graduates. Universities become centers of innovation, combining theoretical academic knowledge with practical experience [5].

3. Focus on Internationalization. Attracting international students through scholarships, exchange programs, and participation in global rankings fosters multicultural campuses that integrate students into the global community [6].

4. Innovative Educational Services. The introduction of new educational products, such as interdisciplinary programs, short-term courses, and digital platforms, keeps universities relevant to students and job market needs [7].

5. Social Marketing and Corporate Responsibility. University initiatives addressing social issues such as environmental sustainability, equality, and community support enhance their positive image in society [8].

6. Use of Artificial Intelligence and Data Analytics. AI-powered analytical tools help universities understand student needs and optimize educational services [9].

7. Adapting the 4P Model to Education. The marketing mix concept (Product, Price, Place, Promotion) has been adapted to improve the efficiency of educational and research programs [10].

8 - Engaging Students in University Branding. Hosting alumni meetings, creating support networks for students, and promoting alumni successes contribute to strengthening the university's brand [11].

We make a conclusion that, one of the most universal and proven approaches in marketing, is the 4P model (Product, Price, Place, Promotion), introduced by Edmund Jerome McCarthy in 1960. Adapting this model to the specifics of university ecosystems allows to structurize marketing strategies, optimizing resource use, and achieving strategic goals. The 4P model provides a structured approach to marketing activities, helping universities not only enhance their competitiveness but also increase their social impact.

The First P: Product, refers to the educational programs, research, innovations, and services offered by the university. By developing unique educational programs that meet job market demands, one university could stand out among others and improve their competitive edge. Social impact is achieved through educational programs that focus on critical thinking, sustainable development, and innovation, creating skilled professionals who contribute to society and promote their university.

The Second P: Price, relates to tuition fees, grants, and scholarships. Competitiveness is influenced by transparent pricing policies and the availability of financial support, which attract a larger number of students. Social impact is reflected in supporting low-income students.

The Third P: Place, takes into account the university's infrastructure, including both physical and digital accessibility. Competitiveness is enhanced through the use of online platforms, enabling universities to reach a global audience. Social impact is achieved by expanding access to education through distance learning, integrating diverse population groups into the educational process.

The Fourth P: Promotion, includes strategies for advancing the university's presence through social media, conferences, and collaborations with business partners. Competitiveness is driven by active public relations and participation in international rankings, strengthening the university's brand. Social impact involves raising awareness of the university's social projects and research, enhancing its role in society.

By integrating the 4P model into their ecosystem strategies, universities can effectively balance market competitiveness and societal contributions, ensuring long-term sustainable development.

In our opinion, the integration of the 4P model into university's ecosystems offers the next following advantages:

1. **Attractiveness for Students.** Thoughtfully designed educational products, flexible pricing policies, and accessibility make universities more attractive to students. This approach enables universities to attract talented individuals from around the world.

2. **Fostering Innovation.** The 4P model creates conditions for effective operations and revenue generation. Universities that actively implement marketing strategies are better equipped to execute innovative projects and research, which are often funded by private and governmental organizations.

3. **Strengthening Partnerships.** International collaboration and partnerships with businesses and governments through joint initiatives enable universities to access new resources and opportunities, enhancing their visibility and reputation.

Examples of the successful integration of the 4P model include the following: The University of Warwick (United Kingdom) effectively employs promotion by collaborating with technology corporations to develop market-oriented educational programs. The National University of Singapore (Singapore) has utilized the 4P model to integrate digital platforms, enabling global student outreach. The Massachusetts Institute of Technology (United States of America) focuses on product development and services (innovations, startups) aligned with contemporary challenges within the framework of the 4P model. Analysis of these cases leads to the conclusion that integrating marketing approaches and the 4P model allows university ecosystems not only to compete effectively in the education market but also to enhance their social impact, contributing to the sustainable development of society. These approaches enable universities to adapt to the changing conditions of the modern world, ensuring high-quality education, innovation, and integration into the global knowledge economy.

The analysis of existing and tested marketing approaches for the development of university ecosystems has demonstrated that integrating the 4P model is an optimal solution. Additionally, the COVID-19 pandemic presented unprecedented challenges to the global community, affecting nearly every aspect of life, including education, healthcare, and social integration.

Kyiv National University of Technologies and Design (hereinafter referred to as KNUTD) faced the need not only to adapt its educational and scientific processes to new conditions but also to address the significant decline in the health and social activity of its students and staff. Prolonged post-COVID consequences, such as physical weakness, psychological stress, and reduced productivity, necessitated the creation of an effective system for rehabilitation and recreation.

Moreover, the pandemic revealed the insufficient preparedness of the infrastructure for remote work, the need for innovative technologies to enable interactive engagement, and the necessity to create support programs for socially vulnerable groups. These challenges served as a driving force that led KNUTD researchers to participate in the project titled «*Marketing Development of the University's Eco Campus for Recreational Post-COVID Persons*» (hereinafter referred to as the Project). This innovative Project became a significant step in implementing the

strategy of integrating advanced technologies and marketing approaches into KNUTD's educational and recreational spaces.

The implementation of the Project aimed to address several critical issues:

1. *The Need for Post-COVID Rehabilitation.* Severe consequences of COVID-19, including long-term post-COVID syndrome, have created a demand for an effective system of physical, psychological, and social rehabilitation.

2. *Insufficient Institutional Mechanisms to Support Socially Vulnerable Groups.* There is a lack of infrastructure, programs, and platforms that provide an interactive approach to rehabilitation, focusing on activating the socio-economic potential of these individuals.

3. *Low Level of Environmental Awareness.* The absence of systematic efforts to enhance environmental consciousness across various social groups remains a significant barrier. Raising awareness is a vital component of sustainable development and the prevention of future global challenges.

4. *The Need to Integrate Innovative Technologies into Educational and Social Programs.* This includes the use of digital platforms, telemedicine, VR/AR technologies, and marketing tools to ensure comprehensive rehabilitation and development.

To address these challenges, under the Project's development a concept for integrating educational, recreational, and innovative technologies was developed to ensure a comprehensive approach to the rehabilitation of post-COVID individuals. The foundation of the Project's implementation was the innovative educational platform named REHUB COVID, created at Kyiv National University of Technologies and Design.

The educational platform REHUB COVID, as an innovative tool for solving key problems related to the development of human capital within the university ecosystem, has enabled physical and psychological rehabilitation, the development of environmental awareness, social adaptation, and professional growth for its participants. By implementing interdisciplinary educational programs and using digital technologies, the platform facilitated the integration of socially vulnerable individuals, strengthened cooperation between students and faculty, and created conditions for the sustainable development of KNUTD.

The Project became an integral part of KNUTD's overall strategy and sustainable development program, which focuses on innovation, international integration, environmental initiatives, and support for human capital. The REHUB COVID educational platform provided KNUTD with a foundation for rehabilitating and supporting socially vulnerable groups, increased the level of environmental consciousness, and strengthened internal communications. By utilizing modern digital technologies and innovative approaches, the REHUB COVID educational platform contributed to forming a new quality of educational and scientific activities.

Project Implementation. The central element of the Project was the creation of the interactive educational platform REHUB COVID, which integrated functions of rehabilitation, learning, and socio-psychological support. The platform provided a personalized approach to the physical and psychological rehabilitation of participants. It included the integration of educational materials, tools for health monitoring, opportunities for communication with experts, and access to recreational resources.

As part of the Project, modern digital technologies were introduced to simulate learning processes and virtual recreational programs, creating a more realistic environment for practical training and psychological support.

The Project included organizing training sessions and educational seminars for university students and staff. These activities aimed to teach participants how to use new technologies, develop skills in environmental awareness, and support socially vulnerable groups. Special attention was given to integrating new knowledge into the daily activities of the university's community.

An important component of the Project involved creating dedicated recreation and rehabilitation zones on university grounds. This included setting up green spaces to promote psychological recovery and introducing physical activity programs to support health. Additionally, a series of events was held to raise environmental awareness among students and staff.

The Project incorporated best international practices for post-COVID rehabilitation. These included studies by Stéphanie Décary, Wouter De Groote, Claudio Arienti, Charlotte Kiekens, Paolo Boldrini, Simona Gabriella Lazzarini, Martin Dugas, Thomas Stefan, Louis Langlois, Fanny Daigle, Fatima Naye, Anik LeBlanc, and Stefano Negrini, presented in "Recommendations for Post-COVID Rehabilitation". This study emphasized the importance of a multi-level, multidisciplinary model of rehabilitation. Key recommendations implemented in the Project included integrating multidisciplinary teams, utilizing research with standardized outcomes, and applying medical recommendations outlined in protocols for the safe rehabilitation of patients.

In the article by Francesco Agostini, Marco Mangone, Paolo Ruiiu, Tommaso Paolucci, Vincenzo Santilli, and Alessandro Bernetti, titled "Rehabilitation Settings During and After COVID-19: An Overview of Recommendations", the authors explored the impact of the pandemic on rehabilitation services and provided recommendations for their reorganization. These included tele-rehabilitation, physical therapy, and psychological support, all of which were utilized by the Project team.

The article by Richard Bakker, Katie Andi, Anne Desloupes, Robert Mitchell, Gregory Lau, Katia Bojani, Daniel Stockholm, William Howard, Ross Wykers, and Bhavna Ramchandani, titled "Global Statements to Produce and Implement Optimal Rehabilitation Practice and Service for Persons With Disabilities During the COVID-19 Pandemic and Beyond", emphasized the importance of a global approach to rehabilitation through the integration of digital platforms, multidisciplinary strategies, and the funding of innovative models.

In the article by Marco Antonelli and Davide Donelli, titled "Respiratory Rehabilitation for Post-COVID-19 Patients in Spa Centers: First Steps from Theory to Practice", the authors examined the potential of natural environments, such as spa centers, for the rehabilitation of patients with respiratory impairments. They mentioned the importance for the active use of physiotherapy, lung drainage, and the integration of psychological support.

These studies provided valuable insights and practical approaches that were incorporated into the Project activities at KNUTD.

In the study by Taslim Uddin, Hasna Raihan Rahim, and Mohammed Nuruzzaman Handaker, titled "The Impact of COVID-19 and the Challenges of Post-COVID Rehabilitation in a Developing Country", the authors examined the specifics of rehabilitation in resource-limited settings, emphasizing the importance of tele-rehabilitation and a multidisciplinary approach.

In addition to the aforementioned methodological and scientific approaches, other sources were considered, enriching the project's concept and ensuring a comprehensive approach to addressing the rehabilitation needs of post-COVID individuals. The integration of these practices enabled the creation of a unique rehabilitation model at KNUTD, which incorporates physical, psychological, and social aspects of recovery.

Thus, the study of experiences from other countries contributed to the development of innovative approaches that were tailored to the specific needs of KNUTD.

Experts from Ondokuz Mayıs University (Turkey) provided consultations, participated in training sessions, and assisted in the implementation of modern educational standards for rehabilitation.

Among the strong points of KNUTD at the beginning of the Project, the following should be noted:

1. Existing Infrastructure. KNUTD boasts over 30,000 m² of modern facilities, including academic buildings, laboratories, research centers, and recreational zones. The university grounds also feature green spaces that contribute to the ecological and psychological rehabilitation of Project participants.

2. Advanced Digital Infrastructure. KNUTD obtains well-developed digital infrastructure for remote learning and project management, which is constantly improving. This infrastructure includes LMS systems, cloud-based collaboration services, and analytics software, which serve as a foundation for implementing telemedicine solutions.

3. Human Capital. The academic community at KNUTD comprises over 1,200 faculty and researchers, 80% of whom hold PhD or Doctoral degrees. The university collaborates with more than 68 international academic institutions, enabling the integration of global expertise into local projects. Additionally, KNUTD had over 11,000 students enrolled at the beginning of the Project.

4. Innovation-Oriented Strategy. KNUTD's innovation focus serves as the cornerstone of its sustainable development strategy.

At the initial stages of the Project, several key weaknesses impacted its implementation.

Firstly, the digitalization of the REHUB COVID educational platform was limited. At the launch of the Project, the platform's accessibility was only supported through the University's «Moodle» environment. Specifically, the lack of integration with tools for automated health status analysis and educational programs hindered effective user engagement.

Secondly, there was a need for comprehensive research on the impact of COVID-19 on individuals. During the initial stages of the Project, a more detailed analysis of the physical, psychological, and social effects of COVID-19 on students and staff became necessary. The absence of systematic data restricted the adaptation of rehabilitation programs to meet the actual needs of the target audience.

Thirdly, the realization of sustainable development goals through online platform was severely challenged by the pandemic and russia's full-scale invasion in Ukraine. These dual crises created significant obstacles to achieving the Project's objectives.

The primary challenge arose from russia's full-scale invasion of Ukraine in February of 2022, which drastically altered the geopolitical situation due to military actions of Russia against Ukraine. This created additional difficulties for the Project's implementation, including disruptions in logistical chains, reduced funding, and increased psychological pressure on the academic community. The war conditions also complicated access to essential technologies and resources, that was needed for the platform's full deployment.

Despite these obstacles, KNUTD carried out the Project by launching several initiatives aimed at creating a comprehensive system for post-COVID rehabilitation and social integration.

The main components of the Project were:

1. **Development and Launch of the REHUB COVID Educational Platform.** The platform combines functions of rehabilitation, education, and social-psychological support.

1.1. The Platform offers educational materials for students and teachers to improve environmental awareness and build psychological resilience. The platform also includes tools for monitoring health through automated algorithms and analytics.

2. **Improvement of Infrastructure.** Infrastructure modernization activities included creating new recreational and recovery spaces, which helped: to set up green zones for psychological relaxation; to build interactive areas for physical activities and training.

3. **The Digital Technologies implementation.** Advanced digital solutions were introduced to make the Project more effective, such as: online platforms for communication with rehabilitation experts, psychologists, and other specialists.

4. Educational Initiatives and Professional Development Programs. Training activities within the Project included: workshops for teachers to develop digital skills and improve environmental awareness; training for students on self-rehabilitation techniques and stress management.

5. International Collaboration and Adaptation of Best Practices. The Project focused on adapting international best practices to the university's sustainable development strategies.

Conclusions. The Project «*Marketing Development of the University's Eco Campus for Recreational Post-COVID Persons*» became a driving force for transformations in KNUTD's strategic directions, ensuring the comprehensive implementation of innovative solutions in its educational, scientific, and social processes.

As a result of creating the multifunctional REHUB COVID educational platform, the functions of rehabilitation, education, and socio-psychological support were integrated. The use of digital technologies enabled the creation of an interactive environment for educational and therapeutic processes, enhancing the university's existing innovative potential.

This technological foundation became a vital component of KNUTD's infrastructure modernization. Specifically, green zones for relaxation and psychological recovery were established on campus, along with interactive spaces for physical activities and rehabilitation. At the same time, the University's digital infrastructure was improved, incorporating learning management systems, cloud services, and analytical tools.

These infrastructural upgrades not only improved the working and learning conditions but also laid the groundwork for the continued development of the University's community.

The Project "*Marketing Development of the University's Eco Campus for Recreational Post-COVID Persons*" played a pivotal role in advancing KNUTD's strategic goals by integrating innovative solutions into its educational, scientific, and social processes. A significant focus was placed on human capital development through educational programs and training sessions aimed at enhancing staff qualification and fostering resilience competencies among students.

Environmental awareness was a key element of the Project, with initiatives promoting sustainable development principles integrated into the educational process. This effort raised the ecological literacy of students and staff alike. Additionally, international collaboration and partnerships with businesses strengthened rehabilitation approaches and secured funding for innovative initiatives, expanding the Project's impact and reach.

Special attention was given to socially vulnerable groups, providing individualized rehabilitation programs for students and staff affected by COVID-19 or experiencing psychological impacts from the war. These efforts successfully facilitated their adaptation and integration into the University's academic and research environment.

The Project's implementation was a defining moment in KNUTD's development, laying the groundwork for enhancing its competitiveness, reputation, and integration into the global scientific and educational community.

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