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# **“EU PRACTICES OF YOUTH AND BUSINESS COOPERATION”**

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For scientists, scientists, students, graduate students, representatives of business and public organizations and higher education institutions and a wide range of readers.

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ENTREPRENEURIAL TECHNOLOGICAL  
LOGISTICS DECISION-MAKING  
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SUSTAINABLE BUSINESS DEVELOPMENT:  
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PRODUCT-AS-A-SERVICE AS AN  
INNOVATIVE BUSINESS MODEL FOR THE  
DEVELOPMENT OF YOUTH  
ENTREPRENEURSHIP

# AI AND THE NEW WORLD OF WORK: BUILDING AN ENTREPRENEURIAL MINDSET TO MEANINGFULLY EMBRACE AI

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Today, we are examining the European Union's strategies for promoting cooperation between young people and businesses. A central theme of this conference is the role of entrepreneurship in enabling young people to make substantial contributions to the economy. Your continued efforts in organizing youth and business conferences are closely aligned with this objective.

It is widely recognized that AI is reshaping the world of work. As educators, we are working to incorporate the implications of AI into our teaching and students' learning, ensuring they are equipped to use AI effectively in professional settings. While students acknowledge the advantages of AI, it is equally important for them to understand its disruptive effects and potential limitations.

I will begin by briefly discussing AI and the evolving landscape of work, followed by strategies to cultivate an entrepreneurial mindset among students, thereby enhancing their engagement with AI. This focus is especially relevant given the rapid evolution of AI technologies and the challenges of staying current with emerging tools. Encouraging students to develop an entrepreneurial mindset better equips them for these ongoing changes.

For context, the McKinsey Technology Trends Outlook 2025 defines artificial intelligence as computer systems designed to perform tasks that typically require human intelligence [1]. These systems are highly complex, utilizing algorithms, data, and computational power to recognize patterns, make decisions, and learn from experience. As a result, AI is increasingly capable of performing tasks traditionally associated with entry-level positions.

AI has already disrupted the workforce, with entry-level positions in some industries being replaced due to AI's greater efficiency in performing routine tasks [2]. The critical question now is how human intelligence will continue to contribute meaningfully alongside AI. As noted by the previous speaker, effectuation theory emphasizes the importance of being the 'pilot in the plane' [3]. It is essential that humans continue to serve as the primary decision-makers, even as we integrate AI into our work.

Drawing from the Udemy Business 2026 Global Learning and Skill Trends Report, I would like to highlight several key points [4]. Rather than treating AI as a simple plug-and-play solution, developing AI fluency allows individuals to reframe their work, adapt their roles, and contribute to building intelligent systems that enhance business value across interconnected workflows. Employees must feel confident using AI tools and be recognized as forward-thinking contributors who

drive tangible progress. Organizations, in turn, should provide platforms that support ongoing learning about AI and its applications. Key takeaways from the report highlight the need to reframe work approaches, adapt professional roles, and enhance business value across interconnected workflows. Maintaining a consistently high level of business value during these transitions is essential.

Employees need to feel very confident in navigating these tools. They must be forward-thinking contributors, so they should look for ways, and creative ways, to utilise AI. Organisations need to provide platforms that empower employees to not only effectively use AI but also to do so in an ethical manner. Utilise AI to ensure that the adaptive capability of the organisation can be built at scale.

A related Gartner report identifies top strategic technology trends for 2026 and discusses the evolving roles individuals will assume as architects [5]. Some professionals will focus on synthesizing and integrating systems, while others will serve as vanguards, providing critical oversight to ensure AI is used optimally. These roles are crucial for upholding governance standards and promoting ethical conduct. Here are several key points to consider.

Confidential computing is identified as a key responsibility for those in architect roles. As professionals progress in their careers, they may transition from synthesizing and supporting AI integration to holding senior management positions and serving as vanguards. Confidential computing involves conducting AI-driven processes securely, ensuring data protection throughout the entire process. This approach ensures a trusted environment where data remains protected during processing. Additionally, significant advancements in AI platforms are expected, with these platforms evolving into supercomputing systems.

Platforms are evolving over time, and they are already becoming a synthesis of these elements. The need is to integrate multi-agent systems, incorporate domain-specific language models, and integrate all of that, while investing in and incorporating connections with the physical AI infrastructure, so that.

The synthesis role involves integrating hardware, models, and the resulting systems, while the vanguard role focuses on oversight and security. Regarding security platforms, pre-emptive cybersecurity is crucial for preventing cyber-attacks before they occur. Digital provenance ensures seamless integration and integrity among all software, models, and hardware, supporting smooth operations.

And then, Geopatriation is a counterintuitive concept. It is about bringing certain key aspects of these models, features, and software back into the local computing platform, rather than leaving them in the cloud. And that is becoming increasingly important due to the rising geopolitical risks. Across the world right now, so vanguards will have to play multiple roles in this regard.

So, what are organisations then doing to build AI fluency? They're empowering their employees with foundational skills. They're helping them to put them into practice through applied roles. They're ensuring that teams work as cross-functional teams and maintain learning agility, and then the time they become architects of change in embracing AI in the best way possible.

The UdeMy report identifies three levels for assessing and building AI fluency within organizations. The first level is developing AI literacy, which supports initial augmentation. The second involves integrating workflows to enable greater assistance and automation. The third level is the 'identify and rework' role, where AI assumes more agentic responsibilities, potentially anticipating human judgment and decision-making. While the goal is not for AI to replicate humans, increasing sophistication enables AI to assume more autonomous roles, which defines agent-driven AI.

This broad landscape demonstrates the transformative impact of AI on the world of work. The central question remains: how can we continue to serve as the 'pilot in the plane' and maintain leadership in this evolving environment?

Together with colleagues, I am investigating how entrepreneurship is integrating AI, particularly among nascent ventures in India. Our data collection from several companies indicates that entrepreneurs are leveraging AI in multiple ways. For example, AI often serves as a cognitive partner, collaborating with entrepreneurs to ideate and identify opportunities.

When opportunities are scaled, AI functions as a sandbox or platform for experimentation, enabling entrepreneurs to explore various possibilities. This role has proven highly effective in supporting innovation. AI is certainly working very well as an efficiency and resource multiplier, making it possible for entrepreneurs to engage fewer people or automate tasks that were previously handled by human employees. Now, AI is sending out mailers, rereading and editing reports, speech documents, and other materials before they can be presented. However, we also found that there's a kind of role complementarity between the entrepreneur and AI. So, AI is playing certain roles that may have been previously performed by their founders. Team members or employees below the founding team level are now being replaced by AI, but certain critical roles are still being handled by the entrepreneur. So, we are somewhat reassured that the entrepreneur remains the driver or pilot in the plane, and they achieve this by retaining domain expertise and agency, mostly by deploying.

AI continues to improve by learning from experience and offering greater support. Nevertheless, our research suggests that entrepreneurs continue to bear essential responsibilities. This observation leads to the second part of my presentation.

### **Entrepreneurs should approach AI with a design thinking mindset.**

While it is possible to learn extensively about AI, its rapid advancement often keeps it a step ahead. To remain knowledgeable and adaptive, adopting a design thinking approach is essential, and I will elaborate on this concept shortly.

So, what does a design thinker generally do, and how might we apply this approach if we're going to approach AI as a design thinker? We have to be creative and innovative. Both these roles must be performed by entrepreneurs or other young professionals that are aspiring to become entrepreneurs. Students who are learning the techniques or have a drive and a motivation to become entrepreneurs.

They will play this creative, innovative role anyway. So, we are saying that let's fine-tune it for working with AI as well.

So, design thinking is a human-centred, creative, and innovation-based process that can result in actual innovation to help solve customer, user, and community-level problems, including grand challenges. It all starts with a deep understanding of the problem and/or the user. The user's problems or needs, so we put ourselves in the user's shoes and really understand that. So, if we return to the AI context, we probably need to start from first principles. Those are the aspects we want AI to do for us. By framing challenges as design problems, we can apply creativity and essential human skills to develop solutions. Creativity is often described as 'a wild mind and a disciplined eye,' reflecting the need to think unconventionally while maintaining focus. Notably, great scientists combine creative intelligence with enjoyment in their work. As Einstein suggested, striking a balance between disciplined effort and a sense of play is crucial for innovation.

Edward de Bono, known for his work on creativity, emphasizes the importance of breaking established patterns to gain new perspectives. While everyone is inherently creative, socialization and personal context can impose boundaries that limit creativity. Self-censorship and functional fixedness—such as restricting oneself to a single professional domain—can hinder creative thinking. Additionally, fear of failure and concern about others' opinions may further inhibit innovation. An excessive focus on achieving the correct solution can inhibit creativity by discouraging experimentation and openness to failure. It is important to approach problems with a fresh perspective and question assumptions. As AI models evolve, understanding both their capabilities and limitations is essential. By asking critical questions and considering counterintuitive approaches, we can foster greater creativity in working with AI.

Creative teams, including future student groups, must cultivate a paradoxical culture that balances a beginner's mindset with disciplined work. They should have the freedom to explore, demonstrate empathy and support during setbacks, and adopt a playful, improvisational approach. At the same time, professionalism and planning are essential. This paradoxical culture underscores the significance of mindset in cultivating creativity. Mindset encompasses our personal paradigm, including how we perceive the world, the assumptions we make, and the core beliefs we hold. It shapes our worldview and serves as an implicit theory guiding our actions. These implicit theories are deeply ingrained and influence our work processes and decision-making. Although mindsets are generally stable, they can be improved or changed through deliberate effort, particularly by engaging in design thinking. We can enrich our mindset by acquiring new skills, embracing counterintuitive thinking, collaborating with others, and learning from diverse experiences. It is important to work with our existing mindset while remaining open to positive adaptation as we advance.

In the context of innovation and AI, it is essential to strike a balance between maintaining the status quo and pursuing innovation. For example, noticing

cold weather and responding by adding layers illustrates the status quo cycle, where we adjust to maintain stability. The status quo cycle involves continuously adjusting our actions in response to environmental feedback to maintain stability. This process is fundamental to human functioning, as evident in physiological responses such as hunger. We are naturally inclined to preserve equilibrium. In contrast, the innovation cycle often requires counterintuitive actions. When challenges reveal that current approaches are insufficient, we must identify areas for change and engage in ideation and creative problem-solving. As we generate new ideas, we test them through action and assess whether they address the challenges at hand. If not, we iterate and develop alternative solutions. Balancing the status quo and innovation cycles within our mindset is essential; we must maintain stability while also embracing change.

Adopting a design thinking mindset involves several key requirements. First, creative confidence is essential; we must believe in our ability to address challenges, even as AI continues to evolve rapidly. Second, maintaining a strong focus on user needs—or, in the context of AI, on the tasks we expect AI to perform—is critical. We should also engage in both divergent thinking, to generate new ideas, and convergent thinking, to select and implement the best solutions. This process is supported by a ‘yes, and’ approach, which encourages building upon ideas rather than limiting them. By avoiding ‘yes, but’ responses, which can stifle progress, and instead using ‘yes, and’ logic, we foster a more constructive and innovative environment.

Before engaging with AI, it is important to examine and set aside our assumptions, recognizing that some may be unfounded. We should assess our current understanding and explore how AI operates within our specific field of interest. For example, when studying the intersection of entrepreneurship and AI, one might consider how AI supports the ideation process. AI may also be used to manage or scale ventures. After assessing the current situation, we engage in divergent thinking to generate a range of possibilities, followed by convergent thinking to reach consensus on the most promising solution. Once a ‘WOW solution’ is identified, we must evaluate its feasibility and viability, refining the approach as necessary before implementation.

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## **WELCOMING ADDRESS: FROM STARTUPS TO UNICORNS – FINANCIAL PERFORMANCE AND KEY INSIGHTS FOR NEW VENTURES**

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Today, I will discuss issues relevant to new businesses, young enterprises, and startups. I would like to highlight several key considerations for those engaged in startup activities. Together with my PhD student, Inga Kartanaite, we conducted research on the financial performance of technology startups at various stages of their development [1]. The importance of this topic is evident, given the growing number of startups and the need for both practical and scientific insights. Notably, more than 80% of startups fail at some point in their life cycles [2]. When aspiring entrepreneurs envision their future, they often think of achieving unicorn status, which is defined as a company valued at \$1 billion. For this reason, we intended to investigate the financial performance of unicorns, then startups and make a comparison of these market players. To achieve this, we collected and compared global data of unicorns with IPO and Lithuanian startups.

One of the main challenges we encountered was collecting and analyzing data from Lithuanian startups, as those are very young businesses. Nevertheless, we recognized the importance of obtaining reliable evidence, so we manually collected all data at the beginning of 2023. At that time, Lithuania had over 800 officially registered startups [3]. We selected a sample representing slightly more than one-third of these companies and focused our analysis on the period from 2013 to 2021. The year 2021 was particularly significant, as it was the first fully reflecting the impact of the pandemic, which we observed had a substantial effect on startup activities. Our analysis of financial performance across the startup life cycle revealed several noteworthy findings. During this period, the number of startups increased, and many were profitable. For comparison, we also conducted a similar analysis of global startups known as unicorns, which are valued at one billion dollars.

Regarding market value, we focused on global unicorns that had completed the initial public offering process, indicating that the market was prepared to invest in these companies. By examining the return on assets (ROA) ratio, we found that global unicorns typically reported negative ROA values (Median of the data sample was -0.087), meaning that most operated at a loss despite valuations exceeding one billion dollars or euros. In contrast, smaller startups from Lithuania's sample, which are often the focus for new entrepreneurs, demonstrated stronger financial performance in our case study. Based on these findings, I encourage young businesses and startups to begin their activities. The comparison to global leaders from the very beginning might be redundant, and priority while starting new activities should be focusing on first revenue generating. Over time, startup activities and those targeted financial ratios will continue to evolve.

While aspiring to achieve unicorn status is an admirable goal, it is important to begin with small steps and move forward. I encourage you to start your businesses and focus on generating first revenue. I look forward to the possibility of meeting in the future to celebrate your achievements. Best wishes as you overcome challenges; with perseverance, these obstacles will eventually be resolved.

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## UKRAINIAN YOUNG ENTREPRENEUR'S BUSINESS INTENTIONS AND RESILIENCE WITHIN REFUGEE EXPERIENCE

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**Introduction.** The research primarily examines the motivations and psychological factors underlying businesses established by Ukrainians in the UK. At the outset of our research, we aimed to identify the general demographic profile of Ukrainians who arrived in the UK following the full-scale invasion. The data indicate that many Ukrainians in the UK face financial difficulties [1] Although they possess professional qualifications, these are often not recognized, leading

them to accept jobs outside their fields of expertise [2]. This lack of recognition hinders their career advancement. In 2023, data show that only 7% of Ukrainian refugees benefited from the British Government's support programme. Since the programme's inception, there has been an increase in self-employment among Ukrainians. A review of the literature reveals several noteworthy findings from other scholars on this topic.

Research suggests that individuals with high achievement motivation and entrepreneurial tendencies are more likely to emigrate and establish businesses [3]. While this is often observed among voluntary migrants, similar patterns are evident among refugees. Individuals who have endured the hardships of displacement often demonstrate significant resilience, which contributes to their capacity to start businesses. Startups and self-employment are more prevalent among migrants and refugees than among the local population [4].

We begin by considering motivation theories relevant to both refugees and migrants, with a primary focus on refugees for the purposes of our research. Our research draws on the classical push-pull theory, also referred to as the opportunity-necessity theory, which conceptualizes intentions and motivations along two primary dimensions [5]. One dimension reflects intrinsic motivation, arising from individuals' internal intentions, while the other is shaped by external environmental factors. This framework underpins our research approach. In this abstract, we present a segment of our broader research project, which examines Ukrainian displaced individuals who have established businesses in the UK, with particular attention to youth and young entrepreneurs.

**Methodology.** Definitions of youth vary across organizations and countries. Ukrainian law defines youth as those aged 14 to 35. Thus, for this study, we selected participants aged 35 and under, resulting in eight individuals within this age group out of a total sample of 30. The research employs qualitative methods, utilising in-depth interviews with open-ended questions and subsequent coding of motivational factors. The focus group includes equal representation of female and male entrepreneurs.

**Results and Discussion.** Notably, most participants lacked prior entrepreneurial experience in Ukraine or other countries. An additional point of interest concerns their educational backgrounds. All participants, except one young man who completed only secondary school in Ukraine (equivalent to high school in the UK), possess higher education qualifications. Their fields of study are generally unrelated to business, with only one participant having completed a marketing programme. The remaining participants have diverse academic backgrounds, which often do not align with their current entrepreneurial activities.

While many studies on entrepreneurial motivation focus on business students, real-life trajectories often diverge from these academic pathways. Following the coding of interview data, we constructed two tables: one for pull motivations and another for push motivations. Motivational factors were ranked by

frequency of mention. The most frequently cited factors were opportunity and independence, as indicated by the ranking of motivational frequencies.

Entrepreneurial or managerial experience falls outside the classical set of motivational factors, distinguishing it from traditional pull motivations. This factor emerged inductively from the interviews and has not been widely discussed in previous research, suggesting that prior experience may serve as a significant motivational driver.

The most salient motivational factors identified include independence, opportunity, internal drive, risk-taking propensity, and financial motivation, particularly the intention to increase earnings. For push motivations, we used a similar approach. These factors, not present in classical theory, reflect the profound impact of war, which transforms values, risk perceptions, and channels experiences of displacement and trauma into entrepreneurial intentions.

**Conclusion.** In conclusion, our research indicates that forced migration serves as both a constraint and an enabling condition, fostering resilience, improvisation, and resourcefulness among displaced entrepreneurs. Contrary to previous research that primarily characterizes refugee entrepreneurs as motivated by necessity, our findings present a more nuanced perspective.

Entrepreneurial motivation among refugees should not be viewed solely through the lens of necessity. Instead, it often reflects a hybrid landscape that integrates pull and push factors, structural inclusion, adaptation, aspiration, and growth. Often, entrepreneurial motivations among refugees are shaped not only by adversity but also by emergent resilience, post-traumatic growth, and the ability to recognise new opportunities. The experience is often considered as like suppressing depressing factors, which disrupts self-concept, identity and agency. However, on the other hand, such adversity can also catalyse the new. Such development is evident in new forms of entrepreneurial engagement, facilitated by coping strategies and resilience.

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## THE STARTUP MOVEMENT IN UKRAINIAN UNIVERSITIES: THE EXPERIENCE OF SUMY STATE UNIVERSITY

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**Background.** We present our experience and insights into the startup ecosystem in Ukraine, with particular emphasis on Sumy State University, where the startup system has been established for over a decade. Fifteen years ago, the Erasmus project of the European Commission, Succeed, initiated the first startup centre in the Sumy region. During this period, we actively supported the startup movement at Sumy University and throughout the region.

**Practice.** Approximately five years ago, we launched the United Nations GCIP project at Sumy University [1]. This initiative comprised three consecutive waves, each involving around ten teams that received targeted training [2]. These teams of students and young researchers participated in final startup pitch events.

Our ongoing involvement in the Horizon Europe Project further supports the startup ecosystem. The most recent initiative is the infrastructural support project for the New Generation Startup Centre at Sumy University, which has received new resources since its launch this year [3]. Over time, we have developed a diverse startup ecosystem in Sumy, including the established Business School Youth & Business [4], the Scientific Society for students and researchers, the Sumy Business Hub, and a recently formed machine building cluster for power equipment.

We also collaborate with a range of partners in Ukraine, such as the Sikorsky Challenge and the YEP platform, which connects approximately 100 Ukrainian universities and regularly organises startup events and different competitions for youngsters' toppers [5]. We have their partners related to the local government. Among students, the Sikorsky Challenge is particularly popular, providing an opportunity to present entrepreneurial ideas. This platform offers startups the opportunity to bring innovative products to market and serves as an initial stage for transforming ideas into viable solutions.

**Results.** Our students and researchers generated these ideas during the implementation of various projects. For instance, during the three-year United

Nations project in Sumy, the leading project focused on autonomous robot production. Researchers developed an independent platform for transporting objects in factories, warehouses, and restaurants, offering low cost and flexible configurations.

Another notable achievement is a women-led startup founded by a former student. This innovative mobile application and marketplace enables users to select optimal options for tourism and active leisure across Ukraine. Covering all regions, including both large and small cities, the project exemplifies the entrepreneurial drive and creativity cultivated at our university. Visitors to the website can easily discover Ukraine's most notable attractions, providing an accessible starting point for exploring the country. Another success from Sumy University is the 3D printing robot, which developers used to construct a concrete building. This achievement demonstrates the thriving culture of innovation at our institution.

We have developed numerous other groundbreaking projects, such as pumps for critical infrastructure, advanced inks for 2D and 3D printing, and innovative healthcare startups [5]. These initiatives reflect the diverse talents and determination within the Sumy community. All these activities were completed during the three waves of the United Nations project [6]. We maintain a dedicated website that showcases all projects launched in Sumy, along with the programmes active during those years [7]. Our students and researchers have won both Ukrainian and national competitions, and their startups continue to progress in diverse directions, including B2C, B2B, B2G, and B2B2G, consistently demonstrating excellence and ambition.

Additionally, we have established the Hub Lab, an AI laboratory dedicated to developing models and methods that support the creation of intelligent system clusters. We have also developed a project designed to help children train and manage their own initiatives. Additionally, we are involved in a challenging recovery project that utilises ECHO technologies to restore degraded soils in Ukraine. Our current project is focused on providing infrastructural support for Sumy. Recently, we acquired new resources and computers for our startup centre. Each year, we organize courses on Innovative Entrepreneurship, Startup Project Management, and support for innovative startups, targeting students from Sumy and surrounding regions to foster entrepreneurial success.

**Conclusion.** Despite significant challenges, our community remains resilient and highly motivated. We look forward to the end of the war, anticipating the opportunity to renovate and rebuild. Although more than two-thirds of our infrastructure has been affected [8], our determination and vision continue to drive progress in Sumy.

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## ARTIFICIAL INTELLIGENCE AND ENTREPRENEURIAL CO-CREATIVITY

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**Introduction.** In this paper, I introduce the concept of factual Co-creativity to reconsider how AI is transforming entrepreneurial creativity. I draw on Amabile’s theory of creativity [1;2] and Sarasvathy’s effectuation theory [3;4] to frame this approach. Effectuation theory positions effectual Co-creativity as a novel form of hybrid, modular, and iterative creativity that arises from the interaction between humans and AI. Prior to beginning my PhD, I worked as an

entrepreneur for nearly 20 years, founding my own line of bridal design gowns. My business performed well until the onset of COVID-19, which forced operations to halt as weddings ceased for approximately two years. During this period, my business experienced significant challenges until the emergence of AI technologies. Subsequently, I began integrating AI into my business, particularly for creative tasks such as gown design and campaign development.

Creating a single traditional campaign image required a significant amount of time and financial investment, often taking weeks or months [5]. In contrast, creating an AI-generated image, although imperfect, was achieved within seconds by inputting my sketch into an AI tool designed for social media campaigns. This approach also transformed my marketing strategies. Although AI has advanced considerably, the generated gowns had left impractical (e.g., long in the front). Over time, however, AI has become more effective and useful in my creative process, improving and reflecting my style. The reduction in costs made possible by using AI enabled my business to recover from the challenges of COVID-19. Consequently, I chose to pursue a PhD to examine the intersection of AI and the paradoxes of creativity.

The paradox between creative expansion and constraint underscores the current relevance of studying AI and entrepreneurial creativity. By grounding this discussion in creativity and effectuation theories, I aim to show that these changes represent a significant shift rather than a temporary trend.

This represents a profound transformation in how entrepreneurs approach design and decision-making in uncertain environments. Rather than questioning whether AI will eliminate creativity, I propose we consider how entrepreneurs can leverage AI to create in new, more inclusive, and powerful ways.

**Methodology.** My research centres on a key question: What happens to creativity when entrepreneurs design with AI? To answer this, I adopted an immersive approach, becoming both researcher and participant. As an entrepreneur already working with AI, I conducted an autoethnography by studying my own experiences. This involved examining my journey as a bridal designer collaborating with AI. Through this process, I explored the experience of creating with AI, the evolution of my creative decisions, the shifting dynamics of control between myself and the machine, and the roles of judgment and intuition.

Rather than treating creativity as an objective phenomenon, I argue that it unfolds through the lived experience of working with AI. I chose autoethnography, despite its relative lack of popularity, for its ability to capture these nuanced experiences. I determined this was the most effective method for closely examining the process, as surveys or experiments cannot fully capture the emotions, uncertainties, surprises, frustrations, and intuition involved in the creative negotiation between entrepreneur and artificial intelligence.

**Findings.** Such insights emerge only when humans and AI design collaboratively; by immersing myself in the process, I could better understand and theorize these dynamics. One key finding is that AI can generate an abundance of

ideas during gown design. However, with AI, ideas are no longer scarce. Genuine creativity now emerges from judgment, selection, refinement, and imagination. The creative process becomes an ongoing dialogue between me and the machine. At times, I direct the process; at other times, I follow the AI's suggestions. Occasionally, the AI produces surprising results, while at other times, it generates irrelevant outputs. This dynamic exchange constitutes what I term effectual Co-creation.

Effectuation manifests as entrepreneurs utilizing available resources. Following the COVID-19 pandemic, when my business faced difficulties, AI became a new tool to help sustain my work. I began with existing resources, conducted small-scale experiments, learned rapidly, and adapted my approach based on the outcomes. This approach also involves co-creating with available partners, including non-human collaborators such as AI. AI does not replace creativity, but it fundamentally alters it. Entrepreneurs must guide AI rather than depend on it entirely. Total reliance on AI can lead to homogeneity, making outputs indistinguishable from one another. Entrepreneurs remain responsible for determining what aligns with their brand and must exercise judgment to refine and filter AI-generated content.

Selecting meaningful outcomes and blending intuition with technology transforms creativity into a collaborative partnership rather than an individual endeavour. For scholars, this suggests that autoethnography can generate robust new theories by linking lived experience with academic concepts. AI is transforming entrepreneurial creativity and agency. Research should capture the complex, emotional aspects of innovation, not merely the final product.

As I began reviewing the literature on AI and creativity, I observed that much of it positions AI and creativity as opposing forces, with AI depicted as a threat and humans as the primary source of creativity. Early research emphasized concerns about automation and replacement, often presenting a dystopian perspective. It's going to replace entrepreneurs and do everything we can do. But now evidence suggests something different. AI is increasingly acting as a Co-creator, and many new papers are starting to demonstrate this, especially in entrepreneurial settings where uncertainty, experimentation, and rapid iterations are the norm, leaving us with a blind spot. We know that AI improves outcomes such as content quality and personalization, but we know far less about how entrepreneurs experience these tools.

Since my research seeks to understand how entrepreneurs adapt and how their identities as creative agents evolve, I aim to move beyond output-focused studies and instead examine how AI transforms the practice and nature of entrepreneurial creativity itself. I investigate whether AI serves as a partner or disruptor, and whether it assists, influences, distracts, or produces erroneous outputs.

Below, I illustrate my interactions with AI during the creative process, tracking instances where AI was helpful or unhelpful and evaluating its impact on

creative outcomes. The process begins with a prompt, which is my input to the AI. Based on the AI's response, I assess its usefulness and decide whether to retain or modify it. If the AI influences my existing idea, I again decide whether to keep or adjust the output. Occasionally, the AI acts as a distractor by producing content that is not in line with the brand. In such cases, I may modify useful elements or reject the output entirely. When the AI generates completely irrelevant results, I discard them and continue the iterative process.

**Discussion.** This ongoing work continues to explore how AI influences my creativity. For example, after months of co-creating a gown with AI, the system sometimes generated images that did not match my intended design. In one instance, the AI produced a completely different gown than requested or depicted inconsistent designs between the front and back views. These inconsistencies highlight that AI still has significant limitations and frequently makes errors. Relying entirely on AI can be detrimental for entrepreneurs. In the current era, all three components of Amabile's theory (i.e., skills, creative thinking, and motivation) are evolving due to AI. I refer to this new dynamic as a hybrid creative agency, which resembles an 'alien mind'. AI functions not merely as a tool but as a co-creator, influencing each domain of the creative process.

According to Sarasvathy's effectuation theory, entrepreneurs do not begin with predetermined goals. Instead, they utilize available resources, personal knowledge, and networks to co-create possibilities, embrace uncertainty, and focus on factors within their control. In practice, effectuation in the age of AI requires balance. Entrepreneurs gain agency and speed but must remain reflective, questioning whether AI amplifies creativity and collaboration or narrows outcomes toward efficiency and standardization.

This study makes two contributions to creativity theory. First, it extends Amabile's framework by demonstrating how AI fragments creativity across platforms and tools, resulting in shared creativity between human and machine – a phenomenon I term hybrid creative agency and effectual co-creation. Second, in relation to effectuation theory, this research updates Sarasvathy's model by introducing AI as a new non-human resource. Entrepreneurs now leverage AI for rapid experimentation, data-driven iteration, and novel feedback loops, thereby applying entrepreneurial creativity in new ways.

**Conclusion.** Creative entrepreneurs are not passive recipients of AI's influence. Many are experimenters, creators, and problem solvers who engage with these technologies in resourceful and human-centred ways. My findings suggest that AI is not a straightforward replacement for human creativity. AI is actively reshaping creativity. Entrepreneurs who previously could not afford graphic designers or analysts can now generate professional-quality campaigns and explore new ideas rapidly. However, this shift introduces challenges related to originality, authenticity, and distinctiveness.

In identity-driven fields such as fashion, AI alters notions of authorship and originality. Entrepreneurs must strike a balance between authenticity and

algorithmic performance, creating brands that seamlessly integrate both artistic and data-driven elements. Overall, effectual co-creation provides insight into how entrepreneurs use AI resources thoughtfully, experimentally, and intentionally, achieving a balance between originality and optimization.

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## ADVANCING GENDER-INCLUSIVE ENTREPRENEURSHIP AMONG YOUNG EUROPEANS

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**Introduction.** Today, we will discuss gender-inclusive entrepreneurship among young Europeans, with a focus on the startup ecosystem. Significant challenges exist in this area, extending beyond the high startup failure rates previously highlighted by colleagues. While startup failure is a concern, a more fundamental issue is that most startups are led by men [1]. Our research seeks to determine the prevalence of women-led startups and the specific challenges they face. We examined the proportion of women-led startups receiving support, investigated the reasons for limited investor backing, and explored strategies to increase both the percentage and volume of investment.

**Methodology.** We conducted online surveys, collecting 187 responses from participants in Ukraine, the UK, and other countries between September 2023 and

October 2024. Initially, the survey targeted only startups. However, the survey questions were also relevant to traditional businesses, and some participants reported owning both a startup and a traditional business.

**Results and Discussion.** Among respondents, 33.7% identified as startups. The criteria they used to make this distinction were particularly noteworthy. Startups were frequently defined by their founding years. Respondents demonstrated a clear understanding of what constituted a startup, as will be discussed further. Participants primarily operated in services, education, consulting, trade, creative industries, IT, and technology. Additional sectors included beauty, waste processing, furniture, and the film industry.

The younger generation, particularly young women entrepreneurs, tends to prefer launching simpler, traditional businesses. Most young founders in the beauty, retail, and sports industries typically began as solo entrepreneurs between the ages of 25 and 27. There is now an increase in businesses operating in education, children's products, fashion, and e-commerce. Approximately 25% of respondents manage two businesses. The student and early career stages are often characterized by exploration of new ventures. Their businesses operate both within Ukraine and internationally, including Europe, North America, Australia, and Asia, demonstrating local and global impact.

Another key motivation identified was financial independence. Respondents also cited self-realisation, personal development, and social impact as important drivers for starting their businesses. Additionally, the opportunity to apply creative ideas or realize personal potential emerged as a significant driver. Notably, many women entrepreneurs reported being less focused on financial gain. Instead, they prioritized a more savings-oriented approach. In contrast, research indicates that male entrepreneurs tend to focus more on generating income. Male entrepreneurs often pursue different approaches to achieving impact.

Similarly, among our interviewees, only 2% of women received investments from business angels, and just 1% secured venture funding. Approximately 60% of women entrepreneurs use personal funds to start their businesses. This trend is not unique to Ukraine and has been observed in other contexts as well. (Eurochambres Women Entrepreneurs survey 2025: Unveiling insights from the women entrepreneurs, 2025).

We have been researching this topic since 2017. In 2018, I identified notable statistics regarding the proportion of venture capitalists and investors supporting women-led startups. That year, only 2% of investments went to such startups. When startups are co-owned by both men and women, the investment share increases to 15%. Since 2018, the percentage has increased only marginally, by 3% in some regions and 4% in certain European areas. In the United States, partnerships account for an additional 19% share. Nevertheless, 97% of funding continues to be allocated to male-led startups.

When discussing funding with women entrepreneurs, questions frequently arise regarding awareness of available opportunities, sources of funding, and how

to access financial support. Women reported that networking facilitates a better understanding of and access to venture financing, both through formal business events and informal interactions with other entrepreneurs. Educational programs and media platforms further increase awareness and expand investment opportunities. These platforms serve as significant educational and informational resources, although many women noted that participation in networking did not always yield tangible results. In some cases, networking efforts did not lead to concrete outcomes.

This reflects a gendered approach, as women attending networking events, conference breaks, or meetings often discuss personal topics such as family, emotions, and ideas. However, financial topics are less frequently addressed. For example, during a recent presentation in Brussels, the significant gender gap in investment was emphasized. The results from the networking events organised for men and women were similar, with the main point being raised by the women. We don't need coffee, we need money. Women expressed a desire for more active discussions about funding, rather than focusing on personal topics. While personal conversations are valuable, addressing financial matters is essential for business growth.

Most women evaluate future financing needs primarily at the initial stage, with 67% doing so when first sharing their business idea. This finding aligns with previous research, as women entrepreneurs often encounter additional challenges as their ventures progress, risking the achievement of their previous successes. Funding is primarily allocated to equipment and raw materials. After receiving venture financing, women reported business growth of 20–30%, even with modest investment amounts. The primary reason women may decline to seek venture funding is outlined below.

Many women preferred to assume business risks independently, with 29% expressing reluctance to pursue external investment. This perspective is particularly prevalent in Ukraine. Additionally, 25% cited a lack of information or understanding regarding future capital needs, equity, and investor relations. There is currently insufficient information available in the Ukrainian entrepreneurial ecosystem on these topics. Key threats to business include ongoing conflict and insufficient financial support. Weak market conditions and frequent legislative changes are also significant concerns. Women-led startups in Ukraine reported that these factors make investment in their businesses particularly risky.

Consequently, there is a growing trend of registering businesses abroad, including in Estonia, Romania, Poland, the United States, and the United Kingdom. Many prominent and mid-level startups are officially registered in these countries. For example, many startups featured in Forbes' top 25 list have legal or official addresses both in Ukraine and abroad, reflecting investor preferences for foreign registration. Investors often provide funding to bank accounts held abroad. In addition to financial barriers, women entrepreneurs frequently encounter pervasive stereotypes throughout their careers.

Interviews conducted in the UK revealed that women in both venture companies and startups face similar stereotypes, including doubts about their ability to establish or manage businesses effectively. One common stereotype is that business success depends solely on personal relationships. Overall, 63% of women reported experiencing such biases, though the actual prevalence may be higher. When these biases become normalized or trivialized, they are more difficult to address. These biases are often dismissed as unimportant, making them difficult to identify and challenge.

Approximately 95% of surveyed women entrepreneurs reported no experience securing venture funding from leading investors or firms, while only about 5% had such experience. Contact with leading venture capitalists remains limited, and many women lack experience and knowledge regarding how to approach or communicate with these investors. Reported barriers include gender biases and stereotypes (39%), limited support (32%), and structural obstacles (16%). Additionally, 60% of women indicated a lack of skills and knowledge necessary to raise venture capital. These challenges encompass preparing financial documents (40%), understanding equity and ownership structures (34%), pitching (34%), and related tasks such as creating pitch presentations and learning effective pitching techniques (32%). Women highlighted that economic conditions, stereotypes, market situation, and lack of networking were issues.

**Conclusion.** Although many women understand the distinction between enterprises and startups, they often associate startups with early-stage ventures, particularly during formative business years. Collectively, these findings reveal significant challenges as well as opportunities to enhance gender inclusion in the European entrepreneurship ecosystem. Addressing existing barriers and supporting women entrepreneurs can foster a more equitable and dynamic startup landscape.

Women expressed interest in attracting venture funding from leading venture capital firms, business angels, corporate investors, and specialized startups. Many also indicated a preference for support from programs dedicated to promoting women entrepreneurs. Such organizations can offer not only financing but also mentorship, networking opportunities, and strategic guidance. The survey results provide a comprehensive overview of the current challenges and opportunities facing women entrepreneurs. We are now using these findings to develop an initiative that provides targeted support and improvement. This initiative will focus on enhancing their knowledge and skills.

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## EU GLOBAL GATEWAY: OPPORTUNITIES FOR SMES AND YOUTH IN AFRICA

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This analysis examines the EU Global Gateway, with particular emphasis on its relationship with small and medium-sized enterprises (SMEs) and its implications for Africa, especially African youth. The following discussion addresses the significance of the Global Gateway for the European Union, EU businesses, SMEs, Africa, and the continent's younger population.

The EU Global Gateway is a major investment programme targeting the so-called Global South, a term that, while simplifying complex realities, is widely used in policy discourse. The initiative seeks to provide significant investment opportunities across the Global South, with at least 55% of the funding expected to be allocated to Africa [1]. In addition to its economic objectives, the Global Gateway serves a geopolitical purpose as the European Union's strategic response to China's Belt and Road Initiative (BRI) [2]. Launched in 2021, the programme began implementing its first projects in Africa and Latin America, with further expansion occurring by 2023 [3].

A distinctive feature of the Global Gateway is its commitment to the United Nations Sustainable Development Goals (SDGs), a standard that distinguishes it from initiatives such as China's Belt and Road, which does not prioritize these objectives [3]. This commitment may limit the EU's flexibility compared to China. But also, why? Why is the youth in Africa, and why the private sector in the SMEs in particular? First, why the Youth in Africa? Because the youth are key.

For Africa's future, given the demographic explosion currently taking place on the continent, Africa is the last region that has not yet experienced its demographic expansion. So that's Africa's turn. That's quite normal and expected, but the population of Africa is expected to double by the year 2050 [4]. At that time, the population of Africa will be equivalent to the combined populations of China and India. So, the median age in Africa is below 20. And by then it will be 17 years old. So, when we talk about the youth in Africa, this is key if this demographic expansion is to be harnessed to bring benefits. Then, Africa needs to create between 20 million and 25 million jobs a year, which will be impossible to achieve [5]. The sustainability of African growth will be crucial in providing these new jobs. When you provide substantial public investment (because the EU is not a state, but rather a union of 27 states). You do this with the hope that you will also attract private investment, particularly from SMEs. Why particularly from SMEs? Firstly, because major companies already invest in certain domains in the Global South, and also because there are 25,000,000 SMEs in Europe within the Single Market. This is a cornerstone of the European economy. They make up 99% of all

businesses (i.e., 99% of businesses are SMEs). We must realise that they employ over 88 million people out of a population of 450 million [6;7]. This is very, very substantive.

Given these foundations, some analysts argue that Europe has the potential to become an SME superpower. While the European Union is a significant economic power, it remains politically less influential. In the current geopolitical context, the EU must strengthen its political presence to maintain its global standing. For SMEs to prosper, a stable and predictable environment is essential. The EU aims for its SMEs to benefit from increased investment in the Global South and enhanced connections with Europe. However, the participation of SMEs depends on the presence of a reliable regulatory framework. Political instability, such as recent attempted coups in countries like Benin, increases risk for investors. Nevertheless, if adequate regulatory safeguards are established, SMEs may be more inclined to engage in these projects.

The complexity of regulations, with approximately 6,000 pages of legislation, imposes significant compliance costs and administrative burdens on SMEs. This underscores the persistent need for regulatory simplification within the EU. To attract private investment and place SMEs at the centre of policymaking, the EU must facilitate easier access to finance, provide regulatory clarity, and simplify SME funding programmes. Support for the green transition, digitalisation, and the development of green skills is also essential. These priorities are consistently advocated by key European forums and associations, including the SME Envoy Network, the EUSME Assembly, the SME Intergroup in the European Parliament, SME United, Eurochambres, and BusinessEurope.

Improving the regulatory environment for SMEs should be considered a top priority for the success of the Global Gateway. The aforementioned associations are encouraged to publish a joint report evaluating the effectiveness of the EU Commission's application of the 'think small first' principle in policymaking. These organisations regularly convene events across the EU to facilitate dialogue among SMEs, policymakers, and industry leaders, addressing challenges and exploring potential solutions.

The Global Gateway presents significant investment opportunities in Africa, particularly in the renewable energy sector [8]. European multinational enterprises (MNEs) are leveraging migration flows to Europe to access African markets and participate in the implementation of the Global Gateway through diverse business activities. Additionally, the African diaspora plays a crucial role by regularly sending remittances to their families and communities.

The African diaspora is a substantial asset in supporting development efforts, as members possess local knowledge, familiarity with their countries of origin, and fluency in both local and international languages. This linguistic and cultural competence facilitates stronger connections on the ground. For example, between 2015 and 2016, approximately one million migrants arrived in Germany [9]. The potential benefits for German SMEs are notable, given Germany's status

as Europe's economic and industrial leader, as well as its 10,000 medium-sized enterprises that possess unique competitive advantages. However, many migrants in this wave originated from countries such as Somalia and Eritrea, which currently face significant challenges and are less likely to attract investment. Consequently, the potential for leveraging the diaspora in the German context is limited, as few migrants come from countries like Ghana, Côte d'Ivoire, or South Africa that are more stable and investment-attractive.

In conclusion, the Global Gateway represents an ambitious and strategic initiative by the European Union to foster sustainable and reliable partnerships with countries worldwide. By prioritising the green transition and digitalisation, the programme aims to shape the global economy in the coming decades. The European private sector plays a crucial role in achieving these objectives; however, the EU must invest strategically and expedite digital project implementation to maintain its competitive edge.

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## STARTING A STUDENT-RUN BUSINESS AT LOYOLA UNIVERSITY CHICAGO

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**Context.** The idea emerged from a practical challenge, a frequent catalyst in entrepreneurial ventures. Loyola's main campus is located on the north side of Chicago, while the Business School is downtown. Next to the main campus, the university owned a parcel of land that had remained unused. Michael Brosco, who led the University of Real Estate, was tasked with determining the optimal use for this land. Traditionally, the university would develop real estate or build dormitories, but the site was too small for such projects. Drawing on his experience at the University of Dayton, where student enterprises provided valuable experiential learning, Michael envisioned a similar initiative at Loyola. He proposed developing a residential building, possibly a hotel or guest house, to comply with zoning requirements. However, several obstacles arose, including investment risk, liability concerns, and skepticism from faculty about the project's educational value. The timing was also difficult due to a major recession. Furthermore, Loyola did not offer a hospitality degree, which raised questions about the project's alignment with the university's mission. The primary risk involved undergraduate students managing the guest house, which, because of zoning restrictions, could not operate as a full hotel. The concept was to offer hotel-like amenities within a residential structure, hence the term 'guest house.'

The partnership proved significant. Michael approached me when I was a young newcomer to the university, and I see this as an example of how challenges and necessity can arise from specific circumstances. If the same proposal were presented to me today, my response might differ. I might be less inclined to take risks or feel less compelled to develop a project for my classes, having already established my professional standing. At that time, however, I had not, and this opportunity, though risky, was valuable for my growth.

**Approach implemented.** We structured an MBA course around this initiative, making it the central project for the class I was scheduled to teach. We presented three genuinely viable options to the students. The first option involved

constructing the building and then selling the units as condominiums. However, market prices at the time were unfavorable, and this approach would have resulted in the university relinquishing ownership of the property. The second option represented the default scenario: constructing the building and renting each apartment either to students or to members of the local community. While this option offered some revenue potential, demand in the area was not particularly strong at the time. This context led to a new entrepreneurial alternative: allowing students to establish and manage a guest house as their own business. Under this model, students would oversee the entire operation. Naturally, this approach introduced significant uncertainty, as student management, even with supervision, entailed risks beyond the direct control of faculty.

We organized students into teams with distinct responsibilities. Some teams conducted marketing analyses and identified two primary customer segments: university-affiliated guests and general tourists visiting the city of Chicago. Other teams developed financial models and projections based on various assumptions. Additional teams assessed operational feasibility, particularly in light of students managing the guest house while balancing their academic commitments.

During the semester-long analysis, Michael regularly attended class sessions. We visited the construction site, reviewed architectural drawings, and examined prototypes of the rooms and apartments, including their furnishings. Michael's consistent involvement contributed to the dynamic atmosphere of the course, which became the most contentious one I have ever taught, due to its real-world implications. Although the business remained conceptual at that stage, the ongoing construction provided a tangible context, making the project more immediate and engaging for students.

The project's reality became increasingly apparent as the scale of investment was made visible. Students took ownership of the initiative in a manner I have rarely witnessed since. Emotions ran high, and Michael exemplified the passionate entrepreneurial personality, holding strong convictions about the project's direction and likelihood of success—perspectives not always shared by the class. Ultimately, the experience was both challenging and rewarding, making it a truly memorable course to teach.

**Outcomes.** The financial case was as follows: the total investment amounted to approximately \$3 million. If the university pursued the student-run guest house model, the operation would be required to make monthly payments. Due to loan requirements, only six units could be offered for daily rental to tourists, while the remaining four had to be leased as regular rentals, adding complexity to the business model. This situation exemplified the challenges entrepreneurs face when external constraints do not align with their ideas. Our research indicated an average annual occupancy rate of about 70%.

We developed financial projections for all three options, carefully considering their respective risks and uncertainties. The university retained the authority to make the final decision, as it would maintain ownership of the land

and building while students managed the business. My MBA students presented their analyses and recommendations to senior university leadership, including the President, Vice President, and board members. The first option was financially unviable, while the second, more conservative approach, would yield modest positive cash flows with minimal risk. The third option, despite its uncertainty, provided substantial experiential learning opportunities, allowing students to manage a significant business and gain valuable experience for their future careers. Ultimately, the university President recognized the educational value and endorsed the student-run guest house initiative.

The experiential learning component was considered too significant to disregard, leading the university to approve student management of the operation. Michael assumed a supervisory role, while an initial team of eight undergraduate students took responsibility for all aspects of launching and operating the guest house. The students managed all operational aspects, such as website development, payment processing, marketing, and hiring cleaning staff, even though these responsibilities were not part of their formal curriculum. This hands-on approach required them to learn in real time, often by researching comparable business models. They were responsible for the guest house at all hours, addressing any issues that arose. While student-run businesses are not unusual, this initiative was unique in both scope and complexity [1]. To my knowledge, it remains the only student-run guest house of its kind and has operated successfully for 15 years.

**Conclusion.** In most years, I believe the operation has remained cash flow positive, with no interruption in service. The guest house model has expanded to additional units within the building, now known as Loyola Flats at Loyola Station. Recently, the enterprise underwent rebranding, and a holding company was established to manage and own other businesses. As a result, students with new business ideas can apply and, with board approval, launch additional full-time student-run ventures, with all decisions made by undergraduate students at the university. This experience is documented in a teaching case study published by the Case Research Journal [2].

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# THE IMPACT OF STUDENT MIGRATION ON THE ECONOMIES OF HOST COUNTRIES

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**Introduction.** Over the past few decades, increasing globalization and political conflicts, including armed ones, have had a noticeable impact on migration processes around the world, including student migration. Students move to other countries in search of better education and job opportunities, safety in case of conflict in their homeland, and new experiences. International education is an industry with billions of dollars invested in it, and it continues to grow steadily.

In many European Union countries, international students play an increasingly important role not only in higher education but also in the broader economy. They contribute directly through tuition fees, accommodation, and everyday consumption, while also indirectly supporting local businesses, innovation ecosystems, and employment. After graduation, many of them integrate into the labor market, strengthening the knowledge economy and fostering entrepreneurial activities.

From this perspective, student migration is closely connected with the EU's broader practices of promoting youth mobility, education-to-business partnerships, and international cooperation. European experience demonstrates that involving young people – including international students – in innovation networks, startups, and business incubators helps to enhance competitiveness and sustainable growth. Therefore, analyzing the economic effects of student migration on host countries also contributes to understanding how youth and business cooperation can be leveraged as a driver of economic and social development within the EU framework.

This paper explores the key channels through which student migration affects the economies of host countries, including fiscal contributions, labor market effects, and long-term human capital development.

**Methodology.** The research is based on a comparative and analytical approach, combining qualitative and quantitative methods to examine the economic impact of student migration on host countries. The main objective is to identify and analyze the key channels through which international students contribute to national economies - including tuition fees, living expenses, employment, and post-graduation retention.

The study relies primarily on secondary data collected from official government sources, international organizations (such as OECD), and national

statistical offices of the selected countries. Additional information was obtained from research reports, policy documents.

To ensure comparability, data were standardized to the same time period (2024-2025). The analysis focuses on six major host countries – the USA, Canada, the United Kingdom, Australia, France, and Germany – which together account for the largest share of global international student flows.

The methodological framework also includes an economic impact assessment, which evaluates both direct and indirect effects of student migration. Direct effects include tuition payments and personal expenditures on housing, transport, and services, while indirect effects cover contributions to local businesses, innovation networks, and labor markets. Descriptive and comparative analysis was applied to assess the scale of financial benefits and to highlight structural differences among host countries.

This methodological approach makes it possible to draw general conclusions about the efficiency of investments in international education and their relevance to EU practices promoting youth mobility, skills development, and business cooperation.

**Results.** To better understand the dynamics of international education and global mobility trends, it is useful to look at the main destination countries attracting the largest numbers of international students in recent years (Table 1).

Table 1 – The most popular destination countries for international students in recent years, based on research findings and official government data

Country	Most popular destination countries
USA	Around 1.1 million students in 2024.
Canada	Target cap of 437 000 students in 2025, which is almost a 10% reduction from 2024 target cap.
Great Britain	Around 11% of all international students in 2024, dropped after the year 2023-2024
Australia	Around 955 317 international student enrolments for August 2025.
France	443 500 international students in 2024-2025.
Germany	Over 405, 000 students in the winter semester 2024-2025.

*Source:* created by the author based on [1-5]

All listed above countries are popular not only for good education. For example, USA is valued for good job opportunities, universal language (English), freedom of speech, belief and identity and safety. Also, many immigrants, including students, are attracted to the idea of an American Dream.

UK is chosen for English, as well as Canada, US and Australia. Also, immigrants find the diversity of cultures there attractive, as well as employment and social security.

Canada offers high quality of life, strong economy and job opportunities, welcoming multiculturalism, and comprehensive social systems like universal healthcare.

Australia is popular for appealing environment and high quality of life, friendly people, multicultural society, excellent healthcare and great opportunities for self-expression because of high tolerance level.

France and Germany offer highly valuable on the labor market educations, high quality of life, good salaries, and many cultural, social and business opportunities as members of EU.

As mentioned above, international education is a project with billions of dollars invested in its growth. But obviously, nobody would invest so much money in a non-profiting field. Aside from paying itself off, international education must give the host countries income.

As mentioned above, international education is a sector with billions of dollars invested in its growth. However, it is clear that no one would invest such enormous sums in a non-profitable field. In addition to covering its costs, international education generates significant income for host countries. The following table illustrates the net financial benefits that countries receive from international students (Table 2).

Table 2 – Net benefit countries received from foreign students according to official government websites (in USA dollars) for 2024-2025, billion \$

Country	Net benefit
USA	43,8
Canada	22,06
Great Britain	49,8
Australia	32,6
France	1,6
Germany	18

*Source: created by the author based on [6-7]*

The net benefit depends on lots of different aspects. For example, in the UK tuition is many times higher than for domestic students, and in Germany most public universities charge \$- \$1,747/year. Also, there are other sources of income for economy, such as living expenses, social services, retention after graduation etc.

Therefore, the findings clearly demonstrate that student migration generates significant economic benefits for host countries, not only through direct financial inflows but also via long-term socio-economic effects. Countries with well-developed educational systems and favorable immigration policies, such as the United Kingdom, the United States, and Australia, tend to receive the highest net benefits. This is largely due to higher tuition fees for international students and efficient integration mechanisms that allow graduates to enter the labor market. In contrast, countries like Germany and France, where education is largely subsidized, benefit more from long-term human capital accumulation and labor market contributions rather than immediate financial gains.

**Discussion.** The analysis highlights a strong connection between student migration and the European Union's broader goals of promoting youth mobility, skills development, and business cooperation. By engaging international students in research projects, startups, and innovation networks, host countries enhance their global competitiveness and foster sustainable growth. Such cooperation also helps bridge the gap between education and business, providing young people with practical skills, entrepreneurial experience, and cross-cultural competencies that are highly valued in the modern economy.

However, several aspects of this issue remain insufficiently explored and require further study. Future research could focus on the social integration and adaptation of international students in host communities, as these factors directly affect their decision to remain in the country after graduation. Another promising direction involves assessing the long-term fiscal impact of student migration – including tax contributions, innovation outputs, and entrepreneurship rates among international graduates.

**Conclusion.** To summarize the information given above, investments in attracting foreign students and offering them job opportunities is a profiting strategy for economy of these countries both in short-term (expenses of students during the studying years) and long-term (their investment in economy as future citizens with jobs in case they stay in the country after graduating, and chances of this are mostly pretty high) perspectives. Student migration doubtlessly has a positive impact on host countries, and the government is always ready to welcome hard-working, talented and socially active learners regardless of their nationality and beliefs, which also helps to create a friendly multicultural society full of great people who will give the host countries bright and successful future.

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## **MECHANISM OF STATE SUPPORT FOR SOCIAL ENTREPRENEURSHIP: UKRAINIAN REALITIES AND EUROPEAN EXPERIENCE**

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Social entrepreneurship, under the conditions of growing social challenges in Ukraine, is gaining increased significance and relevance due to its focus on solving urgent social problems combined with economic responsibility for generating profit. In this context, state support for social entrepreneurship becomes particularly important, as the state acts as a guarantor of social security, social stability, and social development. Amid war and its consequences, demographic shifts, a large number of people forced to leave their homes and established lives, destruction of parts of the economy, and an increasing need for social services, the importance of state support for social entrepreneurship becomes extremely urgent and should be aimed at strengthening its potential.

Analyzing the mechanism of state support for social entrepreneurship in Ukraine and the European Union allows assessing the effectiveness of existing tools and developing recommendations for adapting European practices to Ukrainian realities. This will help expand the scope of socially oriented enterprises and address urgent social issues.

Social entrepreneurship in Ukraine, as a distinct type of entrepreneurial activity, is still not regulated at the legislative level. The draft Law of Ukraine “On Social Enterprises,” submitted to the Verkhovna Rada of Ukraine, remains only a proposal. The draft law provides for the creation of an interagency commission

authorized to: grant enterprises the status of a social enterprise; determine forms of state support with the issuance of the appropriate permit; revoke such permits or enterprise status. The commission also oversees regional commissions and resolves disputes [1].

The draft law also outlines measures to support social enterprises. The main measures include: tax incentives, investment incentives, land-use benefits, repayable and non-repayable financial assistance, loans, priority placement in government procurement and programs, and employment opportunities for vulnerable groups. It also foresees funding for social projects and programs from the state budget on both repayable (budget loans) and non-repayable terms, with funding volumes determined by programs approved by the Cabinet of Ministers of Ukraine or local authorities.

Thus, Ukraine is only at the initial stage of recognizing and regulating social entrepreneurship at the legislative level. However, this does not mean that social entrepreneurial activity is absent. On the contrary, recent realities show that entrepreneurship is becoming increasingly socially oriented due to the need to function under conditions of instability and uncertainty. Socialization manifests through employing vulnerable or socially disadvantaged people (persons with disabilities, internally displaced persons, women who lost their breadwinner due to war, individuals who lost their jobs due to destruction or closure of enterprises, etc.); producing socially significant goods; providing services aimed at solving social issues (education, medical rehabilitation for war victims, psychological assistance, cultural, sports, ecological programs, etc.); directing profit or part of it toward charity, social programs, and NGO support.

There are numerous practical examples of social entrepreneurship in Ukraine, each addressing specific social challenges [2]. According to the National Institute for Strategic Studies, Ukrainian social enterprises are mainly focused on: employment of vulnerable groups (61%); directing profits toward supporting social organizations (around 53%); providing services to specific population groups (40%); funding service provision (27%); only 3% are focused on environmental protection, and 7% are engaged in other activities [3].

In Europe, according to the European Commission, about 2 million social enterprises operate, accounting for approximately 10% of all registered businesses. They employ more than 11 million workers (6% of the total workforce).

The main areas of activity include:

- creation of jobs, training, integration, and social adaptation for people with disabilities, the unemployed, and refugees;
- personal social services — healthcare, welfare, medical assistance, professional training, education, childcare, elderly care, and support for low-income groups;
- local development in disadvantaged regions — enterprises in remote rural areas, micro-district rehabilitation projects, cooperation with third countries;

- other areas: agricultural processing, environmental protection, sports, arts, culture, preservation of historical heritage, science, research and innovation, consumer rights, and sports engagement [4].

European regulatory frameworks share both similarities and differences.

The origins of social entrepreneurship are often associated with the United Kingdom, where cooperative movements emerged in the mid-19th century. Today, around 70,000 social enterprises operate there, employing nearly 2 million people (around 3% of the population). One in five social enterprises has an annual turnover exceeding £1 million, contributing around 9% of the country's GDP. British social enterprises operate in construction, transport, waste recycling, trade, food services, green energy, and even theatre. On average, 68% support vulnerable populations, 44% employ them, and 28% operate in highly depressed regions. Nearly 52% of British social enterprises receive income from the public sector, alongside grants, social investments, loans, social impact bonds, equity investments, crowdfunding, and national lottery funds. In 2014, tax incentives were introduced, reducing income tax by 30% for investors in social enterprises [3].

Key features of British social enterprises include [5]:

- a clearly defined social or environmental mission stated in governing documents;
- reinvestment of most profits into social projects (about 50% must be reinvested);
- independence from the state;
- management aligned with the social mission;
- accountability and transparency.

In Germany, most social enterprises address issues of vulnerable groups: migrants, refugees, unemployed youth, and people with disabilities. The “Kiron” platform allows refugees to obtain education remotely. The “Social Impact” organization, active for over 20 years, supports social entrepreneurs as a “social innovation agency.” State support is implemented through two key directions: stimulating successful initiatives and developing cooperation strategies between social entrepreneurs and the government [4].

In many European countries, social entrepreneurship is clearly defined and legally regulated (Italy, Belgium, Spain, Poland, Portugal, UK, Finland, France, Greece, Czech Republic, etc.) [6,7].

Italy was one of the first countries to legally define social entrepreneurship. In 1991, Law No. 381 established social cooperatives, divided into two types: “A” – providing social, educational, and medical services; “B” – creating employment for vulnerable populations (at least 30% must be employees from these groups).

Profit distribution is limited, and asset development is required.

In Poland, social entrepreneurship gained momentum after the adoption of the new Constitution (1997) and EU accession (2004). Key legal acts include: “On Public Benefit Work and Volunteering” (2003), “On Social Employment” (2003), “On Employment Promotion and Labor Market Institutions” (2004), and “On

Social Cooperatives” (2006). The latter provides three founding mechanisms: through integration centers, by NGOs or local governments, or individually. Founders are exempt from registration fees and may receive financial support. Local authorities may purchase services from social cooperatives without tenders [4].

Thus, proper legal regulation is a key factor in the successful functioning and support of social enterprises in Europe.

Ukraine should adapt financial support mechanisms (tax benefits, preferential lending), expand educational initiatives for entrepreneurial competency, and develop information platforms to popularize social entrepreneurship. Altogether, this will create conditions for systematic development of social entrepreneurship and increased social responsibility.

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## SOCIAL AUDIT AS A TOOL FOR STRENGTHENING TRUST BETWEEN YOUTH AND BUSINESS

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**Introduction.** In the context of ongoing transformations within the global and European economic environment, the importance of corporate social responsibility (CSR) and transparent business practices continues to grow. Youth,

as a dynamic socio-economic group, play a crucial role in shaping innovation, developing entrepreneurship, and modernising business ecosystems. Their expectations regarding ethical behaviour, accountability, and social engagement of companies significantly influence the formation of new standards in youth–business cooperation.

Against this background, social audit emerges as an essential mechanism that provides independent verification of a company’s social commitments, strengthens the trust of young people in business, and promotes sustainable partnerships. In Ukraine - where European integration processes overlap with the challenges of wartime the need for responsible, transparent, and socially oriented business practices becomes especially urgent. Companies oriented toward sustainability, youth engagement, and responsible governance require effective instruments to assess their performance.

The aim of this paper is to analyze the role of social audit in strengthening trust between youth and business, examine relevant European practices, and identify opportunities for adapting these approaches to the Ukrainian context.

**Methodology.** The methodological framework of the study includes: i) An analysis of European standards and regulatory documents (ISO 26000, EU ESG reporting directives, youth and employment initiatives); ii) Structural and logical analysis of the role of social audit in youth–business cooperation; iii) Comparative analysis of CSR and non-financial reporting practices in the EU and Ukraine; iv) Systematisation of the main functions of social audit and their impact on corporate reputation. This approach enables a comprehensive assessment of the potential of social audit to enhance transparency and strengthen youth–business partnerships.

**Results.** In EU member states, social audit is an integral part of corporate governance. Companies are required to report on labour conditions, environmental performance, diversity, ethical governance, and community engagement. Young people - whether as employees, entrepreneurs, or innovators - consider these aspects highly relevant when choosing employers or business partners.

European initiatives such as the EU Youth Strategy, Youth Guarantee, and Erasmus for Young Entrepreneurs promote youth entrepreneurship and employment, while emphasising the need for responsible corporate behaviour. Social audit therefore plays an important role in increasing youth trust in companies; providing access to reliable non-financial information; shaping the image of socially responsible employers; encouraging youth involvement in community, innovation, and sustainability projects.

A social audit provides an independent assessment of non-financial dimensions of corporate activity, including working conditions and equal opportunities; corporate culture and values; environmental practices; social investments and community engagement; transparency and accountability systems.

By reducing information asymmetry, social audit helps ensure that youth and other stakeholders have a clear and accurate understanding of a company’s

social impact. This is particularly important in an era where ethical and sustainable behaviour is increasingly valued.

In wartime conditions, Ukrainian companies are increasingly involved in supporting communities, internally displaced persons, humanitarian initiatives, and reconstruction projects. Social audit enables companies to verify their social commitments; evaluate the effectiveness of youth support programmes; increase investment attractiveness and compliance with EU standards; strengthen trust among young employees, communities, and stakeholders; align business practices with European sustainability requirements.

As Ukraine moves toward post-war recovery, social audit may become a key instrument for establishing long-term reputational stability and fostering cooperation with European partners.

Social audit contributes to strengthening corporate reputation by confirming compliance with CSR and sustainability standards; fostering youth trust in business; enhancing transparency and public accountability; encouraging youth involvement in innovation, volunteering, and entrepreneurship initiatives.

For young people, working with companies that demonstrate proven responsibility is a critical motivator for long-term professional and entrepreneurial engagement.

**Discussion.** The findings indicate that social audit holds significant potential for enhancing youth–business cooperation. The implementation of social audit practices supports structured development of CSR activities; strengthening of corporate culture; creation of transparent and equitable business environments; harmonisation of Ukrainian business practices with EU sustainability and reporting standards.

In the context of post-war reconstruction, social audit becomes particularly important for fostering societal trust, improving accountability, and strengthening Ukraine’s integration into the European economic space.

**Conclusion.** Social audit functions as an effective instrument for building trust between youth and business and constitutes an important component of European CSR and sustainability practices. Its application contributes to increased transparency of corporate activities, the development of socially oriented corporate cultures, the promotion of youth entrepreneurship, the enhancement of sustainable youth–business partnerships, and the acceleration of Ukraine’s European integration. Expanding the use of social audit in Ukrainian companies will support sustainable recovery, improve investment attractiveness, and foster closer cooperation between youth and business communities.

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## DIGITAL TRANSFORMATION AND CHALLENGES OF THE TRANSITION PERIOD FROM INDUSTRY 4.0 TO INDUSTRY 5.0

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**Introduction.** Digital transformation has become a decisive driver of contemporary economic development, accelerating the diffusion of intelligent technologies and reshaping industrial, managerial and socio-economic systems. The transition from Industry 4.0 to Industry 5.0 represents a structural shift from automation-driven production toward a human-centric paradigm based on artificial intelligence (AI), the Internet of Things (IoT), advanced robotics, cyber-physical systems and data-based decision-making.

The research problem arises from the necessity to evaluate how this technological paradigm shift affects enterprise performance, competitiveness, industrial sustainability and national economic resilience. Industry 5.0 emphasises personalised production, resource efficiency, social responsibility and synergetic cooperation between humans and intelligent systems. These trends create new strategic, financial and organisational challenges for enterprises.

The objective of the study is to analyse the economic implications of digital transformation in the context of the transition from Industry 4.0 to Industry 5.0 and to determine the factors shaping competitiveness and resilience at enterprise and national levels.

**Methodology.** The research methodology integrates qualitative and quantitative approaches i) analysis of international analytical databases (World Bank, OECD, European Commission) to assess trends in digital development and industrial transformation; ii) review of scholarly publications on Industry 4.0, Industry 5.0, intelligent technologies and digital convergence; iii) case studies of

enterprises integrating AI, IoT, robotics and other Industry 5.0 solutions; iv) SWOT analysis to evaluate opportunities and constraints for enterprises during the transition period; v) economic assessment of potential benefits, risks and financial impacts of adopting intelligent technologies; vi) trend analysis and short-term forecasting to identify future vectors of digital transformation.

This methodological framework ensures a comprehensive assessment of digital, technological, organisational and socio-economic implications.

**Findings.** *Technological transformation.* The shift from Industry 4.0 to Industry 5.0 is characterised by: integration of human expertise into intelligent production systems; personalised and adaptive manufacturing; diffusion of AI, IIoT, blockchain and autonomous robotics; increased role of ethical, social and environmental priorities. Enterprises implementing these technologies achieve higher adaptability, faster decision-making, reduced operational risks and improved long-term sustainability.

*Socio-economic transformation.* Digital transformation influences socio-economic structures through rising demand for digital, analytical and interdisciplinary skills; the emergence of new business models and financial strategies; enhanced innovative capacity and resilience; expansion of green technologies and resource-efficient systems. Industry 5.0 reinforces human-centric development, linking technological progress with social welfare and environmental sustainability.

*Trends in Ukraine.* Ukraine demonstrates progress in public digital services, fintech, telecommunications and cloud infrastructure. However, digitalisation levels across industries remain uneven, digital infrastructure requires substantial investment and the gap with EU industrial digitalisation standards persists. Adopting Industry 5.0 solutions could enhance industrial competitiveness, accelerate post-crisis recovery and strengthen economic resilience.

**Significance.** The findings highlight i) the transformative role of intelligent technologies in improving productivity, sustainability and competitiveness; ii) the need to update enterprise and national strategies to integrate human-centric innovation principles; iii) the importance of investing in digital skills development and cross-sectoral training programmes; iv) the necessity of financial mechanisms supporting technological modernisation and risk mitigation. This study contributes to academic and practical discourse by outlining pathways for effective digital transformation during the transition to Industry 5.0.

**Conclusion.** Digital transformation significantly influences economic systems, reshaping production models, management practices and financial strategies. The transition from Industry 4.0 to Industry 5.0 enhances competitiveness and resilience through the adoption of AI, IoT, robotics, blockchain and human-centric technologies. However, digital maturity gaps, economic instability and limited investment capacity may constrain the pace of adoption.

Future research directions include measuring the economic effects of specific Industry 5.0 technologies in Ukrainian enterprises; identifying priority sectors for accelerated industrial modernization; assessing environmental and social implications of the new industrial paradigm.

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## DEVELOPMENT OF CREATIVE ENTREPRENEURSHIP IN COOPERATION WITH EU

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In the current conditions of active integration of Ukraine into the European space, the development of creative entrepreneurship is becoming particularly relevant. This area plays an important role in the socio-economic development of Ukraine, therefore, for the effective development of creative business, systematic actions are necessary, the implementation of European practices and the creation of conditions for partnership with EU countries. Therefore, the study of European experience in supporting creative entrepreneurship is extremely relevant.

In the context of a globalized world, creative entrepreneurship is increasingly playing the role of a driver of economic development, a source of innovation and social progress. The European Union consistently demonstrates awareness of the strategic importance of cultural and creative industries, implementing multi-level programs to stimulate their growth [1]. One of the leading initiatives is the Creative Europe program, aimed at supporting cultural diversity and increasing the competitiveness of the cultural and creative sectors. In the 2021-2027 budget cycle, it received funding of €2.44 billion, almost double the amount in the previous period. The program is structured around three strands:

- culture - educational, artistic and cooperation initiatives;
- media - development of film, television and digital content;
- cross-sectoral cooperation supporting digitalization, new business models and innovation.

Research shows that the development of creative industries in EU countries is closely linked to the re-imagining of the role of cities as platforms for innovation and culture. After deindustrialization in the 1970s, many European cities, such as Manchester (UK), Lyon (France) and a number of cities in the Ruhr region in Germany, faced economic difficulties [2]. This necessitated a new development policy, with a focus on the creative sector.

In response to these challenges, EU governments have begun to explore the potential of creative industries in greater depth [3]. The first strategic documents have been appearing since the late 1990s: in the UK – Creative Industries Mapping Document, 1998; in Denmark – Denmark’s Creative Potential, 2000; in Austria – Erster Österreichischer Kreativwirtschaftsbericht, 2003; in the Netherlands – Culture & Economy, 2005. The European Commission has also confirmed the priority of this area in a number of key documents: «The Economy of Culture in Europe» (2006); «The European Agenda for Culture» (2007); «The EU Green Paper» (2010); «Europe 2020 Strategy» (2010) and the «Creative Europe» program for 2014-2020.

The European approach is based on a holistic vision – support for CCIs involves not only financial investments, but also the development of creative infrastructure, innovations, digital platforms and network cooperation [3]. A feature of this model is the focus on people as a source of ideas and content, which makes the sector resilient to changes in the labor market associated with automation.

According to EU reports, today more than 12 million people are employed in the CCI sector in the region (approximately 7,5% of the economically active population). The European cultural and creative market occupies a leading position in the world. Thus, the ECCIA (European Cultural and Creative Industries Alliance) brings together six leading national associations, including Altagamma (Italy), Circulo Fortuny (Spain), Comité Colbert (France), Gustaf III Kommitte (Sweden), Meisterkreis (Germany) and Walpole (UK), representing over 600 well-known brands. Thanks to the activities of the CCI, more than 30 million jobs have

been created in the global market, and European brands account for over 70% of the high-quality creative products segment [4].

Thus, the EU implements a comprehensive policy of supporting creative entrepreneurship, recognizing its strategic importance for economic growth, innovation and social progress. The main tools for the development of CCI are the Creative Europe program, financial mechanisms for SMEs, initiatives at the national and municipal levels, as well as support for innovation, networking and creative infrastructure. Examples of such European Union countries as Poland, Estonia, Finland, Sweden and Denmark demonstrate a successful combination of cultural policy, urban changes and interdisciplinary cooperation [5]. In general, the European approach is based on investments in human potential, intellectual resources and creativity as key factors of sustainable development. In this regard, the implementation in Ukraine of various forms and instruments of interaction with the EU in the context of the development of creative entrepreneurship has significant prospects.

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## OPPORTUNITIES FOR DEVELOPMENT AND SCALING OF INNOVATIVE IDEAS AT SUMY STATE UNIVERSITY AND THE SUMY REGION

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**Development of startup activities.** Sumy State University (SumDU) is actively transforming from a traditional educational institution into a comprehensive innovation ecosystem, which is a key factor in its competitiveness. This transformation is confirmed by the strategic aspiration to achieve the status of an entrepreneurial European university, which requires compliance with the indicators of innovation activity measured by international rankings, particularly THE and QS. The development of the university's innovation transfer has a positive impact on the development of entrepreneurship in the Sumy region.

From cooperatives of the early 90s to modern information companies. The evolution of commercializing scientific achievements at SumDU has demonstrated a transition from early forms of cooperation to high-tech solutions focused on Deep Tech and Defense Tech. Modern university projects focus on strategically important areas, such as artificial intelligence, cybersecurity, energy efficiency, Cleantech, and Smart Cities.

The implementation of the direction of startup development at SumDU began with active international cooperation and grant projects. The "New Generation" Startup Center was founded back in 2013, receiving support within the framework of the SUCSID TEMPUS project of the European Commission. This initiative enabled us to gain experience, develop methodological support, acquire the necessary equipment, and officially launch the startup center.

Further institutional development took place with the support of international organizations and programs, including the UNIDO GCIP (United Nations Industrial Development Organization). 2021 to 2025; DISCO (Horizon Europe) in 2023–2024.

Integration of EU experience. International experience is actively introduced into curricula. Experts involved in the Startup Center's work utilize the knowledge gained from international projects. Active participation in programs such as Erasmus+, the Jean Monnet Module, and university networks is one key opportunity for further scaling up innovations.

Recent years, especially since 2014 and the start of the full-scale invasion, have been characterized by a significant development of state support for entrepreneurship and innovation in Ukraine. This support is particularly aimed at the development of university startup schools as key platforms for the birth, growth, and commercialization of new ideas.

Key state programs and initiatives that SumDU is currently participating in:

1. The Ministry of Education and Science of Ukraine launched an ambitious project to create a network of “Startup School - Incubator - Accelerator” based on higher education institutions. This network has been expanded to 23 startup schools across Ukraine. SumDU was selected as one of the first six participants in

this national network, and its project “Institutional Development of the Startup Center of Sumy State University “New Generation” received funding of up to UAH 1.5 million for infrastructure development and support for innovation activities. The primary goal of these startup schools is to enhance the information, organizational, educational, and technical capabilities of young scientists, postgraduates, and students who aim to implement innovative ideas.

2. State Defense Tech Cluster Brave1. In 2023, the Brave1 state cluster was launched, which became a key mechanism for supporting developments in the field of Defense Tech (defense technologies). Brave1 provides grant funding, expertise of military specialists, field and combat tests, as well as market entry support (in particular, codification) for innovative solutions. Brave1 also collaborates with universities, attracting top scientific talent and creating opportunities for students through hackathons and consultations.

3. Ukrainian Startup Fund (UFS) and Diia.City. The UFS remains the main state source of grant support for startups in the early stages. The Fund actively cooperates with the Ministry of Education and Science, supporting science-intensive innovations through programs such as the Science & Business Acceleration Program 2025, which focuses on MedTech, BioTech, AgroTech, and dual-use technologies. In addition, the government has introduced a special tax and legal regime for Diia.City to ensure favorable conditions and increase the investment attractiveness of technology businesses.

University startup schools are the central link that ensures the birth and growth of new ideas, the creation of the first prototypes, and access to investments.

The participants in the startup movement at SumDU include: the Startup Center of SumDU "New Generation", the Laboratory of Ideas, the Business School "Youth&Business", the Scientific Society of Students, Postgraduate Students, Doctoral Students, and Young Scientists, the Sumy Business Hub, and the Sumy Machine-Building Cluster of Energy Equipment. The following disciplines are introduced into the educational process: "Startup, First Steps in Entrepreneurship: Experience of Ukraine and the EU", "Innovative Entrepreneurship and Startup Project Management", "Organization and Management of Startup Projects", etc.

Training at the SumDU startup school encompasses various stages, including searching and testing business ideas, conducting market research (TAM/SAM/SOM), developing a profit model, promoting sustainable development, and addressing legal aspects. For the practical implementation of ideas, the university provides access to equipped laboratories and a modern 3D scanner purchased with funds from international projects.

The SumDU Startup School prepares teams for participation in national and international competitions. For example, SumDU teams actively apply for competitions such as the International Festival "Sikorsky Challenge", where they can receive financial and mentoring support. Projects focus on strategic areas, including defense technology, Cleantech, smart cities, artificial intelligence, and cybersecurity.

The focus of the Startup Center "New Generation" is to enhance innovation policy and entrepreneurship by promoting creative activity, competitiveness, and employability among graduates. The Center provides support through the organization of educational seminars, training, crash tests, as well as the development of partnerships and mentoring with leading startup hubs and investment funds.

A critical part of the current activity is creating an environment of "startup resilience". Within the framework of the scientific and technical project of the Ministry of Education and Science of Ukraine "Institutional Development of the Startup Center of Sumy State University "New Generation"" (No. 0124U004852), the university ensured uninterrupted and efficient work. This was achieved through the purchase of a Starlink satellite modem, charging stations, and portable graphics servers. Access to equipped classrooms, including in the shelter, was also provided.

**Results of the SumDU Startup Center "New Generation".** The total amount of investments attracted to startups and infrastructure development at SumDU since its opening in 2015 is approximately 4 million hryvnias for the implementation of 22 startup projects. In 2025, 30 additional teams were added to the database of promising projects and ideas, and a training program was launched for them, involving mentors and experts.

Startup teams are participants and winners of all-Ukrainian and international competitions. New projects are created and developed by successful teams. Innovative ideas of developers help in the defense sector and contribute to the implementation of the Sustainable Development Goals.

Despite commendable results, startup activities in the frontline region face a number of challenges:

1. Security and infrastructure constraints: The need to constantly maintain a "sustainable startup environment" in the face of shelling and power outages is a significant organizational and financial burden.

2. Funding participation in competitions: There is a need to ensure travel funding for team representatives, especially students, to participate in offline competitions and hackathons, as such events are critical for real commercialization and networking.

3. Commercialization of deep technologies: Many promising technology projects, such as thermoelectric generators and catalysts for green hydrogen, are in the early stages of research and development and have a long cycle to commercialization, requiring significant long-term investments.

Startup development plans for 2025–2028, and key strategic directions include:

1. Creation of Startup Hub: Development of a single co-working space, "Startup Hub," based on the Startup Center "New Generation" to ensure uninterrupted access to resources and stimulate the search for new ideas.

2. Development of a mentoring network: Formation of a multidisciplinary mentors' council, which will include scientists, representatives of business accelerators, and venture funds, to support startup teams.

3. Educational transformation: Updating and digitalization of profile courses ("Business planning of a startup project", "Innovation management", "Intellectual property").

Goals (2028): Launch of DefenseTech/DeepTech/Impact tracks. The plan stipulates that the university aims to secure UAH 10 million in annual attracted investments, create 100+ jobs, and launch 15 startups with sales by 2028.

**Prospects for the development of innovative entrepreneurship for universities.** The practical implementation of scientific ideas, following the example of SumDU, can be successfully implemented through projects that operate in strategic formats of cooperation with the public sector and business (G2B/University-to-Business and G2G/University-to-Government), which have the potential for growth even in wartime conditions and will certainly be important for reconstruction. The role of the university in such models is to provide innovations, expertise, and technologies to solve state and social problems, as well as in the commercialization of knowledge.

The new vision and prospects for the development of university-based science parks in Ukraine are closely related to the national innovation strategy WININ 2030 and deep integration into European innovation ecosystems. A modern university is evolving into a comprehensive innovation hub that extends beyond the traditional understanding of a physical campus, focusing on creating a sustainable and entrepreneurial ecosystem.

A key national initiative defining the new vision is the Science.City project. This initiative aims to unite the efforts of science, business, and government into a coherent network of modern science parks that will act as incubators for innovation, launch startups, and attract global investment.

For the successful implementation of the new vision, institutional changes are needed that encourage entrepreneurial activity among scientists and students:

- Formation of a multidisciplinary board of mentors from scientists, representatives of business accelerators, and venture funds to support young teams.
- Updating the regulatory framework: It is recommended to develop a methodology for rating structural units that would stimulate startup activity.
- Key performance indicators (KPI): Incentive indicators should take into account: the volume of investments and grants attracted by startups, the number of participating students, the share of interdisciplinary teams, and the orientation of projects on the Sustainable Development Goals (SDGs).
- Incentive through ratings: These indicators should be integrated with the evaluation criteria of international rankings (THE, QS) to increase the competitiveness of the university on the global stage.

**Promising areas for startups in the Sumy region.** Given the regional specifics and national priorities, the following sectors are promising: the agro-

industrial complex and processing industry, information technology (IT), the energy sector and critical materials, and the creative economy and social entrepreneurship.

It is important to develop and support state programs of Ukraine that are already providing real results:

- eWork: A government grant program that includes several areas, including grants for creating or developing one's own business, as well as support for enterprises.

- Ukrainian Startup Fund (UFS): The Fund actively supports innovative and technological startups, offering grants and acceleration programs.

- Regional initiatives: Local authorities, in particular the Sumy City Military Administration, hold startup competitions and offer financial support for promising entrepreneurial initiatives at the local level.

- Business Association "4Business": Implements projects and provides grants and consultations, actively working in the Sumy region.

International programs and grants:

- Seeds of Bravery (EU): A European Innovation Council (EIC) project with a total budget of €20 million, aimed at supporting Ukrainian deep-tech startups. Grants can range from €300,000 to €500,000. Focus on cybersecurity, AI, robotics.

- Horizon Europe and Digital Europe: Ukraine participates in these European programs. The Digital Europe program has a budget of €3.2 billion for 2025–2027 and supports projects in the field of digital transformation.

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## **PROBLEMS AND PROSPECTS FOR THE DEVELOPMENT OF YOUTH ENTREPRENEURSHIP BASED ON ECOSYSTEM SERVICES DURING WARTIMEP**

Under the current conditions of military aggression, Ukraine has faced numerous economic, environmental, and social challenges. The sharp deterioration of the business environment, the loss of control over part of its territories and resources, as well as the migration of the young population, have significantly influenced the potential for innovative economic development. However, despite these difficulties, youth entrepreneurship demonstrates the capacity to actively search for new economic models, adapt to changes, and form modern businesses aimed at environmental sustainability, the restoration of natural resources, and the development of ecosystem services as the basis for a new economic balance. The problems and prospects for the development of youth entrepreneurship based on ecosystem services represent a complex process that requires a comprehensive approach and well-grounded decisions.

The full-scale invasion has led to numerous negative environmental consequences. Military actions significantly affect the state of ecosystems and their ability to provide ecosystem services. This is caused by soil degradation, water pollution, and the partial or complete destruction of forests and protected areas. According to government estimates, as of the end of 2024, environmental damage amounted to 65 billion USD [2]. Such a situation complicates yet simultaneously stimulates the development of entrepreneurial initiatives focused on ecosystem services.

Ecosystem services encompass a wide range of benefits provided by natural systems to humans: from regulating functions such as water purification, climate regulation, and pollination, to cultural services — recreation, ecotourism, landscape attractiveness, and educational opportunities.

Growing awareness of the value of natural capital increasingly directs attention to “sustainable” business models based on ecosystem restoration, sustainable tourism, recycling, eco-technologies, green consulting, agroecological solutions, and the use of natural processes to create economic value. Overall, the active integration of ecosystem services into economic mechanisms opens opportunities for the formation of new market segments that may potentially contribute to post-war recovery and development.

Limited access to financial resources for young entrepreneurs is one of the most evident problems [1]. The current situation in the banking sector shows a focus on minimizing risks; thus, financing innovative, environmentally oriented projects or unfamiliar business models is not a priority activity. Moreover, there is a shortage of grant programs aimed at supporting startups in the field of ecosystem services, while demand for such initiatives is rapidly growing. At the same time, the level of specialized education and advisory support remains insufficient,

limiting the ability of young entrepreneurs to formulate a high-quality vision of their prospective businesses while considering the specifics of the chosen field.

Equally important are administrative barriers and the overall instability of the regulatory environment, which—due to military actions—undergoes constant and often unpredictable changes. Entrepreneurship based on ecosystem services requires clear and structured procedures for accessing natural territories, transparent rules for using such resources, as well as proper regulatory support for ecosystem service assessment [3]. Weak integration of the ecosystem approach into state policy discourages the development of relevant initiatives and creates uncertainty in establishing partnerships and expanding entrepreneurship in this area. Additionally, the interaction of youth-led businesses with local communities has become more complicated: communities operate in crisis mode and have limited capacity to support environmental initiatives. Workforce shortages, migration, and loss of infrastructure further reduce their ability to cooperate with young entrepreneurs working on ecosystem-based projects.

Despite all the above-mentioned negative factors, youth entrepreneurship based on ecosystem services has significant prospects. The wartime context stimulates public demand for environmental safety, the restoration of natural territories, and the implementation of innovation in the field of sustainable development. Following these trends, youth startups seek to become drivers of ecological modernization by developing solutions for environmental monitoring, water purification, waste management, or the restoration of damaged territories. Modern digital technologies — remote sensing, GIS analysis, mobile applications for collecting environmental data — open opportunities for creating business models oriented towards providing ecosystem and related services.

The last decade has also seen growing interest from international organizations, funds, and programs aimed at supporting youth initiatives focused on greening and ecological recovery. The active promotion and integration of “green transition” principles create opportunities for financing startups and social enterprises based on ecosystem factors and represent an important direction for Ukraine’s post-war reconstruction.

Youth entrepreneurship can play a crucial role in shaping new cooperation and partnership approaches. The involvement of young entrepreneurs in projects related to community-based natural resource management, the development of sustainable business clusters, and the organization of local initiatives enables the combination of market mechanisms with social responsibility strategies. Such integration fosters the emergence of innovative products and services based not only on the use of natural resources but also on their preservation and restoration. Important factors include the integration of environmental education into university programs, the development of competencies in environmental management, social entrepreneurship, and digital skills.

In conclusion, it can be stated that the development of youth entrepreneurship in the field of ecosystem services during wartime, despite

significant challenges, has strong strategic potential for forming a resilient economy and restoring Ukraine's natural resources. Young people can become a driving force in modernizing environmental policy, implementing nature-based solutions, and developing the green economy. With sufficient state support, the integration of innovative technologies, and effective cooperation with stakeholders, ecosystem services may become the basis for a new wave of entrepreneurial initiatives that combine economic efficiency, environmental responsibility, and social significance in the context of wartime challenges and post-war recovery.

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## DIGITAL TECHNOLOGIES AND AI IMPACTS ON YOUTH LIVES AND REGIONAL DEVELOPMENT

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**Introduction.** Digital technologies and AI have already become part of our everyday lives. The changes that technology has brought us in recent years are already noticeable: from the advent of the first smartphone to AI and the state in your phone. However, these changes have both positive and negative consequences.

Considering the positive effects, it is worth noting that the development of digital technologies has increased the accessibility of knowledge and services. Digital tools, such as AI, mobile applications, social networks, internet platforms, and online forums, make numerous services and products accessible, even in regions with limited development. In Ukraine, the development of digital technologies enables children from areas close to the front line or even from occupied territories to continue their education, thereby reducing educational

losses. Accordingly, the development and promotion of the latest digital technologies in Ukraine's educational environment are important factors in reducing educational inequality between regions. Another example of positive social impact is the emergence of new opportunities for entrepreneurship and employment. This is a pressing issue crucial factor in the Ukrainian context, as population migration due to the war is an acute problem, and the availability of digital technologies and online work helps alleviate migration pressure.

In addition, the availability of AI and digital technology tools opens a wide range of opportunities for their application in regional management, analytics and research. AI can provide automatic data collection by region, monitor the economic situation and/or budget, identify threats to public safety, and search for opportunities for regional development, among other applications.

However, as already mentioned, digital transformation has not only positive aspects, but also potential risks and challenges. Labour automation and AI reduce the need for labour, thereby exacerbating the problem of unemployment. In addition, the requirements for junior specialists in many fields are becoming increasingly demanding: simple tasks can now be performed by AI. For example, in recent years, the list of requirements for junior developers or programmers has grown, as simple code can be written using artificial intelligence. Another significant negative aspect for regional development is dependence on external technologies, as most popular AI-based models and solutions are currently developed outside Ukraine. This ultimately increases external threats to economic and socio-political security.

Therefore, identifying the impact of modern technologies and artificial intelligence on society, and especially on young people, is a relevant and important scientific task. This is the focus of this study.

**Methodology.** This study presents the results of a survey of the population (young people) on the topic 'How do digital technologies and AI affect your life?' Fifty-four people participated in the survey, with the majority being under 18 (approximately 60% of respondents) and the remainder aged between 18 and 25 (40%). Most of the survey participants were residents of regional cities (81.5%), with a majority being students (60% of respondents). A proportion of secondary school students (35.2%) was also among the respondents. The survey results represent the opinions of young people in Ukraine, most of whom reside in two regional centres, Kyiv and Sumy, but also include representatives from other local communities.

**Findings.** When asked about their daily use of AI and digital technologies, over 60% of respondents reported actively using digital technologies in their daily lives. Approximately 6% reported using artificial intelligence very rarely. An equal number of respondents – 2% – do not use AI and rarely use digital technologies. A significant proportion of respondents reported noticing the positive impact of digital technologies and artificial intelligence in education, public services, and the workplace. However, the assessment of these impacts on the quality of life in the

region of residence varies greatly: 29.6% of respondents described the impact of AI and digital technologies as 'very positive', and 27.8% of respondents were unsure whether to describe this impact as positive or negative. At the same time, 11.1% pointed to the very negative impact of new technologies on life in their region.

Interestingly, more than two-thirds of respondents feel threatened by AI replacing certain professions in their region. More than half of them feel threatened but believe that this will not happen soon, while 20.4% of respondents say that changes are already noticeable.

The answers to open-ended questions deserve special attention, as they enable us to determine the positive and negative impacts that society perceives in the introduction of artificial intelligence and digital technologies on the development and life of the region. Among the positive impacts, respondents noted the simplification of life and optimisation of processes; improved access to government, medical and educational services; optimisation of information; accessibility of news to everyone; increased comfort; simplification of work in many areas; and faster service delivery (in particular, referring to the 'Kyiv Digital' app).

Interestingly, there were more responses to the question about negative impacts than to the question about positive ones. For every 20 mentions of positive impacts, there were 26 mentions of threats or problems. The most common narrative centred on the unwise use of artificial intelligence by people, resulting in a decline in their reliance on personal knowledge, and the disappearance of certain professions, which could lead to widespread unemployment. A separate category of negative impact is the consequences of creating overly realistic false content that contributes to the spread of misinformation and deception. Among other consequences of integrating new technologies into society, respondents noted the overflow of the world with non-existent realities and the disappearance of individuality.

Respondents also represented two categories, pointing to problems with the use of AI by people of different ages: some noted the difficulties of using AI by older people, while others noted the dependence of younger people (preschool and school age).

**Discussion.** Thus, the survey results show that the younger generation of Ukrainians under the age of 25 utilises digital technologies and AI in their daily lives, and they are aware of their impact on their routine and life in the region. The results align with those of a nationwide survey on the active use of AI by the Ukrainian population (Yakymenko, 2025) and, in particular, the youth (Eastern Europe Fund et al., 2025). At the same time, a large proportion of these people fear the negative consequences of these transformations and are more aware of them than of the positive opportunities and impacts of AI and digital technologies.

The negative consequences indicated by respondents generally correspond to the traditional understanding of the risks and dangers associated with using AI, including job losses, misinformation, privacy violations, and uncertainty (the threat

of AI itself) (Rybenko, 2025). At the same time, some of these fears, in particular mass unemployment, are still considered myths, as new technologies create demand for other professions (RASK, 2025). In addition, greater awareness of the negative consequences of AI use can be attributed to a lack of adequate knowledge and skills in its application. In particular, as noted in the study (Rohana et al., 2025), greater awareness among students regarding the use of AI (ChatGPT, in particular) leads to a higher assessment of the benefits of its use.

**Conclusion.** In conclusion, it is worth noting that digital technologies and AI have a significant impact on the lives of young people, and, according to their estimates, on the development of regions. At the same time, the level of education in the use of artificial intelligence plays an important role. Without proper development of relevant competencies, users tend to focus more on the negative consequences of AI use, citing the complexity of using the latest technologies for older people and excessive or improper use by younger people. The general problem can be described as follows: people often do not know how to use technology correctly, violating ethical rules (such as academic integrity) without hindering intellectual development, and without compromising their individuality. The results obtained demonstrate the need to introduce specialised training programmes for young people and others to mitigate negative perceptions of the potential consequences and, ultimately, the actual impact of digital technologies and AI on social life.

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# INTELLIGENT AI AGENTS IN IOT AND BIG DATA ECOSYSTEMS: ENHANCING DATA QUALITY, REDUCING INFORMATION NOISE, AND OPTIMIZING REAL-TIME DECISION MAKING

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**Introduction.** The rapid growth of the world's digital data, the development of network infrastructure, and the widespread adoption of the Internet of Things (IoT) create entirely new requirements for information collection, processing, and analysis systems. Streams of telemetry, historical data, events, sensor measurements, and system signals are evolving into a complex, multi-component environment, making traditional analysis methods insufficient.

In such conditions, artificial intelligence (AI) is increasingly acting not only as an optimization tool, but as a fundamental component of the modern digital ecosystem, capable of working with data flows in real time, identifying anomalies that are not captured by threshold methods, reducing information noise, forming correlations and scenarios of system behavior, and making decisions regarding critical situations based on anomalies found in continuous data flows.

This is especially relevant for countries experiencing a high level of digital turbulence and needing effective tools to modernize their economies, such as Ukraine, where digitalization, reconstruction, and a shortage of qualified personnel create a real demand for intelligent analytical systems.

**Theoretical and methodological principles of applying AI in the IoT and Big Data environment.** The IoT ecosystem is formed from an array of sensors, devices, microservices, and cloud platforms that generate vast amounts of raw data, which may include high-frequency streaming, semi-structured and unstructured events (historical logs), large heterogeneous telemetry arrays, along with low-value or duplicated signals.

Such a data set creates key challenges:

- **Signal-to-noise:** critical events are “drowned” in a stream of insignificant triggers. Conceptually, this scenario is similar to a DDoS attack, in which the receiving party misses or refuses to process valuable data because it is overloaded with the general flow of “noise”.

- Lack of linear dependencies: simple threshold rules do not reflect genuine cause-and-effect relationships. In several instances, reaching a particular limit/threshold value is fleeting and has no lasting impact on the system as a whole. However, according to the threshold rules, the event occurred and was recorded, resulting in a large amount of “noise”.

- The need for contextual analytics: an incident depends on the simultaneous behavior of dozens of parameters.

However, Generative and Reasoning-oriented AI models can synthesize information from different sources, perform correlation analysis, recognize recurring patterns of system behavior, and draw conclusions based on multi-factor context. This helps reduce the amount of noise by dozens of times, making it possible to transition from reactive monitoring to intelligent situational analysis.

### **Intelligent agent architecture for IoT and Big Data**

Intelligent agents (AI-ops systems) consist of several mandatory levels:

- Data Ingestion Layer. Collection of events from sensors, metrics, textual historical records (logs), API streams, and MQTT channels.

- Pre-processing Layer. Format normalization, deduplication, detection of primary anomalies, and formation of time windows.

- Correlation & Reasoning Layer. Cross-service correlation of events, root-cause grouping, risk assessment, and prediction of possible scenarios.

- Decision Layer. Generating 1–2 summary messages about the system status instead of dozens of “raw” unprocessed signals, assessing the criticality, and the need to involve special teams to respond to the incident.

- Human-in-the-loop. Humans act as a mechanism for correction, verification, and retraining.

Thus, intelligent agents do not work in isolation, but as part of a composite ecosystem where analytics reinforce operational decisions.

### **Scientific approaches to analyzing big data streams using AI**

In the scientific context, the following areas are key:

- Stream analysis. This analysis examines the stream of system status data (Logs) and telemetry in real-time, considering temporal patterns, contextual dependencies, and the potential for complex anomalies.

- Correlation analysis. Much more effective than threshold triggers, as it allows you to find connections between different components of the system, identifies root causes instead of symptoms, and reduces the number of false positives.

- Semantic analytics. AI agents can interpret unstructured text data, which is not available to classical tools.

- Data quality assessment. Agents can reject noisy events, making Big Data more accurate and cleaner.

This creates the prerequisites for the formation of a new discipline - intelligent management of raw data flows.

## **The impact of AI agents on monitoring efficiency in IoT/Big Data environments**

In highly loaded infrastructures, a phenomenon has been observed that has been called Alert Fatigue – loss of operator attention due to an excess of low-value signals.

Scientific sources (ACM Queue, IEEE, Springer) describe the likely consequences of this phenomenon as a drop in productivity after 30–60 minutes of working with a constant stream of high-priority messages, a significant probability of missing key events in the stream, and a decrease in situational awareness.

AI agents solve this problem by clustering and prioritizing collected signals, reducing the level of information "noise" to 90–97%, and creating summary messages with prioritized consolidated context.

### **Practical example: field study of AI infrastructure monitoring**

An experiment was conducted using two identical dashboards in the Grafana monitoring system, which analyzed the state of the same real system, but with one difference: the decision to create an event and send a signal (notification) to the team. In the first case, traditional threshold monitoring was used, where every time a system parameter reaches a limit, a signal notification for the team is created. The second panel had an AI agent connected that correlated events and decided to create a corresponding critical signal, or to combine several less significant signals into a single message. As a result, notifications for one day were reduced from 180-250 to 8-15 pieces, and the number of duplicates decreased from about 40% to 1%, which dramatically reduced the "information noise" and reduced the load on operators.

### **Negative and limiting aspects of AI applications**

It is essential to note that, despite progress, AI has several critical limitations.

Hallucinations and unreliability. AI is a probabilistic, not a deductive model, relying on publicly available data that is unreliable and contains errors. Therefore, LLM models are capable of generating plausible but incorrect conclusions.

The authors' experiment: response degradation. During a pre-loaded test with 100 exam questions and correct answers, the AI could knowingly provide incorrect answers, justifying them. However, it corrects itself only after the error is explicitly pointed out. This phenomenon is known as Mode Collapse in Reasoning.

Accumulation of errors. New and existing models continue to train on publicly available data. Some of which have already been generated using other AI and which may have errors, inaccuracies, and "hallucinated" data, leading to the accumulation of poor-quality data and an overall progressive degradation of quality.

Normalization drift in stream data analysis. In the process of training an AI agent that was supposed to analyze a stream of historical data from security servers that reflect the process of user authentication in the company's information

systems, the dynamics of the agent's behavior were revealed, from hypersensitivity (reaction to any events), through a period of stable operation, to a period when even potentially dangerous anomalies began to be caught as regular events with an extensive period. This situation is the result of a combination of two phenomena: Concept Drift, which refers to changes in the statistical properties of the stream without proper model updating, and Normalization Drift, the gradual "habituation" of the model to anomalies and their misclassification as regular events. Together, these effects can lead to critical security gaps, as the system potentially ceases to respond to real threats.

Real impact on operator productivity. The attention of a significant number of AI experiments in the last couple of years has been focused on increasing labor productivity with the implementation of AI assistants.

The authors reviewed several similar studies and collected their own data to analyze the effectiveness of such an implementation. It was concluded that the use of specialized AI assistants for programming actually had a positive impact on the work of more experienced developers. In contrast, the productivity of novice inexperienced developers mostly fell. In addition, reviewing and editing code that came from inexperienced developers significantly increased the workload on technical project leaders. In the long term, this approach can significantly reduce the quality of developers, disrupting their natural development. This describes a well-known behavioral phenomenon, **Skill Atrophy** – a process in which a specialist gradually loses or does not develop the necessary professional skills, as he relies on AI tools to perform a significant part of his work.

#### **“AI & Human” Synergy as the foundation of future digital ecosystems**

The undeniable advantages of AI include the enormous speed of analysis, contextual interpretation of events, a significant reduction in information noise, and the ability to work with telemetry streams in real time.

However, at the same time, modern AI models are not a source of truth, as they are vulnerable to model drift, prone to hallucinations and accumulation of errors, and can also degrade the skills of specialists if used irrationally. Real-world results show that the most effective model is the interaction of "AI + human", where AI takes on the routine, scale, and speed. At the same time, the Human provides criticality, creativity, and strategic thinking.

The main conclusion: Artificial intelligence does not replace humans; it enhances them. It is the synergy between human intelligence and the algorithmic power of AI that ensures flexible, reliable, and competitive digital ecosystems of the future.

#### **Use of intelligent agents by Ukrainian youth for business development**

Intelligent agents enable young entrepreneurs to significantly accelerate the launch of startups in many areas, as they provide rapid market analysis, business hypothesis testing, and automated product prototyping. In small and medium-sized businesses, AI enables significant reductions in operating costs through automated monitoring, inventory management, demand forecasting, and energy consumption

optimization, which is particularly crucial during war and reconstruction. The automation of routine processes using AI frees up the resources of young entrepreneurs for creative, strategic, and innovative tasks, thereby contributing to the development of Ukrainian high-tech companies and the formation of a competitive economy.

The use of AI facilitates the integration of youth businesses into European digital ecosystems, as it helps them comply with data standards, adapt products to EU requirements, and participate in innovation support programs and international partnerships. Intelligent agents can potentially enhance business resilience to uncertainty, providing risk prediction, rapid response to changes, and operational process stability in real-time.

The significant recent development of AI is creating new employment opportunities for young people – from streaming data analytics and IoT solution development to AI agent training and data management, creating qualitatively new labor markets and opportunities for high-tech entrepreneurship.

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## MECHANISMS OF INSURANCE PROTECTION AGAINST CYBER RISKS FOR CRITICAL INFRASTRUCTURE: INSTITUTIONAL AND ECONOMIC ASPECT

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**Abstract.** The article analyzes the issues of financial support for the cyber resilience of critical infrastructure facilities in the context of hybrid warfare. The limitations of classical commercial insurance mechanisms due to war risk exclusions and the systemic nature of cyber threats are identified. Based on the analysis of international experience (USA, Israel, UK), a conceptual model of multi-level insurance protection for Ukraine is proposed, which includes the creation of a national reinsurance pool and a state guarantee mechanism (backstop). The necessity of using parametric instruments and data exchange platforms to increase market transparency is substantiated.

**Keywords:** cyber insurance, critical infrastructure, war risks, public-private partnership, parametric insurance, risk management.

**Problem Statement.** In the conditions of the full-scale armed aggression of the Russian Federation against Ukraine, cyberspace has become a full-fledged theater of combat operations. Attacks on the energy sector, financial institutions, and state registries demonstrate that cyber threats to critical infrastructure (CI) have transformed from the operational risks of individual enterprises into a threat to national security. In accordance with the Law of Ukraine "On Critical Infrastructure," ensuring the resilience of CI facilities requires not only technical means of protection but also effective financial instruments for recovery. However, the traditional insurance market in Ukraine has proven incapable of absorbing these risks due to their catastrophic nature and correlation with military actions, which actualizes the search for new mechanisms of insurance protection.

**Analysis of Recent Research and Publications.** Theoretical foundations of cyber insurance and catastrophic risk management are considered in the works of foreign scholars and reports of international organizations. In particular, The Geneva Association emphasizes the problem of the "uninsurability" of systemic cyber risks without state participation in its research. Experts from Marsh McLennan analyze the effectiveness of public-private pools for covering war risks, particularly in the context of Ukraine. Among domestic scholars, the development of the cyber insurance market has been investigated by N. Prykaziuk and T. Rotova, however, the specifics of CI insurance under martial law require additional study.

**Formulation of Article Objectives.** The aim of the work is to substantiate the institutional and economic mechanisms for implementing a system of insurance protection for critical infrastructure against cyber risks in Ukraine, taking into account the limitations of wartime and the prospects for post-war recovery.

**Presentation of Main Material.** The modern architecture of critical infrastructure cyber risks is characterized by the presence of "silent cyber" risks and the complexity of attack attribution. For Ukraine, the situation is complicated by the fact that most standard insurance contracts contain War Exclusion Clauses. This creates a "protection gap" where CI operators are left alone with losses from cyberattacks that may be qualified as acts of cyber warfare or terrorism<sup>22</sup>.

Analysis of the dynamics of cyber incidents in Ukraine for 2022–2025 indicates a 69% increase in attacks on life support facilities. At the same time, direct losses from infrastructure downtime and data recovery often exceed the value of physical assets. In this context, exclusively market-based insurance mechanisms are ineffective due to the impossibility of accurate actuarial calculation of the probability of an insured event occurring under conditions of active combat.

World experience offers several models for solving this problem. In the USA, the TRIP (Terrorism Risk Insurance Program) operates, which provides a

state "backstop"—a guarantee of loss coverage exceeding a certain limit. In Israel, the Property Tax Fund functions, compensating for direct losses from "hostile actions," although its application to cyber incidents remains limited due to the difficulty of proving a causal link.

For Ukraine, the implementation of a hybrid model appears most promising, combining:

1. **Creation of a national cyber insurance pool.** Pooling the capital of local insurers to diversify risks that do not reach a catastrophic level.

2. **Involvement of the state guarantee mechanism.** Expanding the mandate of the Export Credit Agency (ECA) to insure investments in CI cybersecurity against war risks, which aligns with Law No. 3497-IX.

3. **Use of data platforms.** Integrating data on cyber threats into the war risk platform developed jointly with Marsh McLennan will allow creating a transparent basis for underwriting and attracting international reinsurers.

Special attention should be paid to **parametric insurance**. Unlike classical liability insurance, parametric products provide for payout upon the occurrence of a certain trigger (for example, lack of access to the power grid for a specified time), regardless of the fact of physical damage. This allows avoiding lengthy loss adjustment procedures and providing CI operators with quick liquidity for recovery.

**Conclusions.** Building an effective system of insurance protection for Ukraine's critical infrastructure requires a transition from the classical commercial insurance model to a public-private partnership. It is necessary to legislatively establish mandatory cyber risk insurance for CI facilities of categories I and II, while ensuring state support for the reinsurance of catastrophic risks. Further research should be directed towards developing a methodology for actuarial calculations of parametric triggers for the energy and transport sectors.

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## **ADAPTIVE BUSINESS MODELS FOR YOUTH ENTREPRENEURSHIP: USING ARTIFICIAL INTELLIGENCE AND EUROPEAN DIGITAL PRACTICES**

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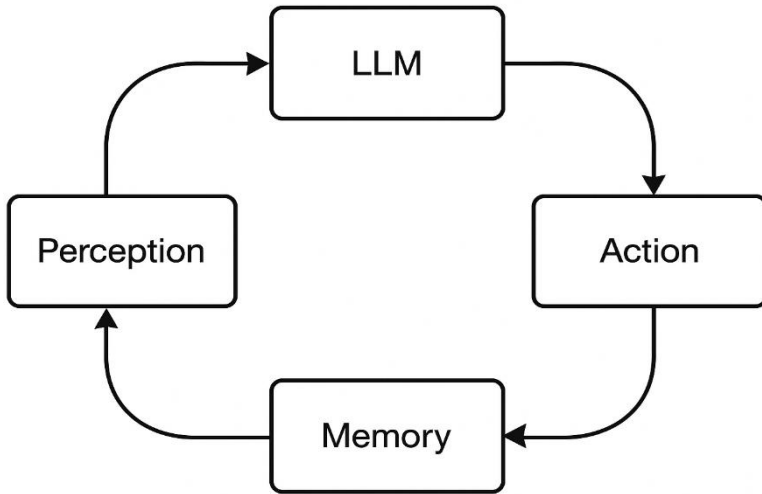
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The development of youth entrepreneurship occupies an important place in the economic policy of the European Union, as it contributes to innovation, employment and the formation of a sustainable economy [1]. Modern ones demonstrate that young entrepreneurs often face a lack of resources, insufficient management experience, a high level of market volatility and limited access to digital technologies. In such conditions, traditional hierarchical approaches to management lose their effectiveness, as they do not provide the necessary flexibility and speed of decision-making. In the digital environment, there is a growing demand for new organizational forms that allow youth business projects to operate adaptively and effectively [2]. The concept of an adaptive enterprise, which functions as a cybernetic ecosystem with the property of self-regulation using artificial intelligence, opens new opportunities for youth startups [3].

The methodological basis of the study is Stafford Beer's Viable System Model, which considers an organization as a living system capable of ensuring its own viability under conditions of dynamic uncertainty [4]. This approach allows structuring a youth startup as a cybernetic object in which individual subsystems maintain a balance between stability and adaptability. An important element of the model is the involvement of AI agents operating according to the Perception →

LLM → Action → Memory cycle, which ensures self-organization, accelerated management decision-making and reduced operating costs (Figure 1).



**Figure 1.** The operational cycle of an AI agent  
*Source:* Elaborated by authors

For youth entrepreneurship, we offer a decentralized architecture based on artificial intelligence agents. The artificial intelligence agent interacts with the outside world (API, OS, databases) through the «Tools» module, controlled by a large programming language model (LLM). This creates a closed cybernetic loop, where the system learns at each iteration. For a young entrepreneur, this means the ability to automate complex tasks (marketing, basic coding, data analysis) without hiring a large staff, effectively creating a «digital workforce».

To assess the digital readiness of youth enterprises, an adaptability index (A) was developed, which integrates technological, strategic and information readiness, as well as a resilience index (S), which considers the ability to manage risks, the level of educational training of the entrepreneur and the technological maturity of the business model. The use of these indicators creates a universal toolkit for identifying strategic and technological weaknesses at the early stages of business development. The introduction of a PID controller into the management system complements the model with a stabilization mechanism that minimizes typical management errors and prevents excessive fluctuations in the strategic course of a young enterprise.

We propose calculating the Adaptability Index (A):

$$A = \frac{T_{tech} + T_{strat} + T_{info}}{3}$$

Sustainability Index ( $S$ ), which is crucial for securing investments and grants in the EU ecosystem:

$$S = \frac{T_{tech} + T_{edu} + T_{risk}}{3}$$

To manage the high volatility typical of startups, we suggest implementing a PID-controller logic in management processes. The control signal ( $u_t$ ) reacts to the deviation ( $e_t$ ) between the planned and actual state of the business:

$$u_t = K_p e_t + K_i \sum e_t + K_d (e_t - e_{t-1})$$

The proposed model is consistent with the EU strategies for youth business development, digital innovation and SME support. The focus on lifelong learning, which is reflected in the  $S$  index, is consistent with the European policy of forming digital competences of young people and developing entrepreneurial skills. In contrast, the use of AI agents contributes to the transition to a performance economy, in which income depends on the actual results achieved, and not on the resources used.

In general, the integration of artificial intelligence and cybernetic principles allows transforming youth startups from structures vulnerable to market fluctuations into adaptive digital ecosystems [5]. The proposed indices and management mechanisms create a toolkit that enables young entrepreneurs to scientifically manage uncertainty, increase the resilience of the business model and expand the possibilities of integration into the European digital space.

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## **DIGITALIZATION AND CYBER-RESILIENCE AS A BASIS FOR THE DEVELOPMENT OF MODERN YOUTH ENTREPRENEURSHIP IN THE EU**

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The rapid development of digital technologies is reshaping economic, social, and administrative realities across the globe. Digitalization has become a defining factor in transforming society, business, and public governance. It provides unprecedented access to global markets, accelerates data processing, automates workflows, and fosters innovation. These changes affect not only the way businesses operate but also how citizens interact with government institutions and how public services are delivered. At the same time, significant risks are emerging alongside these opportunities. One of the most pressing is the rapid proliferation of cybercrime. The digital economy, which relies heavily on internet infrastructure, cloud computing, artificial intelligence, and extensive data exchange, is increasingly vulnerable to cyberattacks. These attacks can affect individuals, small and medium-sized enterprises, large corporations, and government institutions alike. For example, the 2021 ransomware attack on the Irish Health Service Executive disrupted healthcare services nationwide, demonstrating the real-world consequences of cyber vulnerabilities. In this context, the future of entrepreneurship in the European Union is shaped by the intersection of two mutually reinforcing dynamics: rapid digital advancement and escalating cyber threats. This convergence requires policies that both promote innovation and ensure digital resilience.

The presence of modern digital infrastructure alone does not guarantee security. Empirical research shows that high levels of digital readiness do not always correspond with lower cybercrime rates. In some countries, advanced digital systems coincide with as many or even more cyber incidents than in less technologically developed states. For instance, Germany and the Netherlands,

despite their strong digital economies, report higher numbers of cyberattacks compared to some smaller EU states. This phenomenon is often linked to rapid internet expansion, increasing reliance on online platforms, and accelerated growth of e-commerce. Together, these factors expand the attack surface, meaning the number of potential vulnerabilities available to malicious actors. Human factors are equally important. The development of human capital through education, digital literacy, and cybersecurity competencies among employees and entrepreneurs is critical to mitigating risks. Populations with higher digital skills demonstrate greater resilience to social engineering, phishing, and manipulation of sensitive data. Accordingly, EU digital policies focus not only on infrastructure development but also on enhancing competencies, promoting awareness of cyber risks, and establishing standards for secure digital operations.

Global cybercrime continues to grow. Between 2015 and 2024, international reports documented a steady increase in incidents, with some countries experiencing exponential rises. Cyberattacks now target diverse sectors, including private data, corporate information, financial systems, government services, and critical national infrastructure. Traditional forms of digital crime are now joined by ransomware, supply chain attacks, cloud service breaches, botnet exploitation, and automated hacking systems. For example, attacks on cloud services in France and Spain disrupted digital platforms used by small businesses, highlighting the vulnerability of online business ecosystems. As a result, the future digital economy requires not only innovative technologies but also robust protective mechanisms that are embedded within business processes from the outset.

The relationship between digitalization and cybercrime is complex and context-dependent. Statistical analyses show that in certain countries, the expansion of digital services coincides with an increase in cyberattacks. In other countries, where cyber institutions and regulations are well-developed, high levels of digitalization do not necessarily result in more incidents. This contrast highlights the importance of government regulation, institutional capacity, and strategic implementation of cybersecurity frameworks. Effective national strategies, rapid response mechanisms, and institutional trust are essential to controlling cyber risks. Digitalization therefore functions not only as a tool for operational efficiency and innovation but also as a means to enhance transparency and accountability, reducing opportunities for abuse.

These insights carry substantial implications for EU youth entrepreneurship policy. Young entrepreneurs increasingly leverage digital tools and platforms to establish businesses. This approach offers advantages, including reduced transaction costs, access to international markets, and the ability to analyze large datasets for decision-making. For instance, Lithuanian startups in fintech have used digital platforms to expand into Nordic markets, benefiting from both technological innovation and EU regulatory support. However, these benefits come with elevated exposure to cyber threats. Small and medium enterprises, particularly

startups, often lack dedicated cybersecurity teams or specialized IT departments, making them among the most vulnerable actors in the digital economy despite their innovative potential. Supporting youth entrepreneurship therefore requires policies that address both opportunity and security, ensuring that the benefits of digitalization are not undermined by preventable cyber risks.

Indicators of digital readiness across EU member states reveal diverse patterns. In some countries, higher internet penetration, widespread e-commerce engagement, and extensive digital service adoption correspond with more cyber incidents. This trend typically occurs in regions where digitalization outpaces institutional and cultural adaptation. Conversely, gradual infrastructure development combined with systemic cybersecurity measures creates digital environments in which cyber risks remain stable or even decline. Timely public investment in digital literacy, cybersecurity systems, and legislative frameworks allows digitalization to foster innovation while mitigating potential threats. These findings demonstrate the necessity of comprehensive, context-sensitive approaches to digital transformation.

Effective support for youth entrepreneurship must address both technological and human dimensions. Many young entrepreneurs operate entirely or predominantly online—in e-commerce, digital services, data analytics, artificial intelligence applications, online education, and creative industries. These sectors are inherently high-tech yet also highly vulnerable to cybersecurity threats. For example, small AI-based startups in Estonia have successfully scaled while integrating cybersecurity protocols from the start, demonstrating that resilience is achievable with proper support. Policies supporting youth should therefore extend beyond financial grants or mobility programs. They must include training in cyber hygiene, access to secure IT infrastructure, consulting on digital risk management, and adoption of advanced data protection technologies. EU-wide digital platforms offering collaboration tools, market access, and secure interaction systems can further strengthen entrepreneurial ecosystems while ensuring safety and resilience.

Artificial intelligence plays a dual role in business security. On the one hand, AI-driven systems can detect anomalies, predict potential threats, and analyze behavior to reduce the likelihood and impact of cyberattacks. On the other hand, AI can be exploited by malicious actors, who may deploy automated systems to conduct sophisticated attacks, increasing threat complexity and scale. Integrating AI into youth-led businesses requires ethical, legal, and technical safeguards aligned with EU standards to ensure safe and responsible use.

Institutional factors strongly influence digital economy vulnerability. Countries with mature regulatory frameworks, legislative data protection mechanisms, effective incident response systems, and entrepreneur support programs face fewer cyber threats. The EU promotes regulations such as the General Data Protection Regulation (GDPR) and the NIS2 Directive, which establish cybersecurity standards for businesses and public institutions. These measures ensure that digitalization proceeds according to principles of security,

transparency, and accountability, providing predictable environments in which young entrepreneurs can pursue initiatives without exposure to uncontrolled risks.

In conclusion, digitalization constitutes a key structural driver of modern entrepreneurship, reshaping technological, socio-economic, and institutional dimensions. The future of EU entrepreneurship depends on combining innovative digital solutions with robust cybersecurity measures, as well as integrating young entrepreneurs into resilient digital ecosystems capable of withstanding cyber threats. Investments in human capital, the implementation of national cybersecurity strategies, enhancement of digital literacy, and promotion of technological innovation are critical to ensuring long-term competitiveness. Addressing these interrelated challenges requires coordinated policy action, informed debate, and continuous adaptation to evolving technological and security landscapes. Aligning innovation and security strategically provides the foundation for sustainable growth, ensuring that the opportunities of the digital economy are fully realized while minimizing associated risks.

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## **ADAPTATION OF EU DIGITALISATION STRATEGIES IN POST-WAR RECOVERY: CHALLENGES AND OPPORTUNITIES FOR YOUTH ENTREPRENEURSHIP IN UKRAINE<sup>i</sup>**

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**Introduction.** The full-scale military aggression has significantly altered Ukraine’s economic and social landscape, demanding not just recovery, but a fundamental transformation based on sustainability and European integration (*World Bank Group, 2023*). In this context, youth entrepreneurship serves as a key driver of innovation, and digitalisation is a critical tool for ensuring its resilience and competitiveness (*OECD, 2022*).

The research problem lies in the necessity of Ukraine’s rapid and effective integration into the EU’s Digital Single Market as a precondition for attracting investment and reconstruction. It is crucial not only to implement technologies but also to adapt European strategies and regulatory frameworks (particularly the Digital Decade initiatives and AI policies) (*European Commission, 2021*) to mitigate war damage and create a favourable environment for young innovators. An unadapted process could deepen the digital divide and complicate Eurointegration. The aim is to analyse the key aspects of the European Union’s digital strategies and to determine the mechanisms for their targeted adaptation to stimulate innovative and resilient youth entrepreneurship in Ukraine during the post-war recovery. The results offer concrete solutions for international cooperation and the integration of Ukraine into the European economic space through the support of its most dynamic sector – youth business.

**Methodology.** To achieve the stated goal, a comprehensive approach combining qualitative and analytical methods was used.

1. Content analysis and systems approach: applied for the in-depth study of key European Union strategic documents, including Digital Compass 2030, European Digital Decade Policy Programme, and initiatives related to the regulation of new technologies (e.g., *AI Act*) (*European Commission, 2023a*). This allowed for the identification of priority areas for digital transformation most relevant to supporting Ukrainian youth entrepreneurship.

2. Comparative analysis: used to juxtapose existing national programs for youth business support in Ukraine with successful European instruments, such as

Erasmus for Young Entrepreneurs and funding under Horizon Europe. The primary focus was on identifying gaps in the legal framework and opportunities for rapid harmonisation.

3.Scenario planning method: applied to assess the potential impact of integrating European regulatory requirements (especially in cybersecurity and the use of artificial intelligence) on the operational resilience and innovative development of youth startups amid post-war recovery.

These methods allowed not only to describe the European experience but also to develop practical recommendations for its adaptation, considering the specific challenges of the war and post-war period in Ukraine.

**Results.** The analysis conducted allowed for the identification of key fundamental principles of digital transformation and mechanisms for adapting EU strategies necessary to ensure the resilience of youth entrepreneurship and accelerate post-war recovery.

1.Priority pillars for adapting the EU Digital Decade Strategy. It was established that for rapid integration and increased resilience of youth entrepreneurship, the targeted adaptation of three priority areas of the EU by 2030 is critical (*European Commission, 2021*):

Digital skills: accelerated implementation of European standards for digital literacy and vocational training is necessary, particularly in coding, data analysis, and Artificial Intelligence. This will ensure inclusiveness – the involvement of youth from war-affected regions in the innovative economy.

Infrastructure: alignment with EU standards (access to gigabit internet and 5G) is critical for supporting relocated and remote youth businesses, minimising the impact of physical infrastructure destruction on their operations.

Digitalisation of businesses: emphasis should be placed on subsidising and stimulating the adoption of cloud services and AI technologies in small and medium-sized enterprises, which form the basis of the youth startup sector (*Sydorenko, 2023*).

2.Harmonisation as a catalyst for trust and investment. It was found that adapting European regulatory frameworks (AI Act, GDPR, and Digital Services Act) (*European Commission, 2023a*) is not just a requirement for Euro-integration, but a key opportunity for youth entrepreneurship. Compliance with these norms automatically builds trust among European investors and partners, reduces transaction costs, and opens direct access to the EU's Digital Single Market for innovative products developed by Ukrainian youth.

3.The role of digitalisation in regional resilience. Analysis shows that digital tools are an effective mechanism for overcoming the regional digital divide, exacerbated by the war. Young entrepreneurs, particularly in the IT sector, can create jobs and provide services, restoring economic activity in regions where traditional industries have suffered significant losses (*Іваненко, 2024*). This is a key prerequisite for sustainable and inclusive regional recovery.

**Discussion / Significance.** The research results have high scientific and practical significance, as they move beyond a simple description of the need for digitalisation and focus on the targeted integration of Ukrainian policies with EU regulatory and strategic frameworks.

The study offers concrete fundamental principles for using EU digital strategies as a tool for sustainable and inclusive post-war recovery, aligning with the goals of your scientific project.

It shifts the focus from discussing general technological modernisation to the need for targeted policy harmonisation (e.g., in AI and cybersecurity) as a critical condition for ensuring the operational resilience of youth entrepreneurship amid perpetual crisis challenges. This confirms the thesis that digital adaptation is a form of economic resilience.

Practical value:

- for government and regional authorities: The identified priority areas for adapting EU strategies (skills, infrastructure, harmonisation) can serve as the basis for developing targeted national and regional post-war recovery programs (World Bank Group, 2023). These programs should be aimed at supporting innovative youth startups that demonstrate high digital resilience.

- for business: the research results provide young entrepreneurs with a clear understanding of which European standards (e.g., in cybersecurity, Закон України, 2017) must be implemented now to gain competitive advantages and access to European financing and markets.

- for international cooperation: the work underscores the necessity of bilateral experience exchange and the involvement of European instruments (such as the Digital Europe Programme and Digital Innovation Hubs) for financing and developing digital innovation hubs in Ukraine, oriented towards youth.

**Conclusion.** The success of Ukraine's post-war economic recovery, particularly the youth entrepreneurship sector, critically depends on the speed and targeted integration into the European digital space. The study confirmed that digital transformation is not merely modernisation, but a fundamental principle for ensuring resilience, inclusiveness, and international competitiveness. A strategic state policy is needed that combines investments in digital infrastructure with the accelerated harmonisation of legislation regarding digital services and AI with EU standards. This will create a transparent and trustworthy environment, vitally necessary for attracting European investments in youth innovation.

Further research will focus on the empirical assessment of the economic effect of implementing EU regulatory frameworks on the youth startup sector, as well as developing a detailed "roadmap" for adapting key EU digital initiatives within the regional context of Ukraine.

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## **BUSINESS MODEL OF A PROJECT FOR BREEDING AND SELLING ACHATINA SNAILS FOR COSMETOLOGY**

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**Introduction.** The business idea is to create a company for breeding and selling *Achatina* snails for cosmetology. Such a product is natural and is used in the field of slimotherapy (cosmetology procedures that use snail mucus to rejuvenate and restore the skin).

The target audience includes cosmetologists of Sumy and the region, SPA salons, home craftsmen and beginners, as well as clients from other cities of Ukraine. Part of the segment also includes connoisseurs of natural skin care and eco-oriented consumers.

**Methodology.** The methodology is based on applying the Business Model Canvas to analyze the project's structure, including its value proposition, customer segments, channels, key activities, and revenue streams.

**Results.** The business model of the project "Breeding and Selling *Achatina* Snails for Cosmetology" is based on creating value for cosmetologists and SPA salons by providing them with a natural and high-quality product for slim massage. The model involves providing customers with snails directly and a comprehensive solution that includes consulting, educational materials for related products, and after-sales support.

The value proposition of the project is to supply snails grown in controlled conditions, which minimizes risks for cosmetic procedures. An additional value of the business proposition is the ability to use consultations and after-sales support.

The target audience includes several consumer groups: professional cosmetologists, SPA salons, and cosmetology studios who need regular supplies; home craftsmen and beginners who need starter kits; eco-oriented consumers who prefer natural cosmetic procedures at home.

Communications and sales channels are built around social networks (Instagram, TikTok, Facebook), as well as a landing site where customers can view the catalog, place orders, and receive consultations. Additional interaction channels are Telegram, Viber, and telephone, which allows you to quickly respond to customer requests. Such multi-channel interactions will create opportunities for communication with consumers.

Customer relationships are maintained through reviews, post-purchase surveys, and the online community “Achatina Beauty Community” in Telegram, where users can get advice and share experiences. Bonuses for recommendations, regular care tips will stimulate repeat purchases and form a base of loyal customers.

The financial model provides for several revenue streams: the main stream is formed from the sale of Achatina snails; additional financial income is formed from the sale of starter kits, food, substrate and terrariums; as well as income from consultations and educational materials. With the development of the site, it is possible to place affiliate advertising and receive advertising income. Such an income structure allows you to diversify your income and reduce dependence on one type of product.

Key resources of the business project include human resources (owner who manages, a specialist who cares for snails; online consultant who is engaged in SMM activities), material resources (premises, terrariums, lighting, substrate, packaging); financial resources (initial investment budget of 20 thousand UAH); digital platforms. To accommodate the initial farm, a room with an area of 10-15 m<sup>2</sup> is required.

The main activities of the business project are growing and caring for snails, preparing and packing orders, delivery, maintaining social networks, processing applications and after-sales support.

Key partners are suppliers of feed, calcium and substrate, veterinary specialists, logistics companies, in particular “Nova Poshta” Additional partners may be packaging manufacturers, SMM managers, owners of cosmetology studios, cosmetology schools.

The cost structure includes the purchase of starting equipment, regular costs for feed and substrate, rental of premises, payment for a consultant, advertising, website support, utility bills and packaging materials.

**Discussion.** The business model of the project for the sale of Achatina snails for cosmetology is based on the cultivation and sale to customers of a product used in slimotherapy and skin care procedures. The basis of the model is to ensure the supply of healthy snails grown in controlled conditions. An important feature of the business model is the comprehensiveness of the offer: customers

receive snails and care instructions, starter kits, related materials and after-sales support.

Sales channels are based on active social networks and a landing site, which allows customers to quickly place orders and contact a consultant. Additional channels, such as Telegram and Viber, provide constant and convenient contact, building trust in interaction. The value of the model is enhanced by the formation of an online community where customers can get advice, share experiences and receive support.

The financial structure of the business involves several revenue streams: sales of *Achatina* snails; sales of starter.

**Conclusion.** The business model for breeding and selling *Achatina* snails for cosmetology demonstrates that the project has a clear value proposition, a well-structured operational approach based on the Business Model Canvas. The combination of natural product value and multichannel communication creates strong competitive advantages and supports long-term customer relationships. Financial diversification through product sets, supplies, consultations, and potential online courses increases the project's resilience and scalability. The availability of key partners, controlled production conditions, and effective digital promotion further strengthen the model's sustainability. Overall, the project shows high potential for growth within the expanding cosmetology market and can evolve into a broader ecosystem of services and products for natural skincare.

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## **PRIORITIES FOR THE COMING PHASE OF UKRAINE'S AI POLICY**

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**Introduction.** Ukraine still does not use AI widely in its economy, and current adoption is fragmented. Ukraine needs short-term and long-term AI policy actions to benefit from new technological changes. Otherwise, the productivity gap between Ukraine and leading countries will grow even more.

Despite progress in aligning with OECD and UNESCO standards, Ukraine’s AI policy lacks strong institutional oversight and practical enforcement mechanisms. Significant advancements in AI have emerged within Ukraine between 2020 and 2022. Concept of the AI Development in Ukraine 2021-2024, 02.12.2020 declares the supremacy of law, respect for people's rights and freedoms as goals in the process of forming and implementing artificial intelligence policy (Concept, 2020). Ukraine is implementing the OECD AI Principles (OECD, 2023). The following OECD AI principles are addressed in the National Strategy of the Development of AI in Ukraine: fostering a digital ecosystem for AI; building human capacity and preparing for labour market transition (Cabinet, 2021). Furthermore, Ukraine, as a member of UNESCO, has endorsed the UNESCO Recommendation on AI Ethics in alignment with OECD standards (Natsionalna, 2021).

The overall evaluation score for AI policy in Ukraine from 2020 to 2022 is 6.5, indicating that Ukraine's AI policy is still in its formative stages and primarily focuses on aligning with international standards and practices (Tarasenko, 2024).

In the context of AI-driven innovation, Ukraine’s fragmented adoption of artificial intelligence creates both risks and opportunities for young entrepreneurs. The growing involvement of youth in tech-based ventures highlights the need for a coherent national AI framework that can support digital entrepreneurship, stimulate innovation ecosystems, and strengthen Ukraine’s competitiveness. Thus, the emergence of AI-enabled youth-led business models underlines the importance of developing flexible policy tools that can connect innovation potential with national economic priorities.

**Policy Landscape.** Methodology of Center for AI and Digital Policy is used for evaluation state of AI policy in Ukraine (Center). It includes 12 indicators. Scale of indicator’s estimation is (Table 1):

- Yes (Y), 1 point;
- No (N), no points;
- Partly (P), 0.5 points.

Table 1. Key Metrics to Estimate AI Policy

№	Scoring question	Response (example)
Q1	Has the country endorsed the OECD AI Principles?	Y
Q2	Is the country implementing the OECD AI Principles?	P
Q3	Has the country endorsed the Universal Declaration of Human Rights?	Y
Q4	Is the country implementing the Universal Declaration for Human Rights?	Y
Q5	Has the country established a process for meaningful public participation in the development of a national AI Policy?	Y
Q6	Are materials about the country’s AI policies and practices readily	P

	available to the public?	
Q7	Does the country have an independent (agency/mechanism) for AI oversight?	P
Q8	Do the following goals appear in the national AI policy: “Fairness,” “Accountability,” “Transparency,” “Rule of Law,” “Fundamental Rights”?	P
Q9	Has the country by law established a right to Algorithmic Transparency?	N
Q10	Has the country endorsed the UNESCO Recommendation on AI Ethics?	Y
Q11	Is the country implementing the UNESCO Recommendation on AI Ethics?	Y
Q12	Has the country’s Data Protection Agency sponsored the 2018 GPA Resolution on AI and Ethics, the 2020 GPA Resolution on AI and Accountability, and the 2022 GPA Resolution on Facial Recognition Technology?	N
Total		8.0

*Source:* compiled by authors

The total evaluation score of Ukraine’s AI policy for the period 2020-2022 is 6.5 (Table 2).

Table 2. State in Key AI Metrics of Ukraine

Year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
2020-2022	N	P	Y	P	Y	Y	P	P	P	Y	N	N	6.5
2023-2024	N	Y	Y	P	Y	Y	P	Y	P	Y	N	N	7.5

*Source:* compiled by authors

The one-point increase during 2023-2024 compare with 2020-2022 period demonstrates Ukraine’s progress in formalizing AI governance mechanisms and aligning its legislation with EU standards. In October 2023, the Roadmap for Regulation of AI was presented, aimed at developing initiatives on business compatibility, EU integration, and ethical frameworks for the use of AI (European, 2023). In addition, on January 1, 2023, the Copyright Law came into effect regarding the category of “non-original objects generated by computer programs,” which establishes ownership rights to works created or modified by AI systems (Ministry, 2023). In June 2024, the Ministry of Digital Transformation presented a White Paper on AI regulation, which details approaches and principles, including intentions to synchronize Ukrainian legislation with that of the EU European, 2023).

**Main Arguments.** Ukraine's AI policy today is only forming background for standardization and common practices with international partners at AI sphere. In 2023-2024 it was established more regulatory base in AI production and using. Also the report by the Ministry of Digital Transformation, AI HOUSE, and the investment group Roosh states that as of 2023, there are 243 companies operating in the field of artificial intelligence in Ukraine (Cabinet, 2023). This places Ukraine second among the countries of Central and Eastern Europe in terms of the number of AI companies and indicates the presence of sufficient infrastructure to support their activities in the country. Therefore, the results indicate that Ukraine's AI policy is gradually being implemented in practice.

Current scientific evidence emphasizes that responsible AI governance is most effective when it is validated through sector-specific pilots, where operational data, risks, and bottlenecks can be observed. Manufacturing, especially machinery production, is a high-value, high-risk sector where predictive maintenance, industrial IoT, and digital twin technologies have proven to generate measurable productivity gains (Breznitz, 2025; OECD, 2023), this requires targeted pilot in machinery sector to generate evidence for national AI policy improvements.

Main findings of Ukraine's AI policy analysis are:

Today the use cases requiring AI regulation appear faster than AI policy is established in Ukraine. At the same time Ukraine has not endorsed the key AI regulation yet.

When Human Rights principle is directly included into the Concept of the Artificial Intelligence's Development in Ukraine 2021-2024, the goals of Fairness, Accountability, and Transparency are not there.

Ukraine's general approach to AI fits with human rights, democratic values, and the rule of law. The country already has a partly structured AI policy. AI pilot projects, especially those using IoT, can help speed up progress and provide practical evidence for better AI policymaking.

**Recommendations.** *Primary Recommendation:* to adopt a dual-track approach that simultaneously embeds fairness, accountability, and transparency principles in the National AI concept 2026-2030 (Option 1) and provide the IoT based AI policy experiment in Sumy's machinery sector (Option 2).

*Justification:* embedding fairness, accountability, and transparency principles ensures that Ukraine's future AI legislation aligns with OECD, UNESCO, and EU requirements, which enhances trust, safeguards rights, and establishes common standards for all stakeholders. At the same time, the Sumy machinery-sector IoT pilot provides concrete, measurable evidence of how AI can increase productivity, reduce downtime, and support sector transformation.

*Secondary Recommendations:* to create an industrial AI node, based on IoT in Sumy city, to support long-term scaling of industrial AI adoption.

*Implementation Considerations:* Supervision and coordination - Ministry of Defence.

Successful implementation of the experiment policy pilot requires the draft national AI Concept for 2026-2030 with fairness, accountability, transparency) principles for ensuring the responsible use of predictive maintenance algorithms, computer vision systems, digital twins in machine-building processes. Also, it should be specifying rules for sensor data ownership, and mandatory safeguards for critical infrastructure.

*Institutional Arrangements:* Ministry of Digital Transformation, lead development of the AI Concept 2026-2030 and FAT principal integration; Ministry of Defence, oversight of industrial modernization and coordination of AI deployment in strategic sectors; Ministry of Finance, design of financial incentives for AI/IoT pilot; Sumy City Council, local-level support of the policy experiment, coordination with enterprises.

**Conclusion.** Between 2020 and 2024, Ukraine made significant progress in shaping its AI policy architecture, aligning it with OECD and UNESCO standards. However, the policy framework remains in its formative phase, lacking clear enforcement mechanisms and institutional oversight.

Ukraine's AI policy is gradually institutionalizing and generally aligns with democratic values and human rights, but remains incomplete without enforceable fairness, accountability, and transparency principles.

AI pilots, particularly IoT-based ones, is widely recognized as an effective way to generate applied evidence for national AI policy.

These measures will increase efficiency of Ukraine's AI policy and accelerate industrial modernization. Moreover, empowering youths to participate in AI-driven entrepreneurship and innovation ecosystems will strengthen human capital development.

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## STRATEGIC ASYMMETRY: A PRACTICAL SEVEN-LEVEL GENAI ADOPTION GUIDE FOR YOUTH-LED VENTURES

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**Introduction.** The global economy is entering a new phase where Generative Artificial Intelligence (GenAI) and AI agents play a central role in creating value. Many authors now see GenAI as a possible “general-purpose technology”, similar in impact to electricity or the internet.

For youth-led ventures, this change creates a paradox. On the one hand, GenAI gives small teams a real chance to compete with large companies. It can automate knowledge work, speed up research and development, and reduce the cost of creating content and software. On the other hand, young firms usually have little capital, small teams, and limited infrastructure. They cannot apply complex AI solutions everywhere in the company at once.

In the European Union, youth ventures also have to consider the strict requirements of the emerging EU AI Act and the “twin transition” – digital and green. Youth ventures will need to classify their AI use cases correctly to avoid unnecessary compliance work and costs. Productivity gains that ignore energy use

and resource efficiency may become unsustainable as Green Deal policies become stricter.

Many existing studies look at single examples of GenAI use, such as marketing content or coding assistance. They rarely explain how AI adoption connects to competitiveness and sustainability in youth-led firms. This paper addresses that gap. It adapts a Seven-Level Framework of GenAI adoption developed by the author to the needs of youth entrepreneurship and introduces a strategic asymmetry approach. The idea is simple: young founders should focus on selected levels where AI brings the most value for them, instead of trying to “add AI everywhere” from the start.

**Methodology.** This study is conceptual. It uses theory and simple modelling to build a practical guide for youth-led ventures.

First, we use a Seven-Level Framework of GenAI Deployment. It is inspired by Porter’s value chain and by models of digital platforms and ecosystems. Classical models look mostly at internal resources and linear value chains. Our version adds a “cognitive layer”, where AI helps managers make decisions, not only support production.

Second, we use an Updated Competitiveness Model. Following Yankovyi, we argue that profitability and market share alone are insufficient in the digital economy. We add innovation potential (readiness and capacity for change) and strategic partnerships (ecosystem integration) as key measurable characteristics of competitiveness in the GenAI era.

Third, we add a Sustainability Lens. We use environmental impact as a simple filter. We look at how different AI strategies may change the carbon footprint of a venture and how they fit EU Green Deal and twin transition goals.

Together, these three elements form a practice-oriented framework. It links asymmetric GenAI choices (where and how much to invest in AI) with both competitive advantage and sustainability outcomes in youth-led ventures.

**Findings.** *The Seven-Level Architecture.* Based on competitiveness theory and digital ecosystem thinking, we identify seven levels where GenAI can be used inside a company:

1. Strategic Management. GenAI for scenario planning, market and competitor analysis, and AI governance.

2. Business Model. AI-based or AI-supported revenue models, such as subscriptions, data monetisation, or outcome-based pricing.

3. Strategic Partnerships. Cooperation with platforms, universities, accelerators, corporate partners, and data providers. GenAI may be part of joint products or shared infrastructure.

4. Human Resources. Development of GenAI skills (for example, working effectively with prompts), new roles, and workflows where humans and AI collaborate.

5. Investments in Digital Assets. Data flows and pipelines, access to models (via APIs or own models), cloud services, and AI-related intellectual property.

6. Functional Level. Use of GenAI in marketing, finance, sales, R&D, HR, and back-office operations (reports, analysis, communication, documentation).

7. Production Processes. Core logistics, software development, service delivery, and other key processes where GenAI can support or automate work.

For youth-led ventures, these levels can be grouped into two strategic clusters:

- a defensive cluster – mainly Levels 6, 7 and 4, focused on efficiency and survival;
- an offensive cluster – mainly Levels 2, 3 and 5, focused on growth and differentiation.

We argue that for small, resource-constrained ventures, trying to implement GenAI on all seven levels at the same time is inefficient and risky. Instead, we propose two asymmetric adoption strategies.

*Strategy A: Defensive Approach (“Bottom-Up Optimisation”).* This strategy is suitable for self-funded (bootstrapped) startups, small service firms and ventures with limited capital. The main focus is on the operational levels are Level 6 and Level 7 with support from Level 4. The venture uses ready-made GenAI tools such as ChatGPT Team, Midjourney or Microsoft Copilot. These tools are accessed through user interfaces or APIs. The startup does not train its own large models. Instead, GenAI is used to automate routine tasks and support day-to-day delivery.

For example, a youth-led design agency uses GenAI at Level 7 to generate visual assets and at Level 6 to draft emails and proposals for clients. Designers move from doing all work manually to selecting, improving and combining AI-generated options. This allows a small team to handle more orders without hiring more staff.

The expected effect is higher profitability because the firm avoids new hiring costs and increases throughput. This strategy also keeps technical complexity low and helps the team gain experience with GenAI.

*Strategy B: Offensive Approach (“Top-Down Disruption”).* This strategy is aimed at venture-backed startups and deep tech or AI-focused firms that want strong growth and market differentiation.

The main focus is on Level 2 and Level 3, with support from Level 5. The venture invests in AI-based products or services that rely on its own data. GenAI becomes part of the core business model and strengthens its position inside digital ecosystems. The aim is to create value that competitors cannot easily copy.

For example, a LegalTech startup founded by students collects and organises local court decisions (Level 5). It signs an exclusive partnership with a university law clinic (Level 3) that provides verified case data and legal expertise. The competitive advantage (the “moat”) lies in the curated dataset and domain knowledge, not just in the generic language model.

The potential outcome is strong growth in market share and company valuation, if the strategy is executed well. However, this approach requires more

capital and expertise and may increase both technical risks and environmental impact, especially if it involves training or fine-tuning larger models.

**Discussion.** Strategic asymmetry means that youth ventures do not have to “maximise AI everywhere”. Instead, they should decide carefully:

- where to invest more heavily in GenAI (for example, in business model innovation or unique data assets);
- and where to keep a lighter setup based on existing AI APIs, especially in the early stages.

GenAI changes the way we should think about competitiveness in youth-led ventures. Strategic partnerships, which used to be a “hidden” factor, now become a clear external advantage. Building a full proprietary AI system is usually too expensive for young firms. Instead, their success often depends on joining the right digital ecosystems and working with technology providers, data platforms, clusters and universities.

When a venture moves some workloads from large, general-purpose models to smaller, task-specific models at Level 6, it can reduce energy use per query and also pay less for API calls, depending on the setup. In this way, more efficient GenAI choices support both cost control and the growing sustainability expectations.

**Conclusion.** The Seven-Level Framework works as a practical guide for young entrepreneurs. It helps them move beyond GenAI hype and towards a structured way of using AI:

- Start with defence. For most youth-led ventures, the best first step is to optimise operations at Level 6 and build GenAI skills at Level 4. This creates efficiency and resilience.
- Move to offence when stable. After basic stability is reached, founders can use GenAI to rethink the business model (Level 2), build strategic partnerships (Level 3) and invest in their own digital assets and infrastructure (Level 5).
- Always apply a Sustainability Check. Every important GenAI decision should be evaluated both in economic terms and in terms of environmental impact. This helps avoid “ecological debt” that could weaken competitiveness under EU rules.

Future research should focus on creating a simple scoring tool that can measure the economic and ecological effects of GenAI projects within this framework and on testing the two strategies in real European youth ventures. For young entrepreneurs in Europe, finding the right balance between strategic asymmetry and sustainability is not just desirable – it is necessary for long-term success in the AI-driven economy.

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## **FEATURES OF DIGITAL TRANSFORMATION OF SMALL AND MEDIUM-SIZED BUSINESSES IN UKRAINE**

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**Introduction.** Small and medium-sized enterprises (SMEs) in Ukraine represent one of the key pillars of the national economy, forming the majority of registered businesses and providing a substantial share of employment. In recent years, however, the speed and complexity of digital transformation have significantly increased the pressure on SMEs to modernize. While many Ukrainian companies demonstrate a clear willingness to adopt new technologies, the real level of their digital readiness remains uneven and, sometimes, not enough to meet modern competitive challenges.

This situation reveals a deeper scientific and practical problem: the lack of a clear understanding and measurement of digital maturity among Ukrainian SMEs and, equally important, the absence of a unified methodological approach for assessing and guiding their digital development. Although there are many academic publications on digital transformation globally, the Ukrainian SME context still remains partly understudied, and the existing models often don't take into account Ukraine's institutional specifics, infrastructure gaps, or the wartime disruptions that strongly affect businesses today.

The objective of this research is to explore key features of digital transformation processes in the Ukrainian SME sector and identify conceptual and

methodological gaps that prevent effective evaluation of digital maturity. This work also aims to propose a more structured understanding of digital readiness that could potentially be developed further into a practical assessment tool.

The relevance of this topic is strengthened by the fact that Ukraine is currently undergoing enormous structural and technological changes. Under conditions of war, forced relocation, and global market pressure, digital transformation is not just a matter of modernization, it has become, for many firms, a matter of continuity and survival.

Overall, the extended abstract contributes to ongoing scientific discussions on digital maturity and provides directions for improving the competitiveness and resilience of SMEs in Ukraine.

**Methodology.** The methodological basis of the study incorporates a combination of qualitative and quantitative approaches. First, a systematic review of academic literature was conducted to identify key definitions and conceptual interpretations of digital transformation and digital maturity. Special attention was paid to differences between digitalization, digitization, and deeper structural changes associated with digital transformation—terms that are sometimes confusing even in scholarly work.

Second, the research applies elements of comparative analysis to examine existing international maturity assessment models (such as DIMM, DMM, and a number of EU frameworks). At this stage, the study tries to point out which indicators are most relevant for Ukrainian SMEs and which seem unrealistic due to infrastructural or economic limitations.

Third, exploratory analysis of secondary statistical data was used to outline the current digital adoption level in Ukrainian SMEs. Because official data are sometimes fragmented or not fully up-to-date, the analysis includes alternative sources such as business surveys, reports from IT associations, and insights from consulting agencies.

Finally, a preliminary conceptual model of SME digital readiness is developed, integrating technological, organizational, and human-capital dimensions. Although the model is not fully validated at this stage, it provides a foundation for future empirical testing.

**Findings.** The initial results of the study show that digital transformation in Ukrainian SMEs has several distinctive characteristics:

1. Fragmented and inconsistent adoption of digital tools. Many SMEs integrate technologies “as needed,” without a unified strategy. For example, some firms use CRM systems but still manage supply chains manually. Digital solutions are often implemented as isolated instruments rather than elements of a broader transformation.

2. Strong dependence on human competences. Due to small team sizes, the digital literacy of employees and owners plays a decisive role. If management lacks digital understanding, transformation tends to

stagnate, regardless of available technologies. This factor is more intense in SMEs than in larger enterprises.

3. Regional disparities remain significant. Digital infrastructure, particularly outside major cities, continues to vary greatly. Rural SMEs often experience unstable internet, limited access to IT specialists, or fewer opportunities for training. This deepens the “digital divide.”

4. Influence of wartime conditions. Many SMEs adopted cloud-based services, remote work, and digital communication tools under pressure rather than through planned modernization. While this created an impulse for transformation, it also led to uneven quality of implementation.

5. Lack of unified and contextualized maturity assessment. Existing maturity frameworks rarely reflect instability, relocation risks, energy disruptions, or financial constraints typical for Ukrainian businesses today. As a result, many frameworks appear too generalized or over-optimistic for the local context.

These findings collectively indicate that digital transformation is taking place, but not in a structured or fully effective manner. SMEs need clearer methodological guidance and better support tools.

**Discussion.** The discussion highlights several important insights for both academic research and practical policymaking.

First, digital transformation should be considered not just as technology adoption but as a comprehensive restructuring of business processes, culture, and decision-making logic. Many Ukrainian SMEs still confuse digitalization (e.g., switching to online banking) with deeper transformation, which leads to misunderstanding of required resources and expected outcomes.

Second, the existing digital maturity models lack contextual relevance. They often assume stable infrastructure, predictable regulation, and access to financing—conditions that may not hold true in Ukraine, especially during wartime. Because of this, SMEs may receive misleading assessments or fail to interpret results correctly.

Third, the transformation process reveals a growing digital divide between firms that invest in modernization and those that operate using outdated methods. If this divide continues to expand, it may negatively influence the country's competitiveness and ability to integrate into the European digital market.

Fourth, the research contributes to the discussion by outlining the conceptual need for a context-sensitive maturity assessment framework that accounts for Ukrainian realities. Such a framework could support policymakers, SME owners, and business associations in designing better support programs.

Finally, improving digital readiness is crucial for resilience. For Ukrainian SMEs, digital tools not only enhance efficiency but also provide flexibility in unpredictable conditions—from physical relocation to cyberthreats and market instability.

**Conclusion.** Digital transformation has become one of the defining factors of SME development in Ukraine. Despite strong motivation among many entrepreneurs, the level of digital readiness remains inconsistent and insufficient to meet contemporary challenges. This extended abstract identifies several structural issues in current transformation efforts, including uneven adoption, skill limitations, infrastructural disparities, and lack of a solid conceptual framework.

The research emphasizes the importance of developing a clear, context-oriented methodology for assessing SME digital maturity. Such a methodology should integrate technological, organizational, and human factors and reflect the unique circumstances of the Ukrainian environment.

Future work involves deeper empirical research, validation of the proposed conceptual model, and practical recommendations for stakeholders. Strengthening SME digital transformation will ultimately contribute to national economic resilience, competitiveness, and long-term sustainable development.

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## **DIGITAL INNOVATION AND AI ADOPTION IN YOUTH-LED STARTUPS IN UKRAINE: A CASE-BASED ANALYSIS**

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**Context.** Over the past decade, Ukraine has developed one of the most dynamic technology ecosystems in Eastern Europe, driven significantly by a new generation of young entrepreneurs who actively integrate digitalisation, artificial intelligence (AI), and platform-based business models into their ventures. Despite challenges associated with economic instability and wartime conditions, youth-led

startups continue to demonstrate resilience, adaptability, and strong innovation capacity. This corresponds to global trends of digital transformation and the shift toward AI-enabled entrepreneurship, as described in international research on the digital economy (Brynjolfsson & McAfee, 2017). According to analytical reviews of Ukraine’s technology sector, more than 40% of new startups launched between 2022 and 2025 were founded by entrepreneurs under the age of 30, and nearly all of them integrate AI or digital tools in their operational frameworks (Dev.ua, 2022–2025; LB.ua, 2022–2025).

Youth-led business ventures in Ukraine are particularly active in fields such as e-commerce, fintech, edtech, cybersecurity, drones, and AI-driven productivity tools. These sectors experience accelerated digitalisation, reflecting a global pattern where small and medium enterprises increasingly incorporate algorithms, data analytics, and automation into business models (OECD, 2023). Moreover, as international consultancy reports emphasise, the digital maturity of SMEs grows when entrepreneurs adopt agile structures, low-code solutions, and cloud platforms – particularly relevant for Ukraine’s startup scene (Gartner, 2022).

**Practice.** Ukrainian youth entrepreneurs demonstrate a wide range of practical approaches to embedding digital innovation into their startups:

1. *AI-based product development.* Examples include:

- “Mate Academy”, where young developers and founders use machine-learning algorithms to personalise learning paths for IT students, improving engagement and performance outcomes.
- “Reface”, initially created by a team of young AI engineers, implemented cutting-edge generative AI technologies for real-time facial transformation, demonstrating the commercial viability of youth-led AI creativity.

These models align with the global shift toward platform-based and AI-integrated business architectures (Brynjolfsson & McAfee, 2017).

2. *Digital platforms supporting social entrepreneurship.* Young founders of the service “Help24”, a wartime volunteer coordination platform, used AI for logistics optimisation and matching volunteers with needs. This reflects a broader trend in the integration of data-driven decision-making in social-impact ventures (OECD, 2023).

3. *Smart retail and e-commerce solutions.* Youth-led startups such as “D2D Delivery” and “OnePick” introduced automated warehouse tools and AI-driven routing systems that significantly reduce delivery time and operational costs. Gartner’s findings on digital maturity highlight exactly these trends as critical for competitive advantage in SMEs (Gartner, 2022).

4. *UAV technologies and defense-tech innovations.* Teams of young engineers in projects like “Sydh Drone Vision” developed AI-powered drone navigation and object-recognition systems. According to LB.ua analytics, 2023–2025 saw rapid growth in youth-driven defense-tech due to demand for automated surveillance, mapping, and target-detection solutions.

5. *Creative industries powered by generative AI.* Platforms such as “Djooky”, founded by young entrepreneurs, apply machine learning to music promotion, personalised recommendations, and analytics for emerging artists, representing a synthesis of cultural industries and digital innovation.

The common element across these examples is the systematic use of AI algorithms, cloud infrastructure, user data analytics, and mobile-first technologies – demonstrating the advanced digitalisation of youth businesses in Ukraine.

**Results.** The implementation of AI and digital innovation has generated measurable results for youth-led startups in Ukraine:

1. *Increased scalability and global reach.* Most of the startups mentioned expanded their presence internationally due to the digital-by-design nature of their products. Media analyses show that Ukrainian youth-led ventures attracted significant foreign investment, including several rounds exceeding \$5 million (Dev.ua, 2022–2025).

2. *Improved operational efficiency.* AI-powered automation improved logistics performance, reduced manual processes, and decreased operational costs. For example, youth-led delivery platforms improved route optimisation efficiency by up to 25%, aligning with global observations that AI integration leads to enhanced SME productivity (Gartner, 2022).

3. *Job creation and skill development.* Digital startups, especially those in edtech and software, have become centres of youth employment and skill training. OECD reports emphasise that such ventures play crucial roles in fostering digital and entrepreneurial competencies (OECD, 2023).

4. *Enhanced innovation capacity.* Ukrainian startups gained recognition for original AI solutions, including participation in international hackathons, accelerator programs, and innovation competitions.

5. *Social and economic resilience.* Digital-first youth ventures have been more adaptive during wartime disruptions, ensuring business continuity through cloud systems, distributed teams, and flexible business models.

**Lessons Learned.** The Ukrainian experience demonstrates several transferable lessons for other economies and youth entrepreneurship ecosystems:

- *Digital-first business models enable resilience.* Cloud infrastructure and AI-based automation allow young entrepreneurs to maintain operations despite crises or resource limitations.

- *Low-cost innovation is possible.* Ukrainian youth startups often achieve global competitiveness with minimal financial input by utilising open-source tools, ecosystem cooperation, and lean development approaches.

- *Talent development ecosystems matter.* Coding academies, IT schools, and startup hubs significantly accelerate the ability of young founders to bring innovative products to markets supporting the OECD view that digital skills development is fundamental for youth entrepreneurship (OECD, 2023).

- *AI accelerates scalability.* Machine learning, automation, and generative AI allow small teams to compete with larger firms, confirming insights from Brynjolfsson and McAfee (2017).

- *Public-private partnerships amplify growth.* Many youth-led ventures benefited from collaborations with universities, incubators, international donors, and tech associations.

These lessons highlight that the Ukrainian model can be adapted in other regions seeking to develop youth-led digital entrepreneurship.

**Conclusion.** Youth-led startups in Ukraine demonstrate a vibrant and rapidly developing ecosystem centred around digitalisation, innovation, and artificial intelligence. Their achievements confirm the transformative impact of AI on entrepreneurial activity, business scalability, and economic resilience. Despite challenging external conditions, young innovators continue to introduce high-impact solutions across sectors such as edtech, defence technology, logistics, retail automation, and creative digital platforms.

The analysed cases illustrate that youth-driven ventures are capable of generating competitive advantages through the strategic use of machine learning, automation, cloud services, and data-driven decision-making. This aligns with global scholarly observations that the future of entrepreneurship is increasingly shaped by AI, platforms, and collaborative digital ecosystems (Brynjolfsson & McAfee, 2017; OECD, 2023).

Future research could focus on developing AI-driven support systems for youth entrepreneurs, exploring digital-financing mechanisms, and benchmarking Ukraine's youth startup ecosystem against EU innovation models.

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## THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE DEVELOPMENT OF YOUTH ENTREPRENEURSHIP IN THE EUROPEAN UNION

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**Introduction.** Artificial Intelligence (AI) is gradually becoming a key factor in economic and social transformations in the European Union. Within the framework of the European Digital Strategy and the political framework of the Digital Decade, AI is considered one of the most important technologies that will determine the competitiveness of the EU in the coming decades. In particular, the adoption of the Artificial Intelligence Act (AI Act) has created clear rules for the development of an ecosystem of trusted and secure digital technologies.

At the same time, researchers are increasingly interested in the relationship between AI and youth entrepreneurship. Young entrepreneurs operate naturally in a digital environment, have a higher level of digital literacy and adapt faster to new technologies. Because of this, AI becomes for them not only a tool for automation, but also a means of building a new generation of business models. AI allows youth startups and small businesses to compensate for the lack of financial resources, experience and access to professional networks. Given the strategic importance of youth business development in the EU, this topic is becoming particularly relevant.

The aim of this work is to analyze the impact of AI technologies on the development of youth entrepreneurship in the European Union, identify key opportunities and barriers for young entrepreneurs, and assess the role of EU policies in supporting the digital transformation of youth businesses.

**Methodology.** The study used a qualitative analysis method that covers three groups of sources. The first group is EU policy and regulatory documents, in particular the European Digital Strategy, the AI Act, the Digital Europe Programme and the EU Youth Strategy 2019-2027. The second group is academic literature and analytical reports (OECD, Eurofound, McKinsey, PwC) describing current trends in digital transformation and the use of AI in the field of entrepreneurship. The third group is real cases of youth startups in the EU, described in reports by EIT Digital and other European innovation institutions. The synthesis of these sources allows us to form a generalized picture of the impact of AI on youth entrepreneurship.

**Results.** The analysis showed that the impact of AI on youth entrepreneurship in the EU is multidimensional. First, AI acts as a catalyst for youth entrepreneurship by significantly lowering the barriers to entry. Thanks to the automation of operational processes, chatbots, generative models for creating text and images, analytical tools and affordable solutions in the field of personalized marketing, young entrepreneurs can start a business with minimal resources. This is especially important for young people, who often do not have start-up capital or a large team.

Second, AI is transforming business models. Young founders are creating innovative business formats, from micro-content agencies to e-commerce projects using recommendation algorithms to AI-powered applications. Youth businesses

are proving to be more willing to experiment with algorithmic tools than traditional businesses.

Third, the spread of AI is bringing digital skills to the forefront. While young people generally have higher levels of digital literacy, OECD and European Commission research shows that there is a lack of skills in data management, ethical use of AI, and cybersecurity. This is creating a so-called “digital divide,” especially between young people in large cities and those in rural or economically vulnerable regions.

Despite the advantages, young entrepreneurs face a number of barriers. These include a lack of funding for technology adoption, difficulty in accessing data, regulatory uncertainty around AI, and risks of algorithmic bias and privacy breaches. However, EU policy initiatives, including the Horizon Europe, EIT Digital, and Erasmus for Young Entrepreneurs funding programs, are gradually filling these gaps.

**Discussion.** The results show that AI is one of the key factors in the modernization of youth entrepreneurship in the EU. Its use allows young entrepreneurs to increase competitiveness, business scalability and product innovation. At the same time, a significant part of the challenges is not related to technologies as such, but to inequality in access to knowledge and resources.

EU regulatory measures create the basis for the development of trusted and secure AI solutions. However, for the effective implementation of AI in youth business, educational programs, mentoring platforms, access to financing and the development of digital infrastructures remain important. The need to develop competencies in the ethical and responsible use of AI among young people plays a special role.

**Conclusions.** Artificial intelligence has a significant impact on the development of youth entrepreneurship in the European Union, contributing to increased innovation, flexibility of business models and competitiveness of young entrepreneurs. At the same time, to maximize the use of this technology, barriers related to skills, access to finance and regulatory uncertainty need to be removed. EU policies and initiatives play an important role in shaping an environment that will facilitate the equitable and ethical implementation of AI in youth business.

In further research, it is advisable to focus on empirical data on the level of actual use of AI by young entrepreneurs, compare the situation between EU countries, and assess the impact of policy instruments on the dynamics of the development of AI startups created by young people.

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## **DIGITALIZATION AS A CATALYST OF GREEN ENTREPRENEURSHIP: EVIDENCE FROM THE ENERGY SECTOR**

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**Introduction.** The acceleration of digitalization has fundamentally transformed the structure and functioning of the energy sector, creating new opportunities for green entrepreneurship and sustainable economic development. Digital technologies, such as smart grids, big data analytics, artificial intelligence, and digital platforms – reduce information asymmetries, lower transaction costs, and enable more efficient coordination between energy producers, consumers, and innovators. In this context, green entrepreneurship emerges as a key mechanism through which digitalization supports the transition toward low-carbon energy systems, fostering innovation, competitiveness, and resilience. This study examines how digitalization acts as a catalyst for green entrepreneurial activity in the energy sector, with particular attention to its economic and sustainability implications.

The findings indicate that higher levels of digital infrastructure development are associated with increased entry of green start-ups in the energy sector. Digital tools facilitate access to markets, finance, and knowledge, allowing small and medium-sized enterprises to overcome traditional barriers to entry. Online platforms and digital marketplaces enable decentralized energy solutions, such as rooftop solar, energy storage, and peer-to-peer energy trading, which are typically driven by entrepreneurial initiatives [1]. As a result, digitalization contributes to a more diverse and competitive entrepreneurial ecosystem within the green energy branch.

Empirical evidence suggests that digitalization enhances innovation intensity and operational efficiency among green energy entrepreneurs. The adoption of smart technologies and data-driven decision-making improves resource

allocation, reduces energy losses, and accelerates the commercialization of clean technologies. Digital monitoring and predictive analytics allow entrepreneurs to optimize production and consumption patterns, strengthening both economic performance and environmental outcomes. These effects demonstrate that digitalization increases the quantity of green entrepreneurial activity as well as improves its quality and long-term viability.

Beyond firm-level effects, digitalization generates broader systemic benefits for the energy transition through entrepreneurial spillovers. Digital networks promote collaboration between start-ups, research institutions, and established energy firms, fostering knowledge diffusion and co-innovation. Green entrepreneurs act as intermediaries that translate digital advances into scalable energy solutions, reinforcing the resilience of energy systems and supporting decarbonization goals. These spillover effects are particularly relevant in periods of structural transformation, when flexibility and adaptability are crucial [2].

**Conclusions.** The results confirm that digitalization functions as a powerful catalyst for green entrepreneurship in the energy sector. By enabling market entry, enhancing innovation and efficiency, and generating positive systemic spillovers, digital technologies strengthen the role of entrepreneurs in advancing the energy transition. Policy implications include the need to invest in digital infrastructure, support digital skills development, and design regulatory frameworks that encourage experimentation and innovation in green energy markets. Such measures can amplify the synergies between digitalization, entrepreneurship, and sustainability, contributing to long-term green growth.

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## FACTORS SHAPING AND JUSTIFYING GREEN STRATEGIES IN BUSINESS

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With the development of the concept of “green solutions”, new terms have appeared in the scientific literature, detailing certain aspects of this phenomenon [2, p.10].

Circular economy is a practical approach to the implementation of “green solutions”, as it provides economic efficiency with minimal environmental impact. For example, companies that implement circular production models develop environmentally friendly products, reduce waste and create new business opportunities based on secondary raw materials.

Green energy is one of the key components of “green solutions”, as it ensures energy sustainability and contributes to the ecological balance. Its implementation in business processes and public initiatives allows to reduce the ecological footprint of enterprises and create “green” business models [1].

Ecological footprint assessment is the basis for the adoption of “green solutions”. Footprint reduction is achieved through the implementation of environmental innovations, sustainable management and energy-efficient technologies. For example, companies that actively monitor their environmental footprint are implementing measures to reduce it, such as optimizing logistics or switching to renewable energy sources.

Green urbanism contributes to the implementation of “green solutions” in urban communities. For example, the creation of green roofs or the implementation of rainwater harvesting systems in urban infrastructure are examples of such solutions. This improves the quality of life of residents and ensures long-term environmental sustainability.

Therefore, the above concepts are interrelated elements that together form the concept of “green solutions”. They not only complement, but also clarify the essence of “green solutions”, giving them a practical focus. The integration of these concepts into business and social activities contributes to achieving the environmental, social and economic sustainability necessary for the modern world.

The use of green solutions in business activities has both an environmental and economic effect. Firstly, it helps to improve the reputation of the business, which is especially important in a world where consumers are increasingly choosing environmentally responsible brands. Secondly, green solutions allow to reduce costs related to energy resources and waste disposal. Finally, it opens up access to new markets and financing, for example through grants or loans for eco-innovation.

Making green decisions in enterprises depends on a complex of external, internal, technological and economic factors. Legislation, market demand, financial opportunities and innovations create conditions for greening business. Successful implementation of such decisions requires a harmonious combination of these factors with strategic goals and the environmental culture of the enterprise. Green decisions are becoming not only a challenge, but also an opportunity for business development in a world that increasingly values sustainability and responsibility to nature. We will display in Table 1 a general characteristic of the factors influencing

the adoption of “green decisions” and an assessment of the level of impact, where -1 is a negative impact, 0 is neutral and +1 is positive.

Table 1 - Characteristics of factors influencing the adoption of green decisions and assessment of the level of impact

Factor name	Characteristic	Impact assessment
Legislative regulation	The presence of environmental laws, standards, fines for violations, and incentives for environmental initiatives.	+1
Market pressure	Consumer demand for environmentally friendly products and competition in the market.	+1
Global trends	The impact of international environmental initiatives and trends (circular economy, green energy, etc.).	+1
Social pressure	Expectations of companies for environmental responsibility from the public, media and organizations.	+1
Strategic goals	Integrating environmental practices into long-term business strategy to increase competitiveness.	+1
Financial resources	Availability of funds for investment in green technologies and innovations.	+1
Technological level	Availability of funds for investment in green technologies and innovations.	+1
Organizational culture	The level of environmental awareness among management and employees, readiness for change.	+1
Resource cost	Rising prices for traditional resources stimulate the transition to alternative sources and increased efficiency in the use of existing ones.	+1
Digitalization of processes	Using digital technologies to monitor resources, optimize operations, and reduce environmental impact.	+1
Economic efficiency	Benefits from implementing environmental solutions, such as reducing costs or increasing customer loyalty.	+1
Implementation risks	The complexity of integrating new technologies, possible losses during the transition to environmentally friendly solutions.	0
Insufficient information	Limited access to knowledge about "green" practices and technologies or insufficient number of qualified personnel.	-1

*Source:* compiled by authors

According to Table 1, it can be seen that most of the factors that influence green decision-making in enterprises have a positive impact, which is confirmed by the impact level assessment of +1. This includes legislative regulation, market pressure, global trends, social pressure, strategic goals, financial resources,

technological level, organizational culture, cost of resources, digitalization of processes and economic efficiency. These factors contribute to the active implementation of environmental practices, cost reduction, increased competitiveness and adaptation to environmental requirements.

However, there are also factors that can slow down this process. For example, the risks of introducing new technologies have a neutral impact (score 0), which indicates the possible difficulty of integrating environmental innovations into the activities of the enterprise. In addition, a lack of information or qualified personnel (-1) can be a serious barrier to the effective use of "green" technologies and practices.

To achieve success in implementing green solutions, it is important not only to consider existing factors, but also to consider the conditions that can significantly affect the process of their implementation. One of the main conditions for making green solutions is the presence of a legislative framework that regulates environmental norms and standards. Businesses must comply with environmental requirements, such as reducing greenhouse gas emissions, waste management, efficient use of resources, and others. In particular, policies that support the development of alternative energy sources or reducing environmental impact can become key conditions for businesses seeking to become environmentally responsible.

Market demand for environmentally friendly products and services also plays an important role in making green decisions. This trend towards environmental responsibility on the part of consumers forces enterprises to adapt to new requirements, to seek innovative and sustainable approaches in their activities [4].

Investments in "green" technologies can be a significant challenge for many enterprises, especially for small and medium-sized businesses that have limited financial resources. However, the availability of financing or government subsidies for the development of environmentally friendly technologies can greatly facilitate the adoption of green decisions.

Technologies play a key role in the implementation of green decisions. The development of innovative, energy-efficient and environmentally friendly technologies allows to reduce the impact on the environment and optimize the use of resources. Therefore, enterprises should constantly invest in research and development, as well as interact with scientific institutions to study new solutions [3, p. 210].

Thus, we see that the adoption of green decisions in business depends on various conditions, including legislative, market, financial, technological, organizational and social. All these conditions must be taken into account by the enterprise to achieve maximum efficiency in the implementation of environmental practices. Only a comprehensive approach that includes not only internal resources and capabilities, but also takes into account the external environment, can ensure sustainable development and implementation of green initiatives at the enterprise.

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## PROSPECTS FOR YOUTH AND BUSINESS IN SHOSTKA, SUMY REGION, UKRAINE

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Engaging in entrepreneurship in Ukraine is promising for those who are ready for high adaptability, innovation, and work in sectors where demand for recovery and security is growing. Ukrainian entrepreneurs demonstrate strong resilience, rapid adaptation, and the ability to innovate under crisis conditions.

At present, Ukraine has a high and growing demand in construction, infrastructure recovery, and the production of building materials. Demand for energy efficiency and decentralized energy solutions is also increasing. There is a strengthening trend toward supporting local producers and Ukrainian craft and processing enterprises.

Active government grant programs and preferential lending (for example, “Own Business” (eRobot) and 5–7–9% loans) stimulate small and medium-sized enterprises. There are also regional programs for small and microbusinesses that compensate loan interest for SMEs.

Over the past year, initiatives providing grants for micro- and small businesses (up to USD 7,000–20,000) from international organizations have appeared in Sumy Oblast.

Sumy Oblast has educational institutions, including vocational and technical schools, which can provide a starting point—studying economics and acquiring professional skills—for launching one’s own business.

An important support instrument for entrepreneurs, particularly those developing their businesses in Ukraine, is the “**Made in Ukraine**” Office, where one can receive a “**turnkey**” service: consultations on government support programs, assistance with grant applications and business plans, including for veteran-owned businesses.

### **What might be interesting for young people — how to combine business and development?**

For young people in Shostka and Sumy Oblast, the following approaches can be particularly appealing:

- launching a microbusiness or startup with minimal initial capital by using grants and support programs;
- engaging in agriculture, farming, eco-projects, or rural businesses—especially where benefits and support from the state or donors are available;
- combining education and business: for example, studying a locally needed specialty (farming, logistics, IT, management) and immediately launching a business or service in one’s hometown;
- identifying niches that are currently needed by people in the region: services, logistics, repairs, local production—things that “did not leave with the people.”

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## **ENTREPRENEURSHIP SUPPORT UNDER CONDITIONS OF WAR: THE CASE OF THE BUSINESS ASSOCIATION “4BUSINESS”**

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Entrepreneurship is widely recognized as a key driver of economic growth, innovation, employment creation, and social cohesion. In post-war and war-affected regions, its role becomes even more significant, as traditional economic structures are weakened and public resources are constrained. Ukraine's Sumy region, located near the frontline and exposed to continuous security and economic risks, represents a particularly challenging environment for entrepreneurial activity. Against this backdrop, non-governmental organizations increasingly assume functions traditionally associated with state institutions, including business support, training, and coordination.

The Business Association "4Business," founded in 2003 and rebranded in 2023, positions itself as a regional platform for entrepreneurship development, civic engagement, and economic recovery. Its strategic mission is to support responsible business, promote sustainable development, and strengthen cooperation among entrepreneurs, communities, and public authorities. In 2024, the organization significantly expanded its activities, membership base, and partnerships, offering a valuable case for analyzing grassroots-driven entrepreneurship stimulation in a post-war context [1].

Entrepreneurship stimulation extends beyond financial support and includes the creation of enabling conditions such as access to knowledge, networks, markets, and institutions. In fragile contexts, NGOs often compensate for weak market institutions by providing integrated support packages that combine training, mentoring, financing facilitation, and advocacy.

The "4Business" model reflects this integrated approach. Rather than focusing solely on grants or training, the organization implemented a multi-layered system of entrepreneurship stimulation, addressing both supply-side constraints (skills, capital, information) and demand-side factors (market access, promotion, visibility). Particular emphasis was placed on vulnerable groups, including women, youth, internally displaced persons, and veterans, aligning entrepreneurship policy with principles of social inclusion and resilience.

The core entrepreneurship stimulation activities implemented by "4Business" in 2024 can be grouped into five interrelated dimensions.

First, capacity building and education played a central role. The organization conducted training programs on business planning, grant writing, strategic management, marketing, financial literacy, and digital skills. These programs targeted both existing entrepreneurs and individuals planning to start a business, thereby supporting both business survival and new venture creation.

Training formats included in-person workshops, webinars, and hybrid sessions, ensuring accessibility for participants from remote communities.

Second, grant-based support served as a catalyst for business expansion. Through donor-funded programs, “4Business” facilitated competitive grant schemes that provided equipment and material support to entrepreneurs. In 2024 alone, over 12.9 million UAH in equipment was distributed to selected beneficiaries. Importantly, financial support was embedded within a broader framework of training and consultation, reducing the risk of inefficient resource use and increasing sustainability.

Third, business consulting and mentoring constituted a continuous support mechanism. The NGO provided individualized consultations on business planning, legal and accounting issues, agricultural production, marketing, and digitalization. More than 400 participants received consultations through the Sumy Regional Business Consulting Center, illustrating the scale and intensity of support. This long-term engagement distinguishes effective entrepreneurship stimulation from short-term project interventions.

Fourth, ecosystem development and networking were actively promoted. The organization’s membership grew from 35 to 124 participants within one year, reflecting the creation of a dynamic entrepreneurial community. Members were engaged in regional development councils, working groups, and advisory bodies, strengthening the link between entrepreneurs and policymaking processes. Events such as regional forums and craft fairs functioned as platforms for cooperation, trust-building, and market exposure [2].

Finally, promotion and visibility of local entrepreneurship represented an innovative dimension of stimulation. The creation of video success stories, a regional craft product catalog, and public events contributed to improving the social perception of entrepreneurship and expanding market opportunities. By showcasing local businesses, “4Business” reinforced entrepreneurial role models and motivated broader participation in support programs .

The outcomes of entrepreneurship stimulation through “4Business” demonstrate both quantitative and qualitative impacts. Quantitatively, the organization reached hundreds of entrepreneurs through training and consulting, supported dozens of businesses with grants, and significantly expanded its community. Qualitatively, the interventions contributed to increased entrepreneurial confidence, improved business planning capacities, and stronger cooperation between business and local authorities. A notable feature of the case is the high participation of women and youth, indicating progress toward inclusive entrepreneurship. Furthermore, the integration of psychological resilience and safety training highlights the adaptation of entrepreneurship support to wartime conditions, acknowledging the human dimension of economic activity [3].

The recognition received from regional authorities further suggests that NGO-led entrepreneurship stimulation can complement public policy and contribute to regional recovery strategies. “4Business” effectively positioned itself as a trusted intermediary capable of translating donor resources into locally relevant economic outcomes.

The case of the Business Association “4Business” illustrates that entrepreneurship stimulation in post-war regions requires an integrated, ecosystem-based approach. Financial support alone is insufficient; it must be combined with education, consulting, networking, and institutional engagement. NGOs can play a decisive role in this process by bridging gaps between entrepreneurs, donors, and public authorities. The experience of “4Business” offers transferable lessons for other regions facing similar challenges. Entrepreneurship stimulation is most effective when it is locally embedded, inclusive, and oriented toward long-term capacity building rather than short-term outputs. As Ukraine continues its recovery and reconstruction, such NGO-driven models may serve as important building blocks for resilient and sustainable regional economies.

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## **THE ROLE OF YOUTH IN SOCIAL ENTREPRENEURSHIP IN THE EU**

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**Introduction.** Social entrepreneurship in the EU is increasingly seen as an effective tool for addressing social, economic, and environmental challenges, combining entrepreneurial approaches with a social mission. In this context, young people play a particularly important role, as they are the bearers of innovative ideas, digital skills, and new business models focused not only on profit but also on social value. The European Union actively supports the development of youth social entrepreneurship through educational programs, financial instruments, incubators, accelerators, and initiatives to promote civic engagement.

The relevance of the study is determined by the growing importance of social entrepreneurship in achieving the EU's sustainable development goals, overcoming youth unemployment, and strengthening social cohesion. At the same time, the role of young people in this process remains insufficiently systematized in scientific literature in terms of economic effects and institutional conditions. The aim of the study is to analyze the role of young people in the development of social entrepreneurship in the EU, as well as to identify key factors that promote and hinder the involvement of young people in socially oriented entrepreneurial activities within the framework of European Union policies and practices.

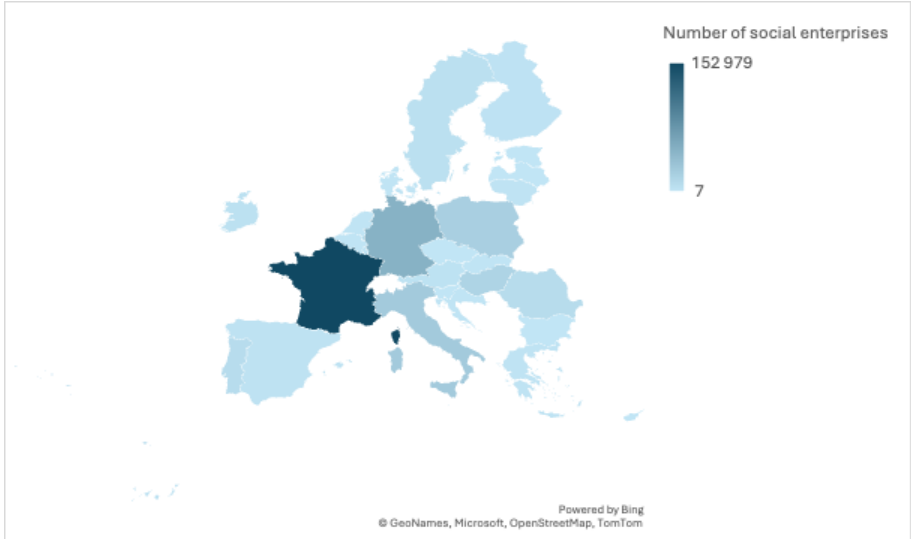
**Methodology.** The study is based on a combination of qualitative and quantitative analysis methods. Secondary analysis of statistical data and analytical reports from the European Commission, OECD, Global Entrepreneurship Monitor (GEM), and other international organizations was used to assess the scale and spatial distribution of social entrepreneurship in the EU. In addition, comparative and descriptive analysis was used to identify the role of young people, key trends, challenges, and institutional mechanisms for supporting social entrepreneurship in European Union countries.

**Findings.** Social entrepreneurship combines an entrepreneurial approach with a social mission aimed at positively impacting society, the environment, or the community. Social enterprises create goods and services, generate income, but reinvest most of their profits to achieve social goals. They operate transparently, engage employees and stakeholders, and focus on sustainable development and solidarity.

The European Commission supports the development of social entrepreneurship through a favorable financial, administrative, and legal environment. In turn, the social business initiative launched in 2011 has identified practical actions to improve the work of such enterprises at the local level. Unlike other regions, social entrepreneurship in Europe within the EU has developed gradually and is an integral part of employment and inclusion policy [1]. As of 2024, the total number of social enterprises is estimated at 312,168. At the same time, the distribution of social enterprises is uneven: most are concentrated in Northern and Western Europe, while in Eastern and Southern countries their number is significantly lower due to limited legal support and a lower level of social responsibility culture. This creates a difference in access to resources and opportunities for social entrepreneurs (Fig. 1).

In this context, young people are an important factor in expanding the influence and growth of social enterprises within the European Union due to their high level of awareness and entrepreneurial initiative. Firstly, numerous studies show that young people are more active in social entrepreneurship than older age groups: in 37 out of 49 countries, it is young people who most often initiate the creation of social enterprises, and in Western Europe, one in four social entrepreneurs belongs to this age group. For example, in France and Spain, young people hold up to 20% of management positions in social enterprises [2-3].

Figure 1. Number of social enterprises by EU's countries\*



\*Created by the authors based on [4].

In addition, the potential for engaging young people in social entrepreneurship in the EU continues to grow. More and more young people express a desire for self-employment (46%), and about a third of those surveyed are already familiar with the concept of social entrepreneurship. The interest in becoming part of the social economy is driven by the opportunity to combine income with the fulfillment of a social mission, which distinguishes social entrepreneurship from traditional forms of business and contributes to a higher level of professional satisfaction and awareness of the value of one's work. These motives are also effective for those young people who prefer to be employed: when choosing a place of work, clearly formulated environmental (73%) and social (75%) goals of the company, as well as the opportunity to participate in decision-making processes (78%), are important to them [5].

Among the main potential benefits of youth social entrepreneurship, the following aspects can be identified: social innovative solutions to local problems (82%), employment opportunities for young people (76%), and the development of

important entrepreneurial and leadership skills for young people (73%). In addition, youth-led social enterprises are engaged in social activities across a wide range of areas, from environmental protection to addressing refugee employment issues [6].

This implies that young people are capable of significantly influencing the growth of social entrepreneurship and the implementation of innovative approaches to solving social problems. The active participation of young people contributes to the dissemination of social ideas, the formation of new networks and projects, and the overall effectiveness and sustainability of social businesses in various EU countries.

Despite existing support programs, a gap remains between young social entrepreneurs' needs and political support. The main problem is limited access to financing due to lack of start-up capital, credit history, and collateral. Therefore, young social enterprises rely on government subsidies, donations, and support programs. Additionally, specialized skills in financial management, legal regulation, social impact assessment, and scaling are needed. A major barrier is differences in EU legal frameworks, which do not always consider the hybrid nature of social enterprises or allow increased visibility to key stakeholders.

In this context, it is important to disseminate and adapt successful EU practices to support young people. Programs and tools such as Erasmus for Young Entrepreneurs, various mentoring initiatives, the European Solidarity Corps, and social business funding have provided significant support to existing young entrepreneurs. They noted that these programs gave them access to mentoring (exchange of entrepreneurial and management experience within Erasmus for Young Entrepreneurs), social and financial resources (e.g., through the EU Programme for Employment and Social Innovation and EU social investment funds), as well as skills to launch and develop their own projects (thanks to Erasmus+, the European Solidarity Corps, and other EU-funded programs), which helped increase their social impact and expand their networks [6].

**Significance.** This work contributes to the development of scientific knowledge, in particular the formation of theoretical and practical approaches in the field of youth social entrepreneurship as an important and dynamic part of the social economy capable of solving pressing social problems. It systematizes the role of young people in the development of social enterprises in the EU, identifies key factors that promote or limit their participation, and assesses the effectiveness of existing support policies and programmes. The results of the study can be used to improve institutional mechanisms, create targeted training, mentoring, and financial support programs, as well as to increase the visibility of youth social enterprises and expand their social impact.

**Conclusion.** Youth social entrepreneurship in the EU plays a key role in addressing social, economic, and environmental challenges. Young people demonstrate a high level of initiative, innovation, and readiness for self-employment, which contributes to the spread of social ideas, the creation of new

networks, and the increased effectiveness of social enterprises. At the same time, youth social enterprises face several challenges, including limited access to finance, a lack of specialized skills, complex legal regulations, and insufficient visibility. The EU has already implemented effective support programs, but there is still a need to transform the legislation, policies, and support instruments of member states. Recommendations for the development of such measures could form the basis for future research, which would not only increase youth participation in social entrepreneurship but also enhance the social impact and sustainability of social enterprises in EU countries.

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## FROM ENGAGEMENT TO CO-CREATION: INTEGRATING YOUTH INTO ENTREPRENEURIAL ECOSYSTEMS

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Youth entrepreneurship plays a key role in forming resilient regional economies, especially under the economic and security challenges facing Ukraine. Young people demonstrate significant motivation for entrepreneurial activity, but high entry barriers, limited access to financial resources, and insufficient practical skills often hinder the transformation of ideas into successful businesses. In the European Union, only 5% of young people (aged 18–30) work on a startup, and another 4% manage a new enterprise, although nearly 40% show interest in self-employment. This indicates a gap between interest and the realization of youth entrepreneurial initiatives, which is also characteristic of other economies, including Ukraine. [3]

Analysis of entrepreneurial activity dynamics in Ukraine for 2025 shows a complex and uneven picture: in the first four months of 2025, almost 82,000 new sole proprietors (FOPs) were registered, while nearly 120,000 FOPs ceased operations, with the number of closed businesses exceeding new registrations by approximately 38,000. At the same time, the number of new registrations decreased by 9% compared to 2024, while closures increased by 44%. [1]

The sectoral distribution shows that retail trade is the most popular area among new initiatives - chosen by about 25% of new FOPs, followed by IT and programming consulting, and wholesale trade. This aligns with pan-European trends, where youth choose sectors such as tourism, trade, and technology, which allow the fastest market entry with minimal capital investment. [1]

Data for Q1 2025 confirm these trends: 56,826 new FOPs were registered, 20% more than in Q4 2024, but closures increased by over 50% (108,242 versus 71,975), resulting in a pronounced negative balance for small businesses. The most active sectors were retail, IT, and “other services,” yet in these sectors, closures exceeded openings, indicating higher competition, entry risks, and demand instability. [2]

The gender aspect is also important: about 61% of new FOPs in 2025 were opened by women, indicating high female participation in small businesses, although women also represented a significant share among closed businesses (≈53%). This aligns with OECD international data showing that the share of “missing” entrepreneurs (especially women and youth) in developed economies represents a substantial loss of economic growth potential. [1, 2]

Despite difficult macroeconomic conditions, during the first nine months of 2025, the total number of newly registered FOPs exceeded 225,000, while closures were 213,000, resulting in an overall positive balance, although part of the new businesses operate for less than a year and demonstrate high turnover. [5]

In regions with the highest entrepreneurial activity – Kyiv, Dnipropetrovsk, Lviv, Kyiv Oblast, and Odesa - activity is growing, but in frontline regions, there is a significant net outflow of entrepreneurs, requiring targeted strategies for support and economic initiative relocation. [2]

Against these challenges, the role of regional development agencies, particularly the Sumy Regional Development Agency (ARRSO), becomes especially important. ARRSO acts as an institutional intermediary, connecting youth, business, and local governance through practical measures: business development consultations, support for access to financing and grants, organization of student internships and professional training. Internship programs help develop practical competencies in youth, reduce entry barriers to the labor market and entrepreneurship, while training projects, such as solar panel installation, develop technical skills in promising green economy sectors – a concrete example of responding to global trends, where green sectors grow faster than traditional industries. [3]

International recommendations from the OECD and EU emphasize that comprehensive support for young entrepreneurs should include not only financing but also mentoring programs, market access, support networks, and education focused on practical skills. Incorporating these practices into regional programs, including through local accelerators, co-working spaces, and partnerships with universities and business associations, can significantly increase the chances of survival and growth for young enterprises. [3]

Based on this analysis, ARRSO recommends the following strategic directions for integrating youth into entrepreneurial ecosystems:

- Improving access to financing: developing grant and microcredit instruments targeted at youth projects.
- Educational initiatives: developing practical business courses in partnership with universities and international organizations, focused on high-growth sectors (IT, technology, creative industries).
- Support networks and mentoring: creating regional platforms connecting youth with experienced entrepreneurs and experts.
- International partnerships: strengthening cooperation with European development agencies to exchange best co-creation practices and develop cross-border programs.

These steps will not only support the preservation and growth of youth entrepreneurship in Sumy Oblast but also serve as a model for adapting successful European practices to the Ukrainian regional context.

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## **DEVELOPING ENTREPRENEURSHIP COMPETENCIES AT HISTORY LESSONS WITH THE TOOLS OF STEM EDUCATION**

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**Introduction.** In today’s rapidly changing world, entrepreneurship is increasingly recognized as a vital skill, not only for business but also for personal and civic development. Integrating entrepreneurship education into school curricula can prepare students to think critically, solve problems creatively, and make informed decisions. One innovative approach is to combine history lessons with the tools of STEM (Science, Technology, Engineering, and Mathematics) education, fostering a multidisciplinary environment where students can develop entrepreneurial competencies while exploring historical contexts. This integration encourages students to analyze past events, identify patterns, and apply practical solutions to contemporary challenges.

History lessons provide a rich foundation for entrepreneurial thinking by exposing students to real-life examples of innovation, leadership, and decision-making in different socio-economic contexts. By incorporating STEM tools, such as data analysis, digital modeling, and simulations, students can explore historical phenomena in interactive ways. For instance, they might analyze trade routes, population growth, or technological innovations using quantitative methods, enabling them to understand cause-and-effect relationships and identify opportunities for creative problem-solving. Such activities promote critical thinking, strategic planning, and risk assessment—core skills for entrepreneurship.

Moreover, STEM-based projects in history classes can cultivate teamwork, project management, and communication skills. Students can work in groups to design solutions to historical challenges, such as recreating an ancient marketplace or developing a sustainable urban plan for a historical city using engineering principles and digital tools. These exercises help students translate

theoretical knowledge into practical applications, fostering a mindset that values experimentation, innovation, and resilience. By linking historical insight with STEM methods, learners gain a holistic perspective that mirrors the interdisciplinary thinking needed in entrepreneurial ventures.

**Conclusions.** Integrating entrepreneurship competencies into history education through STEM tools offers a unique opportunity to prepare students for the complexities of the modern world. This approach not only enhances historical understanding but also equips learners with essential skills such as critical thinking, problem-solving, collaboration, and innovation. By experiencing the past through analytical and creative lenses, students develop a proactive, entrepreneurial mindset that can be applied across disciplines and real-world contexts, bridging the gap between knowledge and action.

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## **DRIVING RESILIENT MANAGEMENT AND YOUTH EMPOWERMENT THROUGH CLOUD UNIVERSITY**

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**Introduction.** The modern world is in a rather turbulent state, characterized by such features as volatility, uncertainty, complexity, and ambiguity (according to the concept of “VUCA”, Bennis & Nanus, 1985). This is manifested in the increasing frequency and spread of global crisis situations, such as pandemics, wars, economic crises, and natural disasters. Accordingly, the ability of systems and actors to adapt and be resilient becomes critically important.

The higher education system is also vulnerable to such challenges that cause disruption of the stability and continuity of the educational process, limited access to resources, reduced quality of educational services, and the need for rapid adaptation to new formats. In such conditions, traditional models of management and learning do not provide sufficient flexibility for rapid adaptation, which actualizes the search for new, more innovative solutions. One of them can be

considered the cloud university model, which combines digitalization, cloud technologies, and adaptive approaches to learning, providing young people with numerous opportunities through digital innovations.

In this regard, **the purpose of this study** is to analyze the potential of cloud technologies as a strategic factor for sustainable management in higher education institutions (HEIs) and to study the role of youth as key users and co-authors of digital innovations.

**Methodology.** This study uses a theoretical approach based on a systematic review of scientific sources and international recommendations related to education that is resilient to crises or natural disasters and digital transformation in higher education institutions.

**Findings and Discussion.** In the traditional sense, resilience is defined as “the ability of systems to cope with or adapt to endogenous or exogenous shocks” (Bourbeau, 2018; Joseph & Juncos, 2020). That is, it is the development of such features that crisis events and phenomena do not lead to chaos in the activities of such entities (or even cessation of activities depending on the level of crisis impact), but allow them to maintain their vital functions taking into account such circumstances, self-organize and even grow and transform (Natorski, 2022). Accordingly, a resilient higher education system should not only continue to provide high-quality and accessible education in crisis conditions but also ensure the preservation and multiplication of learning outcomes for the future (Shah et al., 2019), for example, through risk management, reformatting educational processes and reforming organizational practices.

Resilience can be considered at different levels, including individual, collective and organizational. Thus, Duchek (2020) argues that an important component of organizational resilience is the individual abilities of employees, which form the internal resource of the company. The study by Kowler et al. (2023) emphasizes that to ensure the resilience of higher education teachers in a crisis (using the example of the first wave of the COVID-19 pandemic), not only technical or administrative support was critically important, but also attention to emotional well-being, trust in the team and recognition of employees' efforts. Although teachers received basic assistance, including technological and pedagogical, it was the lack of emotional support, transparent communication and proper recognition of their work that was a barrier to rapid recovery and adaptation of activities.

Hartmann et al. (2020) also viewed resilience as a collective phenomenon that depends on organizational culture (trust, support, openness), effective communication, joint problem-solving, and leadership that promotes cohesion. Brewer et al. (2019), in addition to intra- and interpersonal resilience, additionally identified contextual determinants that significantly affect the ability of individuals and institutions to adapt to crisis conditions. These can be both political decisions and social conditions that either help or, conversely, complicate overcoming the crisis.

At the level of theoretical typology, the resilience of educational systems is realized through three interrelated resilient capacities: absorptive (absorption or minimization of shocks and stresses without significant changes through preventive measures and coping strategies), adaptive (adaptation to new conditions), and transformational (fundamental changes in institutional architecture) (Shah et al., 2019).

The theoretical research on resilience shows that at the level of education systems it is not limited to technical measures or short-term solutions. In this context, the concept of resilient management in HEIs is based on international standards, in particular the Sendai Framework for Disaster Risk Reduction (2015–2030), where education is defined as a critical service that must be protected from the impact of disasters (UN International Strategy for Disaster Reduction, 2015). Accordingly, there is a shift in emphasis from the physical security of educational buildings and evacuation protocols to a comprehensive approach that encompasses infrastructural resilience, learning continuity management, psychosocial support, digital preparedness and inclusion in the context of multiple risks (UNESCO, 2023; World Bank, 2024; Tyas et al., 2025).

In such conditions, universities cease to be passive participants in the process but become centers for the formation of strategies for resilience to crises and disasters (Sulkowski et al., 2024). International developments show that it is universities that are able to act as key agents of resilience at the level of communities and public policy, consolidating expertise and building networks of centers of excellence (Sulkowski et al., 2024)

Simultaneously, digitalization plays an increasingly critical role in ensuring the resilience of higher education institutions. Its catalyst is considered to be the COVID-19 pandemic, which caused a reactive transition of HEIs to distance and online learning. Although this had its own difficulties, in particular at the level of infrastructure provision and lack of digital skills among participants in the educational process, as well as the absence of ready-made strategies for crisis situations (Hall et al., 2020), it led to a rethinking and transformation of traditional learning models. In particular, in the context of the war in Ukraine, when universities had to urgently close campuses due to security challenges, it was those in which digital infrastructure was already established and digitalization of administrative processes was ensured that were able to adapt faster and continue educational and scientific activities in a distance format (Agapova et al., 2024).

At the same time, research on the implementation of cloud technologies in higher education or the formation of a “cloud university” is actively developing (Shakor & Surameery, 2021). In particular, the Erasmus+ project “Disaster Resilience in Higher Education Systems via a Cloud University Model”, within the framework of which this research was carried out, is dedicated to the task of ensuring a university-wide concept that will allow higher education institutions in countries facing armed conflicts or crises to fulfill their educational mission using the cloud university model. Given the lack of a single and unambiguous

interpretation of the concept, a cloud university is understood as a temporarily relocated higher education system in which the main processes such as learning, teaching, and administration are hosted and provided via cloud platforms (Tarasenko et al., 2025). This concept of cloud university emerged as a strategic response to the challenges of unpredictable crises, ensuring flexibility, scalability and accessibility of educational resources in any conditions (Loebis et al., 2024). Cloud platforms allow the integration of innovative tools (from adaptive learning systems to virtual laboratories), which contributes to the formation of digital competencies and increasing the sustainability of the educational process (Régent et al., 2025).

Cloud infrastructure creates expanded opportunities for young people, ensuring:

- accessibility and flexibility of learning regardless of geographical or social barriers, which is especially important in crisis situations;
- development of digital competencies due to interaction with cloud services, analytical platforms and artificial intelligence tools;
- innovative and social entrepreneurship, opening up space for youth startups in the field of EdTech, hackathons and projects aimed at solving community problems;
- global collaboration, as cloud ecosystems integrate students into international research networks, promoting knowledge exchange and cultural dialogue.

**Conclusion.** In summary, the study concludes that resilience management in higher education institutions goes beyond traditional approaches to security and encompasses strategic planning, digital readiness, psychosocial support, and the integration of global risk management frameworks. In such conditions, the cloud university model acts as a catalyst for innovation in higher education, ensuring flexibility, scalability, and continuity of the educational process even in crisis situations. Its implementation contributes to the formation of resilient educational ecosystems that are able to adapt to unforeseen challenges, while maintaining the quality of educational services and accessibility for students.

Particular attention should be paid to youth as a key beneficiary of resilient educational systems. The younger generation not only needs stability and access to quality education in times of crisis but also acts as a driving force for digital transformation and innovation. Developing digital competencies, adaptability skills, and psychological resilience among students is critical for shaping future leaders capable of operating in uncertain environments. Thus, university resilience should be considered not only as an institutional characteristic, but also as a tool to support young people in the process of professional and personal development.

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## **ENERGY MODERNISATION AND ENERGY COST MANAGEMENT AS STRATEGIC DRIVERS OF SUSTAINABLE BUSINESS TRANSFORMATION**

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Energy modernization (EM) has emerged as a key strategic and evolutionary vector of transformation for national economies and individual businesses in the twenty-first century. This large-scale process represents an inevitable response to a set of global challenges, including increasing environmental pressure, the imperative of decarbonization, unprecedented volatility in global energy markets, and the rapid acceleration of technological progress. Consequently, the modernization of energy systems becomes not only a strict techno-economic

imperative but also a decisive component of the broader sustainable development agenda, fully aligned with the United Nations Sustainable Development Goals, in particular Goal 7 (“Affordable and Clean Energy”) and Goal 13 (“Climate Action”) (United Nations, 2025).

The essence of EM lies in a systemic, integrated, and holistic transition from outdated, energy-inefficient technologies, infrastructure, and management practices towards innovative, resource-efficient, and environmentally clean solutions. This process is inherently bidirectional and requires synchronous changes on both sides of the energy system. On the supply side, it involves the decarbonization of power generation sources, the large-scale integration of renewable energy technologies, and the digitalization of energy infrastructure, enabling the development of smart grids. On the demand side, EM entails not only the implementation of advanced energy-efficiency measures but also behavioral change, the development of new consumption models such as prosumerism, where firms act simultaneously as energy producers and consumers, and the deployment of sophisticated demand response systems.

Energy Cost Management (ECM) constitutes an integral and critical component of energy modernization, ensuring the organizational and financial sustainability of the transformation process. ECM employs a systematic and evidence-based approach to assessing, monitoring, and controlling energy flows. This approach significantly reduces operational costs, lowers energy intensity, and enhances the overall economic competitiveness of firms. At the micro level, the integration of EM and ECM becomes a central element of corporate ESG strategies (Environmental, Social, and Governance), enabling companies to improve environmental performance, mitigate financial exposure, and strengthen reputational capital (Organisation, 2025). At the same time, increasing pressure from investors and regulators requires enhanced transparency and accountability, as reflected in compliance with ESG metrics and mandatory reporting frameworks. Despite its global relevance, successful energy modernization faces substantial challenges, particularly in transition economies. Among the most significant barriers are limited access to financial resources for upfront capital investments (CAPEX), regulatory constraints, institutional inertia, and insufficient technical expertise to implement complex solutions. Existing academic literature often addresses isolated dimensions of the problem, focusing either on technological upgrades or on organizational energy management practices, such as the implementation of energy management systems or ISO 50001, without adequate integration. This fragmentation complicates the effective alignment of four critical dimensions of modernization: technological, organizational, financial, and behavioral.

The increasing complexity and interdependence of modern energy systems, gradually shifting from traditional, linear, and centralized models towards distributed and adaptive architectures, necessitate an integrated and adaptive approach capable of responding to real-time changes. Ensuring a successful and

lasting energy transition, therefore, requires a holistic strategy based on clearly defined guiding principles (Table 1).

Table 1 – Core Principles of Integrated EM and ECM

Principle	Characteristics
Prioritization of energy efficiency	Reduction of energy consumption should systematically precede investments in new generation capacity, as efficiency measures (such as process optimization, building automation systems, and energy-efficient equipment) typically offer the fastest payback periods and form the foundation for subsequent, more capital-intensive interventions.
Decentralization	It involves the deployment of distributed generation technologies, including photovoltaic systems, combined heat and power (CHP) units, small-scale wind installations, and flexible energy storage solutions. Decentralization enhances energy self-sufficiency, reduces dependence on centralized grids, and increases system resilience to external disruptions.
Integration and a systemic approach	This entails the holistic coupling of energy systems with operational processes, digital platforms, and industrial IoT devices, enabling granular real-time monitoring and control of energy flows. Interoperability across production, logistics, IT, and building management systems is essential for unlocking synergies and achieving predictive and adaptive energy management.
Continuous improvement	Energy transformation should be institutionalized as an iterative process, supported by regular energy audits, benchmarking, and the implementation of energy management systems in line with ISO 50001. Investment decisions should be guided by Life Cycle Costing (LCC), complemented by Life Cycle Assessment (LCA) and Multi-Criteria Decision Analysis (MCDA), to ensure a comprehensive evaluation of economic, environmental, and social impacts (Federal Ministry, 2025).

The objectives of integrated EM and ECM are multidimensional, encompassing strategic reductions in operational expenditures, enhanced energy security and resilience, as well as regulatory compliance and the achievement of a sustainable competitive advantage. Energy modernization is also closely linked to the principles of the circular economy and industrial symbiosis, requiring a reconceptualization of energy flows as part of broader resource cycles. This enables firms to reduce waste, recover residual heat, utilize renewable inputs, and

generate co-benefits such as lower emissions, improved workforce well-being, and local economic development.

The dynamics of energy modernization are shaped by a combination of technological progress (such as declining costs of solar energy, automation systems, storage technologies, and AI-based energy management platforms), political drivers, including the European Green Deal (European Commission, 2025), market volatility, and the growing availability of green finance instruments. The convergence of digital and energy transitions generates significant synergies, allowing firms to achieve economies of scale while increasing transparency and effectiveness in energy management.

In conclusion, EM integrated with effective ECM represents not a reactive compliance exercise, but a proactive, forward-looking strategy aimed at ensuring resilience and future-proofing business operations. This transformation creates substantial opportunities for youth-led entrepreneurship, as digitally native firms leveraging IoT and AI-based energy solutions are well positioned to deliver high-value, cost-efficient innovations. The success of this transition depends on aligning energy objectives with broader social and environmental priorities, supportive policy frameworks, public–private partnerships, and capacity-building programs. Integrated EM and ECM thus constitute a high-impact innovation pathway with strong economic, social, and environmental returns, forming a foundation for a mature and competitive economic ecosystem.

Конец формы

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## **Application of Game Theory in Entrepreneurial Technological Logistics Decision-Making**

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**Introduction.** In the context of supply chain disruptions, and spatial reconfiguration of logistics networks in Ukraine, strategic decision-making under uncertainty has become a managerial challenge for logistics of enterprises. Decisions related to the location of warehouses and distribution hubs directly affect transportation costs, market coverage, service quality, and long-term competitiveness. However, in modern logistics systems these decisions are increasingly intertwined with the adoption of technological solutions such as digital warehouse management systems, route optimization tools, real-time tracking, and elements of automation.

Warehouse location choices are rarely made in isolation, as competitors actively respond not only to spatial strategies but also to differences in technological capabilities. Firms with advanced logistics technologies may operate more efficiently, absorb competitive pressure more effectively, and sustain profitability even in highly contested markets. This creates an interdependent decision environment in which geography and technology jointly define strategic outcomes.

Game theory (Dixit, Nalebuff, 2024) provides an analytical framework for modelling such strategic interactions among logistics of firms. In particular, the concept of Nash equilibrium allows researchers and practitioners to identify stable strategy combinations in which no player has an incentive to unilaterally deviate. This paper applies game-theoretic modelling to analyze entrepreneurial logistics decision-making in Ukraine, focusing on the combined role of warehouse location and technological logistics solutions. By using simplified and extended payoff matrices, the study demonstrates how logistics of companies can anticipate competitor reactions, evaluate alternative spatial strategies, and assess the value of technological investment in a market environment.

**Methodology.** The research is based on the application of game theory methods, with a particular focus on non-cooperative game and Nash equilibrium

analysis. The modelling framework assumes two rational players that make decisions simultaneously and pursue profit maximization. Information is symmetric, each player is aware of the available strategies, payoff structure, and technological conditions of the opponent. Strategic choices include warehouse location and, implicitly, the level of technological logistics solutions applied in operations.

Warehouse location decisions are treated as discrete strategic choices among alternative cities. Payoffs are expressed in expected profit (million UAH) and are influenced by market potential, transportation costs, competitive overlap, and operational efficiency. The technological factor is incorporated as a modifier of payoffs, reflecting cost reductions, improved coordination, and enhanced market capture resulting from digital logistics solutions. If both firms select the same city, market demand is assumed to be shared; however, firms with higher technological efficiency may achieve relatively higher net returns.

First, a simplified two-strategy model is constructed to illustrate the basic logic of Nash equilibrium in logistics location decisions without explicit technological differentiation. Subsequently, the model is extended to a multi-strategy setting that includes three potential cities and implicitly accounts for technological advantages. Subsequently, the model is extended to a multi-strategy setting that includes three potential cities and implicitly accounts for technological advantages. For each scenario, best-response functions are identified, and equilibrium outcomes are derived through systematic comparison of payoffs. This approach enables the identification of stable strategic configurations and highlights how spatial, economic, and technological factors jointly influence entrepreneurial decision-making in the Ukrainian logistics sector.

**Results.** In the simplified model, each player (competitor A and competitor B) chooses between two locations: Kyiv (K) and Poltava (P). The corresponding payoff matrix is presented in Table 1.

Table 1. Payoff Matrix for the Two-City Model (million UAH)

Competitor A \ Competitor B	K (Kyiv)	P (Poltava)
K (Kyiv)	5, 5	8, 3
P (Poltava)	3, 8	6, 6

The results show that for Competitor A, choosing Kyiv dominates Poltava regardless of the competitor's decision. Similarly, for the competitor B, Kyiv is the preferred response when Competitor A selects Kyiv. At the same time, when Competitor A selects Poltava, the Competitor B best response is also Poltava. As a result, two Nash equilibrium exist (K, K) and (P, P). These equilibrium represent stable market-sharing outcomes in the absence of explicit technological differentiation.

To enhance real conditions, the model is extended to include a third location, Kharkiv (Kh), and additional technological factor related to logistics efficiency. The resulting payoff matrix is shown in Table 2.

Table 2. Payoff Matrix for the Three-City Model with Technological Efficiency Effects (million UAH)

Competitor A \ Competitor B	K (Kyiv)	P (Poltava)	Kh (Kharkiv)
K (Kyiv)	6, 6	8, 4	7, 5
P (Poltava)	4, 8	5, 5	6, 4
Kh (Kharkiv)	5, 7	7, 6	5, 5

The analysis of best-response strategies indicates that Competitor A maximizes its payoff by choosing Kyiv, even when technological efficiency gains are considered. For the competitor B, Kyiv remains the dominant response when Competitor A selects Kyiv or Kharkiv. Consequently, the strategy combination (K, K) emerges as the unique Nash equilibrium in the extended model.

At the same time, the results suggest that technological efficiency increases absolute payoffs and reduces the relative disadvantage of operating in secondary cities. Firms with advanced logistics technologies are better positioned to mitigate competitive pressure and may consider alternative spatial strategies under specific risk or investment conditions.

**Discussion.** The findings confirm the relevance of Nash equilibrium analysis for understanding entrepreneurial logistics decisions in competitive and technology-driven market. The dominance of Kyiv as an equilibrium outcome reflects logistics dynamics in Ukraine (Ukraine, 2025), where central hubs attract multiple operators due to superior market access and infrastructure. However, the integration of technological factors reveals that competition is no longer purely spatial but increasingly efficiency-based.

Technological logistics solutions partially offset the disadvantages of congestion and market sharing in central hubs by reducing operational costs and improving coordination. At the same time, technology expands the strategic viability of secondary locations by enhancing service quality and lowering transportation inefficiencies. This indicates that technological investment can weaken spatial lock-in effects and increase strategic flexibility.

The model also highlights the limitations of static game theory approach. Logistics decisions are shaped by fast technological diffusion, infrastructure development, security risks, regulatory changes, and demand volatility. Therefore, Nash equilibrium outcomes should be interpreted as conditional strategic benchmarks rather than fixed predictions.

**Conclusion.** This study demonstrates that game theory, and Nash equilibrium in particular, provides a useful analytical framework for modelling strategic logistics decisions. By applying simplified and extended models to the Ukrainian

logistics market, the research shows how warehouse location choices interact with technological efficiency, transportation costs, and competitor reactions.

The results highlight that while central logistics hubs remain strategically dominant, technological logistics solutions significantly enhance firms' ability to manage competition and explore alternative spatial strategies. From a practical perspective, the proposed modelling approach can support logistics managers in jointly evaluating location and technology investment decisions, anticipating competitor behaviour Abstract, and reducing uncertainty in strategic planning.

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## Artificial Intelligence–Driven Innovation Strategy as a Tool for Sustainable Business Development: Evidence from the Banking Sector

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**Introduction.** In the context of accelerated digital transformation and increasing economic uncertainty, innovation has become a key driver of sustainable business development. The ability of enterprises to integrate advanced digital technologies into strategic management determines their competitiveness, resilience, and long-term growth. Among such technologies, artificial intelligence (AI) plays a crucial role, enabling data-driven decision-making, process automation, and predictive analytics.

Within the European Union, digitalisation and AI are considered strategic priorities for strengthening cooperation between business, young professionals, and innovation ecosystems. AI-driven innovation strategies create new opportunities for youth involvement in high-tech sectors, support entrepreneurial initiatives, and enhance collaboration between universities and business organisations. Therefore, studying AI-based innovation strategies aligns with EU priorities in youth–business cooperation, digital skills development, and sustainable economic growth.

The purpose of this paper is to substantiate the role of artificial intelligence as a core element of an enterprise's innovation strategy and to analyse its practical implementation in the banking sector using the case of JSC CB "PrivatBank".

**Methodology.** The research is based on a combination of qualitative and quantitative methods. Theoretical analysis and synthesis were used to examine existing approaches to innovation strategy formation and the role of artificial intelligence in strategic management. Economic and statistical analysis was applied to assess the financial and innovation performance of the case company.

Strategic diagnostic tools, including SWOT analysis, were used to identify key internal and external factors influencing AI integration. Elements of economic and mathematical modelling supported the evaluation of AI-driven solutions in credit risk management. Investment appraisal methods such as Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period were applied to assess the economic effectiveness of the proposed innovation strategy.

**Results.** The study demonstrates that artificial intelligence significantly enhances the innovation capacity of enterprises by transforming decision-making processes and improving operational efficiency. In the banking sector, AI technologies are particularly effective in credit risk assessment, fraud detection, customer segmentation, and process automation.

The case of JSC CB "PrivatBank" illustrates a high level of digital maturity and readiness for AI integration. The bank actively applies machine learning models for credit scoring and non-performing loan (NPL) prediction, which contributes to reducing credit losses and improving portfolio quality. Based on the analysis, an AI-driven innovation strategy was developed, focused on integrating intelligent risk management tools into the bank's strategic framework.

The economic evaluation of the proposed strategy indicates strong financial performance. The estimated Net Present Value of the AI implementation project amounts to approximately UAH 833.7 million, with a payback period of about five months and an Internal Rate of Return exceeding 280%. These results confirm the economic feasibility and strategic relevance of AI-based innovation initiatives.

**Significance.** The findings highlight that artificial intelligence should be considered not merely as a technological tool, but as a strategic resource shaping long-term development trajectories. AI-driven innovation strategies enable enterprises to move from reactive management models to predictive and adaptive systems.

In the context of EU practices of youth-business cooperation, artificial intelligence-driven innovation strategies create new opportunities for meaningful youth engagement in the business sector. The implementation of AI solutions increases demand for young professionals with digital, analytical, and entrepreneurial skills, strengthening university-business partnerships and facilitating the integration of graduates into innovation-oriented enterprises. Thus, AI-based innovation strategies not only enhance business performance but also

contribute to youth employability, skills development, and sustainable cooperation between education and business in line with EU priorities.

From the perspective of youth–business cooperation, AI integration creates demand for new digital competencies, encourages collaboration between universities and businesses, and opens opportunities for young professionals in data analytics, fintech, and innovation management. This supports EU objectives related to youth employability, entrepreneurship education, and digital skills development.

The experience of PrivatBank shows that AI-based digital banking solutions can significantly support young businesses by improving access to finance and reducing operational barriers. Such practices strengthen youth–business cooperation and create favourable conditions for youth entrepreneurship.

Furthermore, AI-based innovation strategies contribute to sustainable development by optimising resource use, reducing risks, and increasing organisational resilience. In the banking sector, this translates into greater financial stability and improved trust in financial institutions.

**Conclusion.** The study confirms that artificial intelligence is a key driver of modern innovation strategies and a powerful instrument for enhancing business performance and sustainability. The proposed AI-driven innovation strategy for the banking sector demonstrates high economic efficiency and strategic impact.

The results may be useful for enterprises seeking to integrate AI into their strategic management systems, as well as for policymakers and educators involved in promoting youth participation in digital and innovation-oriented business activities. Future research may focus on comparative analysis of AI adoption across EU member states and partner countries, as well as on the role of AI in fostering inclusive and youth-led innovation ecosystems.

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## **Product-as-a-Service as an Innovative Business Model for the Development of Youth Entrepreneurship**

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**Introduction.** Youth entrepreneurship today faces a few systemic challenges, including limited access to start-up capital, high risks of business failure, an unstable economic environment, and rapidly changing consumer expectations. Under these conditions, traditional business models based on one-time product sales are increasingly proving ineffective for young entrepreneurs. Consequently, there is a growing need for innovative approaches that combine a low entry threshold, digitalization, and a focus on long-term customer value. One such approach is Product-as-a-Service (PaaS), a business model that is gaining traction in global practice and demonstrates significant potential for the development of youth entrepreneurship.

**Current Context.** The global economy is increasingly shifting from an ownership-based model toward an access- and usage-based economy. The Product-as-a-Service concept fits organically into this transformation by integrating digital technologies, service-oriented logic, and principles of sustainable development. In Ukraine, this model is still at an early stage of development; however, certain elements have already been implemented in the fields of IT services, urban mobility, consumer goods rental, and environmental initiatives. Young people, as the most flexible and technologically adept social group, have the potential to become key agents in the dissemination of PaaS, particularly in the context of a developing start-up ecosystem and expanding national and international entrepreneurship support programs.

**Main Arguments.** The Product-as-a-Service concept has already been widely adopted across European Union countries, where it is viewed not only as an innovative business model but also as a tool for implementing digital transformation and circular economy policies. EU experience demonstrates that PaaS is particularly attractive for youth entrepreneurship, as it combines a low entry barrier, scalability, and alignment with sustainability principles.

*IT and Digital Services.* In EU countries, the IT sector has been one of the first domains to adopt PaaS models on a large scale, primarily in the form of Software-as-a-Service (SaaS). European start-ups actively develop platforms for distance learning, business process management, financial technologies, data analytics, and cybersecurity. Flexible subscription models allow both small businesses and individual users to access services without significant upfront costs (Sukhorukova, 2023).

*Transport and Mobility.* In major EU cities, the PaaS model has become a core element of the Mobility-as-a-Service (MaaS) concept. Car-sharing, bike-sharing, electric scooter rental, and subscriptions to integrated transport services enable urban residents to move away from private vehicle ownership. This approach contributes to reduced traffic congestion, lower CO<sub>2</sub> emissions, and decreased transportation costs for users.

*Consumer Goods.* Across the EU, PaaS is increasingly applied in the consumer goods sector, ranging from household appliances to professional equipment. Companies offer customers not the product itself, but its function—for example, “laundry as a service,” “tools as a service,” or electronics subscriptions. This allows manufacturers to manage product life cycles more effectively and reduce waste generation (Product, 2024).

*Environmental Initiatives.* The European Union actively promotes Product-as-a-Service within its circular economy policy, viewing it as a mechanism for reducing resource consumption and extending product life cycles. Reuse, repair, upgrading, and shared use of products are key principles underpinning such models (Chakraborty, 2024).

Overall, EU experience demonstrates that Product-as-a-Service is not a temporary trend, but a systemic transformation of business models, in which young people play a leading role. For Ukraine, adapting European PaaS practices could become a powerful tool for accelerating youth entrepreneurship, facilitating integration into the EU single market, and fostering an economy oriented toward services, innovation, and sustainability (Product-as-a-Service, 2025).

**Recommendations / Implications.** The introduction and scaling of Product-as-a-Service business models in Ukraine have significant potential for the development of youth entrepreneurship; however, they require comprehensive support both from entrepreneurs themselves and from the state and the broader institutional environment.

The main advantages of implementing the PaaS model include:

- the absence of significant capital investments in production or product procurement;
- stable cash flows ensured by subscription or rental-based revenues;
- high adaptability of offerings to changing market needs and the ability to launch new services quickly;
- continuous interaction with users and rapid response to customer feedback.

At the same time, several challenges must be addressed:

- the need for advanced digital skills and technical expertise, particularly in IT and online platform development;
- the necessity of building customer trust, ensuring service reliability, security, and convenience;
- increasing market competition as PaaS models gain popularity across multiple sectors;
- regulatory and legal challenges, including contracts, licensing, and taxation.

To launch a business based on the PaaS model, prospective entrepreneurs should:

1. Identify the sector where PaaS is most relevant and the specific customer problems it addresses.
2. Test the business idea with minimal costs and collect user feedback.
3. Develop an online platform or application for customer interaction.
4. Seek partners, investors, and support through accelerators, including public programs, start-up accelerators, or grant schemes for innovative projects.

Taking into account the experience of the European Union, it is advisable to develop a targeted state policy to support Product-as-a-Service as a tool for fostering youth entrepreneurship and advancing the circular economy. Embedding PaaS within strategic policy documents—particularly strategies for small and medium-sized enterprise development, digital transformation, and sustainable development—would enable this model to be recognized as a promising instrument for innovative and youth-led entrepreneurship. In this context, the adaptation of tax and contractual legislation to the specific features of service-based models built on subscriptions, leasing, or pay-per-use mechanisms is of particular importance. In addition, simplifying registration and reporting procedures for start-ups operating as digital service providers could significantly reduce administrative barriers and stimulate greater youth engagement in entrepreneurial activities within the Product-as-a-Service domain.

An equally important area of state support for the dissemination of the Product-as-a-Service business model lies in education and human capital development policies. Integrating PaaS concepts, service design, and circular business models into entrepreneurship and economics curricula would help develop a systematic understanding among young people of service-oriented economies and contemporary approaches to value creation. At the same time, the development of specialized training courses, innovation hubs, and mentoring programs involving business practitioners and universities would facilitate the combination of theoretical knowledge with practical skills related to launching and scaling PaaS projects.

Financial support instruments also play a crucial role in stimulating the development of Product-as-a-Service. The introduction of grant schemes and preferential financing mechanisms for start-ups operating under the PaaS model

could substantially reduce financial risks at early stages of business development. Particular attention should be paid to designing targeted support programs for youth-led PaaS initiatives in strategically important sectors, such as information technology, mobility, and environmental services, which closely align with European priorities in digital and sustainable development.

Finally, the integration of Ukrainian PaaS start-ups into European innovation initiatives and support programs is of particular significance. Facilitating the participation of young entrepreneurs in EU programs such as Horizon Europe, Erasmus for Young Entrepreneurs, EIT, and other innovation instruments would enable not only access to financial resources but also the transfer of best practices in service-based and circular business models. In the long term, this would contribute to deeper integration of Ukrainian youth entrepreneurship into the European innovation ecosystem.

**Conclusions.** Product-as-a-Service represents a promising innovative business model capable of acting as a catalyst for the development of youth entrepreneurship in Ukraine. It combines economic feasibility, digital transformation, and sustainability principles, making it particularly relevant under current conditions. However, effective implementation of PaaS requires not only entrepreneurial initiative from young people but also a supportive institutional environment, educational backing, and open expert dialogue. Further discussion and practical experimentation with this model may lay the foundation for a new culture of innovative and sustainable business development.

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