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## Transforming Higher Education Institutions through service-learning and capacity building: Reflections from the iN4iN LATAM Chapter Conference

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Compiladoras



Universidad del  
**Rosario**

**Transforming Higher  
Education Institutions  
through service-learning  
and capacity building:  
Reflections from the iN4iN  
LATAM Chapter Conference**

Aglaya Batz  
and Merlin Patricia Grueso Hinestroza  
*—Academic Compilers—*

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# Editorial Note

## Transforming Higher Education Institutions through service-learning and capacity building: Reflections from the iN4iN LATAM Chapter Conference

Higher education institutions (HEIs) are undergoing a significant transformation in their roles and responsibilities, evolving from traditional academic bastions into dynamic catalysts for innovation, industry collaboration, and social progress. This multifaceted shift was at the center of discussions during the conference *Fostering Innovation Management and University-Business Linkages at Higher Education Institutions – iN4iN LATAM Chapter 2024*, where educators, researchers, and practitioners explored how service-learning, capacity-building, and digital transformation can collectively generate tangible benefits for students, industries, and local communities. The insights presented here draw on a range of international case studies, highlighting the successes, challenges, and future trajectories for HEIs aiming to expand their societal impact through collaborative, high-impact educational approaches.

One of the central themes of the conference was the escalating importance of university-business linkages (UBL). Scholars have noted that universities have transitioned from being viewed primarily as knowledge producers to serving as pivotal contributors to economic development and technological transfer. For example, Leipzig University demonstrated the evolution of its collaborative frameworks with business partners to align research outputs with industry demands (Dornberger – Chapter 2). These linkages have proved especially critical in equipping students with both theoretical knowledge and practical competencies. By involving undergraduates and postgraduates in ongoing research and development projects, HEIs not only foster novel solutions to urgent industrial challenges but also sharpen students' problem-solving skills and enhance their employability prospects. Aligning academic and industry priorities remains complex, as businesses frequently aim for immediate, market-based results while universities often focus on research and pedagogical objectives

over a longer horizon (Dornberger – Chapter 2). Additionally, heavy teaching responsibilities and insufficient professional development opportunities can deter faculty from participating in service-learning projects that involve sustained coordination with external partners. Several speakers also emphasized the need for clear metrics to assess the impact of these partnerships. Without robust evaluation frameworks, it is difficult to demonstrate their value to administrators, prospective funders, and policymakers. In a deeper analysis of the conference cases, (Barriga – Chapter 1) noted that rigorous evidence of a project's benefits—from student learning outcomes to tangible gains for local businesses or communities—can significantly bolster institutional commitment and long-lasting collaborations.

Another topic discussed were Hybrid models—combining in-person instruction with online platforms—. This models have broadened access to service-learning, particularly for international collaborations. The International Online Marketing Challenge (OMC) exemplified this trend, linking students from multiple countries with small and medium-sized enterprises (SMEs) seeking assistance in developing digital marketing strategies (Ponce Gómez – Chapter 8). Participants emphasized that such virtual programs can overcome financial and logistical obstacles often associated with study-abroad initiatives, thus enabling students from diverse socioeconomic backgrounds to engage in global problem-solving. HEIs can additionally leverage research and innovation ecosystems to establish sustainable partnerships with industry and society. The case of Universidad Peruana Cayetano Heredia (UPCH) illustrates how the institution's Research Vice-Rectorate promotes applied research, entrepreneurship, and technology transfer. Three dedicated directorates—intellectual property, technology transfer, and business incubation—have

strengthened the commercialization of research and expanded collaboration with private and governmental sectors (Soborzano y Lucero – Chapter 7). Key programs such as the Health Tech Innovation Hub (in partnership with AstraZeneca) and the Lab to Market program demonstrate how HEIs can serve as catalysts for technological advances in industry.

The UR STEAM Lab at Universidad del Rosario illustrated the potential of a quadruple helix model—connecting academia, industry, government, and civil society—to co-create innovative strategies and technological tools (Grueso Hinestroza – Chapter 4). The lab integrates neuromarketing, decision sciences, and digital collaboration platforms to bring businesses, students, and researchers together in real time. Through engagement with industry professionals on real-world problems, students acquire a direct understanding of market demands, collaborative processes, and advanced research methodologies. According to data presented at the conference, such interactions pave the way for sustainable partnerships that can outlast individual projects and funding cycles. The UR STEAM Lab’s emphasis on leveraging AI-driven analytics and neuromarketing further reflects the expanding digital transformation of higher education (Grueso Hinestroza – Chapter 4). By incorporating decision-science methodologies, advanced data collection, and focused stakeholder engagement, digital platforms bring structured evaluation and real-time feedback into collaborative projects. Students receive ongoing performance indicators, and academic and industry mentors can monitor progress more precisely. However, conference attendees acknowledged that technological innovations also present obstacles, especially in institutions and rural areas with limited broadband access, digital infrastructure, and faculty acceptance of new pedagogical approaches. Overcoming these disparities remains crucial for universities aspiring to make digital tools accessible to all students, rather than an elite few with robust technological support (Batz Liñeiro and Grueso Hinestroza – Chapter 9).

The Process Optimization Challenge (POC) in Tunisia and Ghana further exemplifies this commitment to robust university-business cooperation. Students participated in hackathon-style competitions to develop logistics and supply-chain solutions

for local enterprises (Ansari Vaghef, Masmoudi and Yanguí – Chapter 5). This hands-on model bridged the gap between academic theory and industrial practice, enhancing students’ critical thinking, teamwork, and digital literacy. Conference attendees noted that such projects transcend traditional classroom boundaries by creating networks among universities across different regions and local businesses seeking novel perspectives. However, several sessions emphasized concerns regarding reliance on external funding—such as DAAD grants—and the associated challenges to long-term sustainability (Dornberger – Chapter 2). Overdependence on short-term grants may jeopardize the continuity of collaborative research and student engagement once financial support expires. Another key perspective on university-industry relationships presented at the conference was the growing prevalence of service-learning as a capacity-building strategy within HEIs. Historically considered optional or co-curricular, service-learning has evolved into a structured approach that merges academic instruction with community-based problem-solving. Scholars underscored that incorporating real-world challenges into coursework can foster entrepreneurial mindsets and employability skills. The ACCESS Project at Mount Kenya University (MKU), for instance, illustrated how service-learning connects students with local businesses and communities (Yatich – Chapter 3). Rather than merely conveying classroom-based knowledge, MKU immerses students in field projects where they practice research, communication, and project management skills in real time.

In Costa Rica, the Universidad Técnica Nacional (UTN) engaged students in bioeconomy projects aimed at repurposing agricultural waste into value-added products, such as bioferments and compost (Alvarado Barrantes – Chapter 6). This model demonstrates how service-learning can advance sustainability imperatives while helping students develop interdisciplinary expertise in environmental science, business management, and community outreach. Conference participants noted that these initiatives not only strengthen skill sets but also foster broader social values by encouraging students to engage in environmental stewardship and inclusive economic practices. Nevertheless, service-learning

often encounters institutional barriers, such as insufficient incentives for faculty and limited assessment structures. Consequently, many transformative projects remain confined to specific departments or grants, restricting their scalability and broader institutional adoption.

Discussions of sustainability reinforced the interplay among service-learning, UBL, and digital transformation. Because many environmental issues require both technological innovation and widespread behavioral change, universities are particularly well positioned to generate integrated solutions spanning multiple disciplines. One speaker emphasized that the synergy between academic research and industry-driven development offers a promising path toward sustainability objectives, assuming that collaborations remain grounded in trust and reciprocity. The bioeconomy project at UTN embodies this cooperation: local firms contribute domain-specific expertise on agricultural waste, while students bring current research findings and creative problem-solving methods (Alvarado Barrantes – Chapter 6). Conference participants

concurred that maintaining these solutions over time calls for consistent institutional support, clear government policies, and reliable funding structures.

What this book seeks to accomplish through its nine chapters is to underscore the optimistic discourse surrounding service-learning and capacity-building in higher education institutions, reflecting a collective conviction that these models can significantly enhance the relevance and reach of higher education. By adopting a more holistic approach that transcends disciplinary, geographical, and sectoral boundaries, universities can assume an expanded role as architects of social and economic progress. In practice, this entails fostering continuous dialogue among stakeholders, providing targeted incentives and professional development for faculty, and further examining how digital platforms can create equitable access for institutions and students with fewer resources. From the vantage point of the iN4iN LATAM Chapter Conference, the future of HEIs lies in forging stronger synergies among educational frameworks, digital infrastructures, and community-driven objectives.

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# Innovative Partnerships in Capacity Building: Bridging Academia, Industry, and Communities for Sustainable Development

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**Abstract:** This chapter explores the intersection of capacity building, service-learning, and sustainable development in higher education institutions (HEIs). Focusing on university-business linkages (UBL), these case studies examine key initiatives such as the International Online Marketing Challenge (IOMC) and Process Optimization Challenge (POC), both aimed at fostering student engagement and driving SMEs growth. Additionally, service-learning models like the ACCESS Project in Kenya and the UR STEAM Lab in Colombia provide a practical framework for addressing community challenges through student-led research and innovation. The objectives of these initiatives were to enhance employability, strengthen SMEs, and offer students hands-on experience. The methodology included collaborative workshops, international online marketing campaigns, and interdisciplinary problem-solving sessions with SMEs. Key findings revealed significant improvements in students' practical skills, the internationalization of SMEs, and the development of scalable service-learning programs that benefit local industries. This chapter concludes with recommendations to strengthen university-industry partnerships, scale service-learning programs, promote cross-cultural collaboration, and focus on capacity building for vulnerable populations coming from the shared experiences during the in4in Conference in Colombia. These initiatives contribute to educational innovation, economic development, and social impact, demonstrating the critical role of HEIs in advancing sustainable development goals (SDGs). This chapter emphasizes the potential of service-learning as a powerful tool for academic and societal advancement.

**Keywords:** Capacity Building, Service-Learning, University-Business Linkages.

## 1. INTRODUCTION

In today's rapidly evolving global landscape, higher education institutions (HEIs) face increasing pressure to not only deliver academic excellence but also equip students with the skills and experience necessary to address complex societal and industrial challenges (Morgan, 2006; United Nations Development Programme [UNDP], 2017). As economies and industries become more interconnected, there is a growing need for innovative approaches that integrate real-world learning with academic instruction. Service learning, which combines community service with structured reflection and academic objectives, has emerged as a vital tool for enhancing student capacities, while also contributing to societal development (Bringle & Hatcher,

1996; Rodríguez-Zurita et al., 2024). This approach aligns with the goals of sustainable development by fostering critical skills such as problem-solving, collaboration, and innovation (Álvarez-Vanegas et al., 2024; Biesta, 2010).

One area where HEIs can make a significant impact is through capacity building. Defined as the process of developing and strengthening the abilities of individuals and institutions to achieve their goals (Morgan, 2006; UNDP, 2017), capacity building is critical for advancing industries, fostering innovation, and addressing global challenges (Brundtland, 1987; Putnam, 2000). When integrated with service learning, capacity-building efforts are amplified, as students engage with real-world problems in partnership with external stakeholders such as businesses, governmental agencies, and communities. These

partnerships facilitate the transfer of knowledge between academia and industry, creating a dynamic exchange that benefits both students and society at large (Etzkowitz & Leydesdorff, 2000; Dewey, 1938).

The conference titled “Capacity Building and Service Learning in Higher Education Institutions (HEI)” organized by the SEPT Competence Center of Leipzig University jointly with Universidad de Rosario in Colombia brought together diverse voices from around the world to explore innovative strategies that bridge the gap between academic knowledge and practical application. The presentations highlighted the power of partnerships between universities, industry players, and local communities in driving sustainable development. By fostering collaboration across sectors, these initiatives not only enhance student learning outcomes but also contribute to solving pressing societal issues, from public health and agricultural sustainability to technological innovation and business development.

Key examples include the **International Online Marketing Challenge** and the **Process Optimization Challenge**, where students were tasked with solving industry-relevant problems, enhancing both their technical and analytical skills. These projects exemplify how academia can engage directly with industry, providing students with hands-on experience that prepares them for future employment while also addressing immediate business challenges. Similarly, the **ACCESS Project** in which Mount Kenya University participates, has demonstrated how service-learning initiatives can be scaled to address national development goals through partnerships with higher education and industry, particularly in emerging economies.

Other presentations, such as **UR STEAM** from Universidad de Rosario and the collaboration between the **Universidad Técnica Nacional** and local agricultural businesses, illustrate how universities can play a central role in promoting innovation within their communities. By linking academic expertise with the practical needs of industries, these partnerships create pathways for sustainable development while providing students with valuable learning experiences. In particular, the focus on sustainability and innovation in agriculture, as seen in projects like **Recognition of agricultural crop**

**residues**, highlights the potential for HEIs to contribute to global efforts toward the United Nations’ Sustainable Development Goals (SDGs), particularly SDG 9 (Industry, Innovation, and Infrastructure).

Through collaborative efforts, such as those presented at this conference, universities are redefining their role in society. By acting as hubs for innovation and problem-solving, HEIs are not only building the capacity of their students but also actively contributing to the sustainable development of their surrounding communities and industries. This chapter aims to explore these intersections between capacity building, service learning, and sustainable development, and to demonstrate how innovative partnerships can lead to significant progress in both educational outcomes and societal impact.

## 2. THEORETICAL FRAMEWORK

To understand the relationship between capacity building, service learning, and sustainable development, it is essential to explore the theoretical foundations that underpin these concepts. This chapter outlines the key theories and frameworks that provide context for analyzing the role of higher education institutions (HEIs) in fostering innovation, societal engagement, and sustainable growth.

**Capacity Building Theory.**—At its core, **capacity building** refers to the process of developing and strengthening the skills, knowledge, and resources necessary for individuals and organizations to achieve their objectives. This concept is grounded in theories of organizational development, human capital, and institutional strengthening (Morgan, 2006; UNDP, 2017).

Amartya Sen’s Capabilities Approach emphasizes expanding individual and collective capacities as a foundation for development, highlighting the role of higher education institutions (HEIs) in preparing students for societal contribution by providing both academic knowledge and practical skills (Sen, 1999). By integrating service-learning initiatives with capacity-building efforts, HEIs foster not only career readiness but also a broader understanding of sustainable development (Rodríguez-Zurita et al., 2024). The UNDP’s Capacity Development Framework complements this by outlining three

levels of capacity: individual, institutional, and systemic. Service learning enhances individual skills through practical experience, while at the institutional level, HEIs build networks with industry and community partners (Bringle and Hatcher, 1996). Systemically, these capacity-building efforts support societal goals such as innovation, infrastructure development, and sustainability, particularly aligning with Sustainable Development Goal (SDG) 9 (Álvarez-Vanegas, Ramani, and Volante, 2024; UNDP, 2009).

**Service-Learning Theory.**—Is a pedagogical approach that combines academic study with meaningful community service. Theories of experiential learning, particularly Kolb’s Experiential Learning Theory, provide a foundational framework for understanding how students learn through experience. According to Kolb, learning is a process whereby knowledge is created through the transformation of experience, with four key stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, Boyatzis, & Mainemelis, 2001). Service learning immerses students in real-world problems, prompting them to apply theoretical knowledge to practice while reflecting on their experiences to generate deeper learning. Another important theoretical lens is Dewey’s Pragmatism, which posits that education should be grounded in real-world problems and experiences (Dewey, 1938). Dewey argued that learning is most effective when it is active and connected to social purpose, a principle that resonates strongly with the goals of service learning. By engaging with communities and industries, students not only develop their intellectual capacities but also contribute to addressing real-world challenges, fostering both personal growth and social change (Biesta, 2010).

Service learning is closely linked to Civic Engagement Theory, which emphasizes the role of educational institutions in fostering active citizenship and social responsibility. This aligns with higher education’s broader goal of producing socially conscious graduates who can address societal challenges (Rodríguez-Zurita et al., 2024). In terms of sustainability, service learning contributes to the UN’s Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 9

(Industry, Innovation, and Infrastructure), and SDG 11 (Sustainable Cities and Communities). By focusing on interdisciplinary approaches to solving societal issues, service-learning projects directly support these goals, particularly through partnerships with industry and communities (Brundtland, 1987; UN, 2015). The Triple Helix Model, developed by Etzkowitz and Leydesdorff, further illustrates the importance of collaboration between universities, industry, and government in driving innovation and capacity building. Through these strategic partnerships, service-learning initiatives foster sustainable development by contributing to knowledge-based economies (Etzkowitz & Leydesdorff, 2000). Lastly, Social Capital Theory, as articulated by Robert Putnam, highlights the role of networks and relationships in achieving collective goals, underscoring how service learning enhances community capacity and fosters long-lasting social benefits (Putnam, 2000).

### 3. CONTEXT OF THE DESCRIBED RESEARCH/ PRACTICE

The following section provides an overview of the various contexts in which the research and practice initiatives presented during the conference were carried out. These cases span different geographical regions, industries, and educational sectors, but all share a common focus on creating innovative university-business linkages, promoting service learning, and fostering capacity building through collaboration between higher education institutions and external partners. The research and practice initiatives discussed during the conference reflect diverse approaches to fostering university-business linkages and capacity building across different geographical regions and sectors, with a shared commitment to service learning and sustainability. These initiatives address real-world challenges and aim to produce meaningful societal impacts by involving students in projects that enhance their academic experience while contributing to broader development goals.

The **International Online Marketing Challenge (IOMC)**, launched in 2017, is a flagship initiative aimed at building university-business linkages by connecting international MBA students with local small and medium-sized enterprises (SMEs) in

Saxony. The challenge involves students creating and executing digital marketing campaigns tailored to international markets or customers. This initiative enhances students' practical marketing skills while helping local SMEs expand their global presence. IOMC is designed as a hands-on, practical learning experience that lasts three months. Students participate in a series of online bootcamp sessions focused on digital marketing strategy and execution, with each campaign receiving a €500 budget. At the end of the program, the campaigns are evaluated by a jury, and the best-performing teams are awarded prizes. Since its inception, the IOMC has facilitated more than 50 marketing campaigns, involving over 200 students and 48 SMEs. This initiative exemplifies how university-business collaboration can drive capacity building by providing students with practical experiences that prepare them for the job market while supporting the local economy.

The **Process Optimization Challenge (POC)** is another innovative initiative that creates university-business linkages, focusing specifically on the African context. Funded by DAAD and implemented as part of the Digital Logistics Project, the POC promotes collaboration between universities in Germany, Tunisia, and Ghana, as well as local SMEs in these African countries. The initiative brings together interdisciplinary teams of students from different academic backgrounds—business, management, IT, and industrial engineering—to address real-world business process challenges faced by SMEs. The challenge typically involves optimizing processes like knowledge management, logistics, and administration, critical areas for SME growth. Students participate in a multi-day workshop where they receive mentorship and engage in team-building exercises before developing their solutions, which are then presented to a jury. These interactions often lead to follow-up actions such as internships or thesis projects. The POC emphasizes the importance of capacity building in developing economies by showing how collaboration between universities and businesses can drive innovation and improve business operations. The 2023 edition in Tunisia demonstrated the program's impact by successfully optimizing SME administrative processes and creating long-term benefits for local businesses.

The **ACCESS Project** in Kenya is a model for integrating service learning into higher education. Through this initiative, students engage with local industries and communities to address pressing societal challenges while earning academic credit equivalent to a semester's coursework. The project's success is built on the philosophy that students should immerse themselves in the communities for an extended period to provide long-term, sustainable solutions. One of the project's key achievements has been the establishment of the Graduate Centre for Career Enhancement and Skill Support (GECESS). This center acts as a bridge between academia and industry by facilitating research that addresses industry-specific challenges, particularly in business, economics, and applied sciences. The ACCESS Project underscores the value of service learning in capacity building, as students acquire practical skills and knowledge directly relevant to the labor market while contributing to local community development. In turn, local industries benefit from the research outputs and innovations developed through student collaboration.

In Colombia, the **UR STEAM Lab-Based Campus** serves as a collaborative platform where science, technology, engineering, arts, and mathematics (STEAM) disciplines are integrated to solve societal and industrial challenges. This program emphasizes co-creation, a process where students and faculty work together with industry partners to develop practical solutions that address specific societal or industrial problems. UR STEAM operates through a three-phase framework. In the first phase, *Inspire*, students engage in research activities that lead to the co-creation of knowledge and innovative ideas. In the *Transform* phase, these ideas are further developed into practical solutions that address industrial or societal challenges. Finally, in the *Transcend* phase, these solutions are adapted and scaled for long-term impact. UR STEAM has established several partnership agreements, including with the Econova Network Program and the Global Compact Program, which facilitate collaborations between the university and private sector. Despite facing challenges such as differing expectations between academic and industry partners and intellectual property concerns, UR STEAM remains a powerful model of how service

learning and capacity building can create societal and industrial value.

At the **Universidad Técnica Nacional (UTN)** in Costa Rica, the University-Business Linkage Program focuses on addressing environmental and economic challenges by developing sustainable solutions for agricultural waste utilization. The program integrates applied research and technology transfer to create socio-environmental business models that benefit local communities, particularly vulnerable groups such as women and youth with disabilities. One flagship project at UTN involves the valorization of pineapple crop waste, transforming residual biomass into high-value products like edible mushrooms, fibers, and biofertilizers. Another project focuses on the use of bioferments in coffee production, which reduces fertilizer costs and promotes environmentally friendly agricultural practices. Through these initiatives, UTN fosters innovation in the agricultural sector while addressing environmental sustainability. The projects not only provide practical solutions to local farmers but also generate green jobs through the circular bioeconomy, exemplifying how university-business linkages can drive sustainable development.

#### 4. MAIN REFLECTIONS

The research and practical initiatives described in this section produced significant outcomes in terms of capacity building, service learning, and the creation of university-business linkages (UBL). Each project resulted in valuable contributions to both educational and industry contexts, helping students develop essential skills while providing businesses with innovative solutions to pressing challenges. Below are the main results and reflections drawn from the respective programs.

**The International Online Marketing Challenge (IOMC)** yielded substantial benefits for both students and Saxonian SMEs. Over the course of eight editions, this initiative produced the following results: **50 completed marketing campaigns**, each focused on helping SMEs internationalize their businesses. **200 students** from various MBA programs gained hands-on experience in digital marketing, applying theoretical knowledge in real-world contexts. **48**

**SMEs** benefited from student-led campaigns, which enhanced their online presence in international markets. The students who participated in the IOMC acquired valuable skills in digital marketing, budget management, and client communication. This real-world experience proved invaluable for their future careers, as evidenced by feedback collected from both students and companies. Participating SMEs reported a noticeable improvement in their international marketing efforts, with some businesses successfully expanding their customer base beyond Germany. This demonstrated the power of student-led initiatives in providing practical, measurable outcomes for companies. The IOMC served as a model of how university-business linkages can benefit both parties. Students gained practical experience, while businesses received affordable, tailored marketing solutions.

**The Process Optimization Challenge (POC)** successfully fostered collaboration between African SMEs and higher education institutions. In the 2023 edition held in Tunisia, three SMEs from Tunisia and Ghana presented process challenges in areas such as knowledge management, archive administration, and warehouse logistics. Fifteen students from Germany, Tunisia, and Ghana worked together to develop innovative solutions, supported by mentors and industry experts. Six teams produced solution prototypes, which were evaluated by a jury of business representatives, showcasing the potential of interdisciplinary and cross-cultural cooperation to drive process improvements in SMEs. The collaboration between students and SMEs resulted in innovative process optimization solutions, particularly in knowledge management and robotics for archive administration. These prototypes demonstrated the potential for applied research to address practical business challenges in developing economies. The interdisciplinary and cross-cultural nature of the POC fostered rich learning experiences for students, who worked together across geographical and disciplinary boundaries. This collaborative environment encouraged creativity and problem-solving skills. The active participation of African SMEs highlighted the value of UBL in promoting innovation within businesses.

**The ACCESS Project: Service-Learning in Kenya** has made a significant impact by incorporating service learning into Kenya's higher education

system, particularly in business and applied sciences. Through this initiative, nine SMEs were engaged in service-learning programs, where MBA students applied their academic knowledge to solve industry-specific challenges. The project also led to the creation of the Graduate Centre for Career Enhancement and Skill Support (GECCESS), which enabled students to develop research projects focused on addressing real-world industry problems. This approach allowed students to provide valuable services to local businesses while simultaneously earning academic credits, promoting a dual-purpose learning model. The service-learning initiatives within the project allowed students to remain embedded in local communities for an entire semester, solving real-world challenges and contributing to community development. The joint supervision of students by both university faculty and industry professionals provided an enriched learning experience that prepared students for the labor market. This co-supervision model can also strengthen industry-academia ties, leading to ongoing collaborations. A positive outcome of the project can lead to plans for expanding the service-learning model across 10 local universities in Kenya, with the goal of institutionalizing service learning in MBA programs nationwide.

**UR STEAM Lab-Based Campus in Colombia** has made significant progress in bridging the gap between academia and industry by co-creating innovative solutions. This initiative has resulted in the development of several projects aimed at addressing societal, business, and industrial challenges, particularly in the fields of science, technology, and engineering. Additionally, the lab established partnership agreements with local and international businesses, fostering the co-creation of knowledge and innovations. Students have actively participated in these reciprocity agreements, yielding tangible benefits for both the students and industry partners involved. The lab-based approach fosters close collaboration between students and industry, resulting in the development of practical solutions that addressed real-world challenges. Despite its success, the UR STEAM Lab faced challenges, particularly in aligning the expectations of university and industry partners. Issues such as differing work dynamics, intellectual property concerns, and communication barriers were

identified as areas for improvement. The program's focus on applied research helped build the capacities of students and industry partners alike, creating a valuable ecosystem for innovation.

**Agricultural Crop Waste Utilization at UTN, Costa Rica.** This kind of initiatives address sustainability challenges related to agricultural crop waste. The program develops a socio-environmental business model for the valorization of pineapple waste, producing high-value by-products such as fibers, biofertilizers, and biomaterials. It also fosters social inclusion by collaborating with vulnerable groups, including women and youth with disabilities, to create green jobs. Additionally, the introduction of bio ferments in coffee production reduced fertilizer costs while promoting environmentally sustainable farming practices. The UTN projects show the potential of applied research to create sustainable solutions that benefit both the environment and local communities. By converting agricultural waste into high-value products, the initiative promotes circular bioeconomy principles and contributed to reducing environmental harm. The integration of vulnerable groups into the project highlighted the importance of social inclusion in capacity building. By providing training and employment opportunities to disadvantaged populations, the initiative contributes to broader social development goals.

## Overall Implications

The various initiatives discussed in this section showcase the critical role of university-business linkages and service-learning models in fostering capacity building, innovation, and societal impact. By connecting academic institutions with industry partners, these programs created a platform for students to apply their knowledge in real-world contexts, while providing tangible benefits to businesses. These cases highlight the importance of practical, hands-on learning experiences in higher education. Students not only gain valuable skills but also contribute to solving industry-specific challenges, thereby enhancing their employability. These initiatives feature the potential for businesses to collaborate with universities in developing innovative solutions to complex challenges. The co-creation of knowledge

and solutions fostered by these programs can drive business growth and sustainability. Nevertheless, several projects revealed unexpected outcomes, such as the heightened interest of SMEs in further collaborations, the scalability of service-learning models, and the success of cross-cultural, interdisciplinary teams in generating innovative solutions. These reflections suggest that capacity building and service learning, when effectively integrated into academic programs, can produce lasting benefits for both students and industries, contributing to broader sustainable development goals.

## 5. CONCLUSION

The case study highlights the positive impact of university-business linkages (UBL) and service-learning initiatives on capacity building and employability in higher education institutions (HEIs). Key findings show that these initiatives provide students with hands-on experience, foster industry-relevant skills, and contribute to solving real-world challenges for businesses. Programs like the International Online Marketing Challenge (IOMC) and Process Optimization Challenge (POC) proved particularly successful in driving student engagement and delivering tangible benefits to SMEs. Similarly, the ACCESS Project in Kenya and the UR STEAM Lab in Colombia demonstrated the scalability and sustainability of service-learning models, enhancing both academic and community outcomes.

Higher Education Institutions (HEIs) should focus on strengthening formalized University-Industry partnerships to ensure long-term collaboration and mutual benefits. Expanding service-learning programs to other regions and fields would provide more students with opportunities to develop practical skills while addressing societal challenges. Promoting interdisciplinary and cross-cultural projects can foster creativity and innovation among students, businesses, and communities. Additionally, future initiatives should emphasize inclusivity by engaging marginalized populations, thereby enhancing

capacity building and creating opportunities for social and economic development. The are suggestions that may help to strengthen the foundation for sustainable collaboration between academia and industry, ultimately driving innovation, social progress, and economic growth across diverse sectors.

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# University Model for Promotion of Knowledge and Technology Transfer

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**Abstract:** Due to the complexity of transfer processes and the large number of stakeholders involved, Universities worldwide face the challenge of establishing effective structures and channels for knowledge and technology transfer. Based on the case study of Leipzig University and an action research approach implemented with ten higher education institutions, the paper provides a comprehensive model for promoting knowledge and technology transfer to facilitate the development of an appropriate transfer strategy.

**Keywords:** Transfer Model, Third Mission, Transfer Channels.

## 1. INTRODUCTION

The reputation of a university is based not only on its achievements in research and teaching, but also on special achievements in knowledge and technology transfer. The higher education institution should make knowledge accessible, usable and sustainably effective outside of a university context. The external demands placed on universities for a stronger focus on transfer and the growing importance of transfer in the public perception require an increasing commitment in this area. By developing and providing solutions to social, economic, cultural and technical challenges, the university can play an active role in shaping society. A university is therefore rightly expected to align its activities with social needs or expectations from politics and business. Not least against the background of increasing scepticism towards science and at the same time increasingly knowledge-based economies, the university must contribute more directly and proactively to economic prosperity, open, democratic discourse, social prosperity and cultural diversity.

This requires the development of effective strategies for knowledge and technology transfer. Based on the case study of Leipzig University in Germany, this paper aims to present a corresponding transfer model to support a targeted process of strategy development at universities.

## 2. THEORETICAL FRAMEWORK

The primary functions that a contemporary university plays in the knowledge economy include the triad of teaching, research, and service (Dealtry et al., 2005; Santoro, 2000). The transfer of knowledge through education and the advancement of new knowledge through research refers to the traditional core missions of a university (Nkusi et al., 2020). Evolving from the ‘first mission’ and ‘second mission’ of universities (Nakwa and Zawdie, 2016), the ‘third mission’ is the relationship between universities and stakeholders from the non-academic world (Compagnucci and Spigarelli, 2020). As the United States of America (USA) marked the starting point, the passage of the Bay-Dole act in 1980 began the re-emergence of the concept of ‘third mission’ (Etzkowitz and Leydesdorff, 2000; Bayuo et al., 2020). As enshrined in the Bay-Dole act, universities in the USA were given the freedom to engage with communities and industry in the transfer of knowledge from applied research through the common practice of patents and license fees (Bayuo et al., 2020). Since the ‘80s till now, the concept of ‘third mission’ has been well acknowledged in other regions; as commonly discussed by policymakers and practice in universities of most countries in Europe and currently gaining attention in the developing world.

Being considered as a complex, nebulous, ambiguous, and evolving phenomenon (Fuller et al., 2017), the university-third mission has been defined in many diverse ways and covers a wide array of models, dimensions, functions, and activities (Compagnucci and Spigarelli, 2020). On one aspect, the ‘third mission’ reflects an ‘entrepreneurial university’ (Etzkowitz, 1983; Guerrero et al., 2016), an ‘enterprising university’ (Woollard et al., 2007), ‘technology transfer’, and ‘Triple Helix Model partnerships’” Whiles an entrepreneurial university mainly focused on innovation-related activities of the university, the enterprising university covers activities such as enterprise education and graduate entrepreneurship. Additionally, the third mission covers a broad array of activities undertaken by higher education institutions that seek to promote entrepreneurial skills, innovation, social welfare, and the formation of human capital, as well as to transfer knowledge to society in general and organizations (Fuller et al., 2017).

Perkman et al. (2013) discuss concrete channels of knowledge and technology transfer. They distinguish between academic engagement and knowledge commercialization. The former refers to the transfer activities of scientists in the context of contract research, scientific services and consulting. The focus is therefore on the knowledge-based interaction between scientists and external stakeholders in business and society. The aspect of commercialization of academic knowledge covers academic entrepreneurship, as well as the patenting and licensing of inventions (i.e., intellectual property creation and transfer). However, other transfer channels such as knowledge communication or talent transfer have hardly been discussed in the literature to date.

In summary, the essential mechanism of knowledge and technology transfer seeks to advance the interests of business, universities, and societies (Orazbayeva et al., 2019), but there is a lack of comprehensive models that cover all aspects of knowledge and technology transfer at universities and can serve as a starting point for the development of appropriate strategies.

### 3. CONTEXT OF THE DESCRIBED RESEARCH/ PRACTICE

The model described in this paper was created as a first step in the process of developing the knowledge and technology transfer strategy at Leipzig University. Between 2018 and 2019, the author took part in this process and provided significant support in developing the concept for knowledge and technology transfer at Leipzig University (Universität Leipzig, 2019). In the following years between 2020 and 2023, this model was further modified on the basis of various action research projects with a total of ten universities in different countries. The author supported the concept development at these academic institutions and tested the transferability of the model.

### 4. MAIN RESULTS/REFLECTIONS

The following scheme for knowledge and technology transfer at the university identifies its central resources, structures, channels and players. It is suitable for systematizing existing transfer activities, recognizing potential and highlighting possibilities for their retrieval as well as for integrating actual activities into overall strategic efforts. Transfer is a dialogical process, which is why the scheme places university and society on an equal footing. Both sides can and should equally take on the role of knowledge giver and knowledge taker.

The central resources of transfer at a university are the people involved, the existing knowledge and the established infrastructure. First and foremost, these people include members and affiliates of the university. University alumni also play an important role, as they are involved in transfer both as representatives of the university and as partners in society. The knowledge involved in transfer includes declarative knowledge, i.e. knowledge of concepts, statements, models or theories, as well as procedural knowledge, i.e. knowledge of methods or procedures. Finally, transfer can make use of the university’s infrastructure, such as buildings and premises that the university manages and maintains, scientific

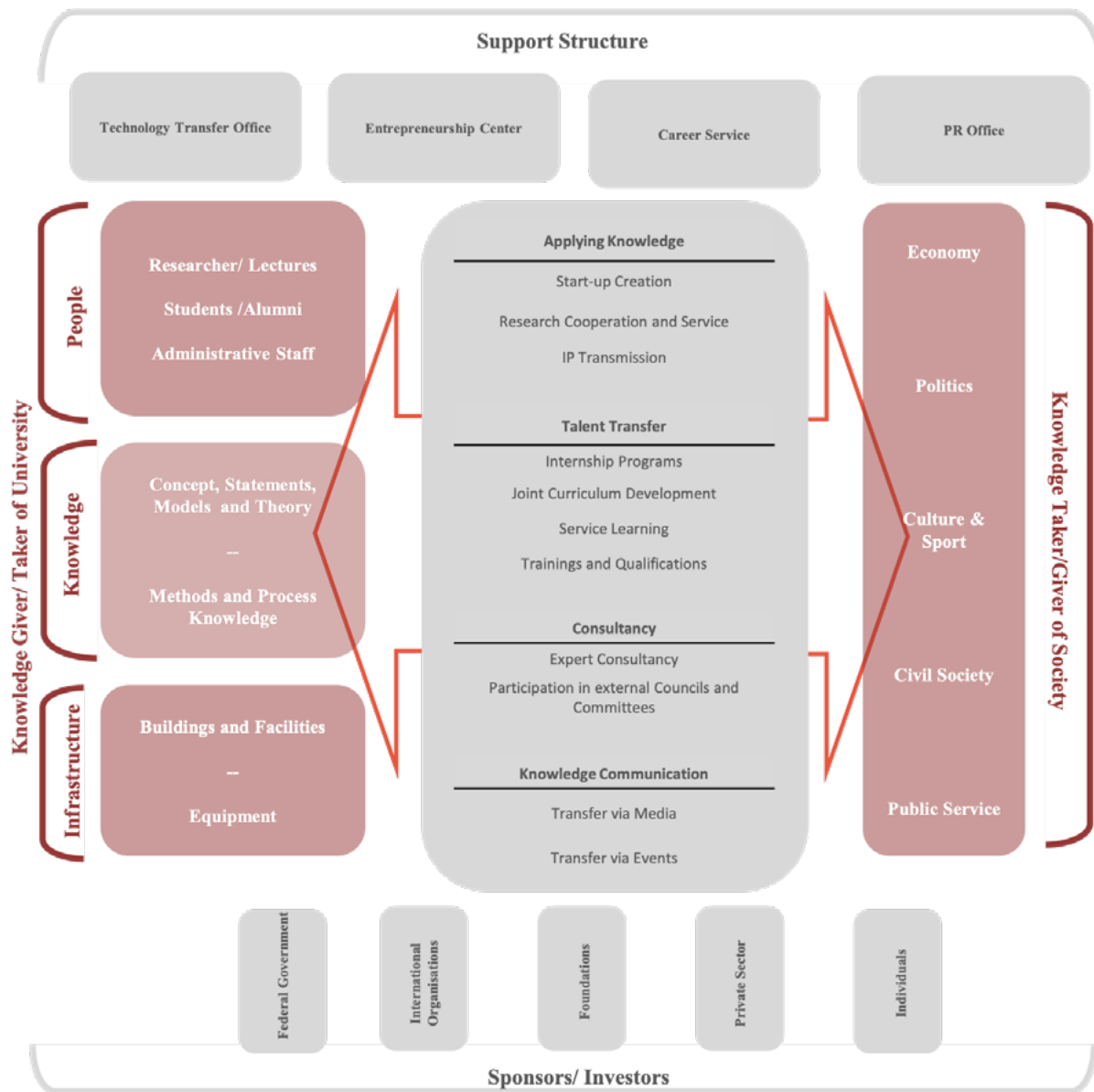


Figure 1: Model for Promotion of Knowledge and Technology Transfer at Universities

equipment or data resources that are made available to the scientific community, the economy and the interested public.

Economy, politics, culture and sport, civil society and public service are the central areas of society that the university addresses with its transfer efforts. The economic sector refers to all economic institutions, players and activities. The area of politics comprises those institutions and actors that regulate all matters of the community through binding decisions.

The area of culture and sport refers to institutions and actors that do not primarily pursue economic interests and can be assigned to theater, music or the visual arts, in a broader sense also to language, morality, religion or law, or even sport. The area of civil society refers to the part of society that is not directly organized by the public sector and that citizens shape through active participation. The public service sector comprises actors in the provision of public services that ensure the basic supply of goods

and services to people. This includes public administration and public companies, for example in the education or healthcare system.

The Transfer Support Structure contains four important units: Technology Transfer Office, Entrepreneurship Center, Career Service, and Public Relation (PR) Office. The Technology Transfer Office supports scientists along the entire innovation cycle in securing research results, the marketing and exploitation of intellectual property rights and networking with actors from business, politics and society. It provides internal and external partners with contracting support and fosters the establishment strategic cooperation. An Entrepreneurship Center at a university is a dedicated facility or initiative designed to promote entrepreneurship, innovation, and business development among students, faculty, and the broader community. These centers serve as incubators for new ideas, providing resources, education, and support for aspiring entrepreneurs to develop and launch successful ventures. Career Services at universities are dedicated departments or centers that support students and alumni in their career planning, job search, and professional development. These services act as a bridge between academic experiences and the professional world, helping individuals align their skills, interests, and goals with career opportunities. Finally, the Public Relation Office has an important role in science communication activities.

The Donors section lists the stakeholders from whom the university receives financial support for the transfer. In addition to the state with its respective ministries and authorities, these include other public donors at local level and municipal level, international organizations, foundations, the private sector and private individuals.

The central area of the model describes the transfer channels, which are summarized in four categories:

- Knowledge Application
- Talent Transfer
- Consultancy
- Knowledge Communication

## Knowledge Application

### *Start-up Creation*

This channel bundles activities aimed at transforming academic knowledge into a marketable product, identifying a suitable business form for its commercialization and placing a corresponding company on the market. According to Zhao (2004), academic entrepreneurship is defined as universities taking the role of corporate entrepreneurship to accelerate the generation, dissemination and application of research outcomes of the university community. Thus, it refers to the process of developing new ideas and/or research output into commercial products or services and putting them on the market (Zhao, 2004).

### *Research Cooperation and Services*

This channel refers to joint activities between universities and companies in which a contractual framework regulates the joint research (research cooperation) or the mutual exchange of research and material services (such as contract research or research-related services). R&D activities generally deal with answering a more complex research question in a methodologically open manner and the partners are involved on an equal footing within the framework of their own sub-projects. In the case of contract research or research related services, research objectives and tasks are defined by the client and as well as indicated clearly prior to the cooperation.

### *IP Transmission*

The IP transfer channel summarizes activities that are aimed at generating, protect and exploit intellectual property (IP). As a rule, technology-oriented research results are protected in the form of patents or utility models. The aim is to acquire exploitation partners who are interested in transferring or licensing university property rights, or in technology partnerships.

## Talent Transfer

### *Internship Programs*

An Internship Program is a structured initiative offered by the university to provide individuals—primarily students or recent graduates—with hands-on experience in a professional environment. The primary goal is to help interns gain practical skills, industry insights, and real-world knowledge that complement their academic learning.

### *Joint Curriculum Development*

This channel refers to the collaborative process of designing, implementing, and refining educational curricula by multiple stakeholders, such as educators, subject matter experts, policymakers, industry representatives, and community members. This collaborative approach ensures that the curriculum meets diverse needs, remains relevant, and achieves intended learning outcomes.

### *Service Learning*

The Service Learning or Learning through Engagement channel bundles activities and teaching formats in which subject-related learning is providing a direct, social or economic application through cooperation with external partners. This creates direct didactic added value in teaching and the results of the applied research activities can be used by the external cooperation partner.

### *Trainings and Qualifications*

This channel focuses on one side to extracurricular offers and activities that prepare graduates or students for a professional career outside academia on the basis of special training activities and aims to open up attractive career paths for them. On the other side, it refers to structured formats of knowledge transfer that are explicitly aimed at groups of people outside the university. The target groups include both professionals, whose interests and needs arise from the respective professional context (continuing professional development), as well as children, young people or senior citizens, whose motivations

for participating in continuing education courses are generally more heterogeneous (lifelong learning).

## Consultancy

### *Expert Consultancy*

Expert consultancy involves leveraging academic expertise, research, and knowledge to provide advice, solutions, and strategic guidance to organizations, businesses, or individuals. This type of consultancy is typically offered by universities or individual academics, aiming to address real-world challenges using evidence-based approaches.

### *Participation in External Councils and Committees*

The channel refers to the involvement of university members in non-university, non-primarily academic bodies, associations, societies or other institutions of general interest and civil society.

## Knowledge Communication

### *Transfer via Media*

This channel includes activities of university members who contribute to or are responsible for the creation or publication of a contribution in a public medium and thus make scientific knowledge accessible to its recipients.

### *Transfer via Events*

This channel refers to activities by university members who use the context of university events to communicate scientific findings to third parties or to draw attention to transfer opportunities. This also includes the use of trade or visitor fairs to communicate scientific findings to third parties.

## 5. CONCLUSION

Universities worldwide face the challenge of establishing effective structures and channels for knowledge and technology transfer. Due to the complexity of transfer processes and the large number of stakeholders involved, this is no easy task. The model described above provides universities with a

concrete starting point for developing an appropriate transfer strategy. Particular attention is paid to the description of possible transfer channels. Each university management should adapt this model to the specific circumstances of the academic institution and the central environmental factors. This step of adaptation is necessary in order to enable an effective and at the same time efficient transfer of knowledge and technology at the respective university.

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# Implementing Service-Learning-ACCESS Project Framework with Higher Education and Industry-A Kenyan Perspective

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**Abstract:** This paper examines the implementation of Service-Learning (SL) initiatives at Mount Kenya University (MKU) through the ACCESS Project Framework, focusing on collaborations with national higher education and industry partners. The primary problem addressed is the limited awareness and integration of SL within Kenyan higher education institutions (HEIs). The key objective is to evaluate the effectiveness of SL initiatives at MKU and their impact on community engagement and industry collaboration. The research question guiding this study is: “How do Service-Learning initiatives at Mount Kenya University enhance student learning outcomes, community and industry service, and industry partnerships?” Using a case study approach, data was collected through surveys, interviews with stakeholders, and analysis of existing records. Key findings indicate significant improvements in student learning outcomes, particularly in practical skills application and community problem-solving. The collaboration with 9 SMEs in Thika provided industry-relevant solutions, enhancing student readiness for the job market. The establishment of a university cafeteria by hospitality students exemplifies the successful integration of academic learning with industry practice. The study concludes that SL initiatives at MKU significantly contribute to bridging the gap between academic learning and real-world applications, with potential for scaling across HEIs in Kenya.

**Keywords:** Service-Learning, Collaboration, Problem-Solving.

## 1. INTRODUCTION

Service-Learning (SL) has emerged as a key pedagogical approach that integrates academic learning with community service (in our case industry), offering university students the opportunity to apply classroom knowledge to real-industry and community challenges. This approach not only enriches student learning but also contributes to practical exposure that allows industry to gain solutions to their challenges (service) while allowing students to network, become more practice oriented (competitive graduate). In addition, it fosters industry collaboration. At Mount Kenya University (MKU), SL has been strategically implemented across various disciplines, particularly in education, business, and hospitality. These initiatives are part of the broader ACCESS

Project Framework, which aims to align academic outcomes with societal needs through collaboration with national higher education institutions and industry partners in Kenya (Yatich, 2022).

The ACCESS Project Framework at MKU emphasizes the importance of service-learning to bridge the gap between theory and practice. By engaging students in community-based projects, the university seeks to enhance their problem-solving skills, foster civic responsibility, and create sustainable solutions to local challenges (Bringle & Hatcher, 1996). This paper examines the implementation of SL initiatives at MKU, focusing on their impact on students, communities, and industries, and explores the challenges and opportunities associated with scaling these initiatives across the Kenyan higher education landscape.

## 2. THEORETICAL FRAMEWORK

The study draws upon Experiential Learning Theory (ELT) and Self-Efficacy Theory, introduced by Albert Bandura. The theory is attributed to David Kolb (1984), which emphasizes the role of practical experience in the learning process. Experiential Learning Theory (ELT) suggests that learning occurs through a cycle of practical experience, reflective observation, abstract conceptualization, and active experimentation. Service learning (SL), is a form of experiential learning, integrates this cycle by placing students in real-world scenarios where they apply theoretical knowledge to practical challenges within companies, communities or organizations. This experience allows students the opportunity for understanding through direct practical application, fostering development of critical skills, problem-solving abilities, and self-efficacy. In Kenya, service learning holds a significant relevance as it addresses skills mismatch in the labor market by aligning academic learning with labor market demands, equipping graduates with practical competencies that enhance employability and global graduate competitiveness.

Furthermore, Self-Efficacy Theory, introduced by Albert Bandura, provides a basis for understanding the impact of service learning on students' ability to succeed in their academic endeavors. Self-efficacy is an individual's belief in their capacity to execute behaviors necessary to produce specific performance attainments. Service-learning environments can strengthen self-efficacy by providing students with opportunities to overcome challenges, make impactful contributions, and witness the real-world impact of their skills. In Kenya, where employability is a pressing concern, service learning not only builds job-related competencies but also instills a sense of agency and responsibility, encouraging graduates to engage actively in their communities and economic systems. These theories underscore the importance of embedding service learning into higher education as a holistic approach to address both academic, economic and societal needs.

## 3. CONTEXT OF THE DESCRIBED RESEARCH/ PRACTICE

In Kenya, the integration of SL into higher education curricula has been slow and inconsistent. Despite its potential to enhance academic outcomes and contribute to community and industry service, many institutions struggle with its effective implementation. This gap results in missed opportunities for students to engage with real-world challenges, for communities to benefit from academic expertise, and for industries to tap into innovative solutions. This has largely contributed to increasing graduate unemployment in the country. This survey was carried out within the framework of ACCESS project at Mount Kenya University in Kenya, between 2023 and 2024.

Since the inception of the ACCESS project in 2020, MKU's challenge has been to create a robust framework for SL that can be replicated across disciplines and institutions while addressing the unique needs of Kenyan communities and industries.

The problem is further compounded by limited awareness of the benefits of SL among students, faculty, and industry partners. Additionally, resource constraints, including funding, training, and infrastructure, pose significant barriers to the successful implementation of SL initiatives. This study aimed to address these challenges by evaluating the effectiveness of MKU's SL initiatives, identifying best practices, and providing recommendations for scaling SL across the Kenyan higher education sector, while promoting University-Business Linkages among SMEs.

Mount Kenya University has been at the forefront of aligning academic programs with the skills demanded by the Kenyan job market, addressing the critical issue of employability through practical learning approaches. This service-learning initiative is aimed at bridging the gap between classroom theory and real-world practice. Through partnerships with local industries, employer organizations, industry organizations and communities, students engage in hands-on projects addressing societal challenges, fostering essential skills that enhance job readiness and self-reliance. This setting provides a

rich environment for applying academic knowledge in fields like education, business, and healthcare, while simultaneously contributing to the social and economic development of local communities.

The primary objective of this study was to evaluate the effectiveness of SL initiatives at MKU in addressing community and industry challenges while enhancing academic outcomes. This evaluation includes assessing the impact of SL on student learning, community and industry service, and industry collaboration. The study also seeks to identify the challenges and opportunities associated with implementing SL in the Kenyan higher education context.

This study adopted a case study approach to explore the implementation of SL at MKU. The case study method is particularly suitable for in-depth analysis of complex phenomena within their real-life context (Kothari, 2004). Data were collected using a combination of qualitative and quantitative methods, including panel discussions, surveys, and interviews with students, faculty, and industry partners involved in SL initiatives. These methods were chosen to capture a holistic view of the SL experience from multiple perspectives.

### 3.1 Panel Discussions

Panels were convened with key stakeholders, through breakfast meetings including university administrators, faculty members, and industry and employer representatives, to discuss the implementation and impact of SL initiatives. These discussions provided insights into the strategic objectives of SL at MKU and the challenges encountered during implementation.

### 3.2 Surveys

Surveys were administered to a sample of 108 students who participated in SL projects. The survey aimed to assess students' perceptions of their learning experiences, skill development, and the relevance of SL to their future careers. The survey also included questions about the challenges students faced during their SL projects.

### 3.3 Interviews

In-depth interviews were conducted with 30 faculty members and 15 industry partners. The interviews focused on the design and execution of SL projects, the collaboration between academia and industry, and the outcomes of these projects for both students and the community.

### 3.3 Secondary Data Analysis

In addition to primary data collection, secondary data were gathered from university reports, industry feedback, and published literature on SL. This data provided a broader context for understanding the trends and outcomes of SL at MKU. Data were analyzed thematically for qualitative data and descriptive statistics for quantitative data. Thematic analysis involved identifying recurring themes and patterns in the data, while descriptive statistics were used to summarize key metrics related to student engagement, community impact, and industry collaboration.

## 4. MAIN RESULTS/REFLECTIONS

The analysis of data from the case study revealed several key findings related to the implementation and impact of SL initiatives at MKU.

### 4.1. Student Engagement and Skill Development

SL initiatives at MKU have significantly enhanced student engagement and skill development. Survey results indicated that students involved in SL projects reported substantial improvements in problem-solving skills, teamwork, communication, and practical application of theoretical knowledge. Results indicated that over 80% of students felt better prepared for their future careers after participating in SL pilot projects. This finding suggests that SL provides a valuable experiential learning opportunity that complements traditional classroom instruction (Furco,1996).

Table 1: Student Engagement and Skill Development

Metric	Before SL Implementation	After SL Implementation
Student Problem-Solving Skills	65%	80%
Teamwork Skills	70%	90%
Communication Skills	60%	88%
Practical Application of Knowledge	55%	75%

Source: Research Data (2024).

#### 4.2. Community Impact

The community-based projects undertaken by students as part of their SL initiatives had a positive impact on local communities. These projects addressed a range of challenges, including education, entrepreneurship, and healthcare. For example, education students engaged in community service learning helped to improve literacy rates in local schools, while business students worked on entrepreneurship projects that supported local SMEs (Gelmon, Holland, Driscoll, Spring & Kerrigan, 2001).

Table 2: Industry Impact Metrics

Project Type	Impact (Score)	Number of Beneficiaries
Skill Improvement	75%	108 students
Entrepreneurship Support	80%	15 SMEs

Source: Research Data (2024).

#### 4.3. Industry Collaboration and Outcomes

Industry partners involved in SL initiatives reported positive outcomes, including innovative solutions to industry-specific challenges and the development of a skilled workforce. The collaboration between MKU and local SMEs in Thika has been particularly fruitful, with selected MBA and DBA students working on research projects that address real-world industry problems. These

collaborations not only provided practical solutions for the SMEs but also enhanced the students' understanding of industry dynamics and challenges, while allowing them to graduate in their thesis writing-the dual approach (Jacoby, 1996; Kenworthy, 2003; McCarthy & Tucker, 1999).

### 5. CONCLUSION

Despite the successes, several challenges were identified in the implementation of SL initiatives at MKU. The most significant challenges included limited awareness and understanding of SL among students and faculty, resource constraints (e.g., funding, infrastructure, and training), and varying levels of industry involvement. These challenges highlight the need for greater institutional support and resources to sustain and scale SL initiatives (Mount Kenya University, 2024).

The findings of this study underscore the transformative potential of SL initiatives at MKU, particularly in enhancing student learning, community and industry service, and industry collaboration. The integration of SL into the curriculum for the school of education at MKU, Research Methodology for MBA students and Entrepreneurship Common Curriculum is expected to yield significant improvements in student engagement, skill development, as well as positive outcomes for local communities and industries. This paper underscores the following 3 key findings:

#### 5.1 Enhanced Student Learning

SL initiatives have proven to be an effective way to bridge the gap between theory and practice. By engaging students in real-world projects, SL helps to develop essential skills such as problem-solving, teamwork, and communication. Moreover, the practical application of knowledge in community and industry settings reinforces the learning objectives of academic programs.

#### 5.2 Community and Industry Service

The impact of SL on community and industry service has been particularly notable. Students

involved in community-based projects have made meaningful contributions to local development, particularly in the areas of education, entrepreneurship, and healthcare. These projects not only address immediate community needs but also contribute to the long-term sustainability of local development efforts. For instance, school of education students who spent a semester in local communities while carrying out their teaching practice reported a 75% success rate in implementing educational interventions.

### 5.3 Industry Collaboration

The collaboration between MKU and industry partners has yielded positive outcomes for both parties. Industry partners benefit from innovative solutions to their challenges, while students gain valuable insights into industry practices and challenges. This dual-focused approach enhances the relevance of academic programs and prepares students for successful careers in their respective fields, while allowing postgraduate students to attain their graduation requirement of thesis presentation. For example, School of Business and Economics MBA students working with selected SMEs helped reduce operational costs by an average of 5%.

### 5.4 Integration with Curriculum

The SL initiatives in the School of Business, particularly the service-learning component of the entrepreneurship course, allows students to earn academic credits while gaining practical experience. This integration will be highly valued by students, with 90% indicating that it will enhance their understanding of entrepreneurship and expose them to real world challenges.

### 5.5 Hospitality Industry Practice

The university cafeteria, managed by hospitality students, served as a model of effective SL implementation, where students applied classroom knowledge in a real-world setting. The cafeteria's success has been reflected in a 20% increase in student satisfaction with the hospitality program for the school of hospitality and tourism management programme.

### 5.6. Conclusion

Despite the positive outcomes, several challenges remain. Limited awareness and understanding of SL among key stakeholders poses a significant barrier to its effective implementation. To address this, Institutions of Higher Learning (HEIs) should invest in awareness campaigns and training programs to educate students, faculty, and industry partners about the benefits of SL. Additionally, resource constraints need to be addressed through increased funding, infrastructure development, and the establishment of dedicated SL centers within the university. Finally, to ensure sustained industry involvement, HEIs should explore long-term specific tailored partnerships with relevant industry stakeholders (particularly SMEs), in sectors where SL projects have shown the most relevance and impact.

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# Linking Academia with Public and Private Partners

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**Abstract:** UR STEAM Lab Based Campus is an interdisciplinary innovation ecosystem to connect academia with industry for developing human capital and fulfilling the 2030 Agenda. This document describes the operation model of UR STEAM as well as the main challenges it faces. In particular, we have participated in the development of new products for the industry while transferring knowledge based on science, technology and innovation. We have collaboratively designed spaces for the socialization of research and topics of interest to different actors. As challenges, we find that initiatives such as these, which seek to connect the university under a quadruple helix model, must overcome challenges such as capacity development, differences in goals, data confidentiality, and infrastructure/resources. Effective collaboration requires bridging these gaps through training, aligning goals, and securing necessary resources.

**Keywords:** University Business Linkages, Quadruple Helix Model, STEAM Model.

## 1. INTRODUCTION

UR STEAM Lab Based Campus is the evolution of an interdisciplinary laboratory-based project, initiated as an initiative at the School of Management of the Universidad del Rosario in 2018. To achieve this purpose, two laboratories were created for teaching and research, focused on Neuromarketing and

Decision-Making. After that, in 2021, UR STEAM evolved as a strategic project that is joined by four academic units, which promote interdisciplinary training based on laboratories. Finally, in 2023, the name UR STEAM Lab Based Campus was adopted with a focus on four areas of impact: training, research, foresight and experimentation (Figure 1). Through these areas, it seeks to connect academia

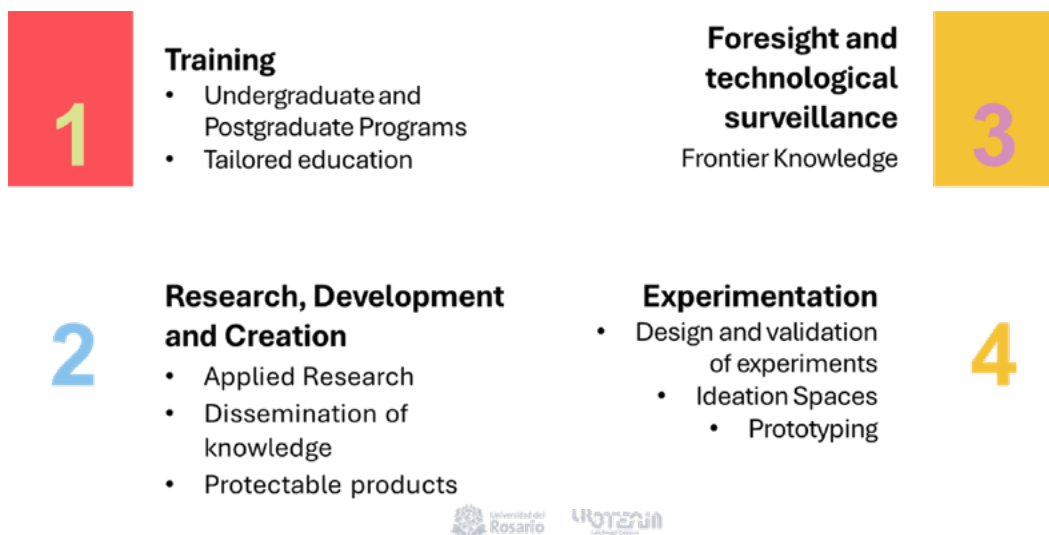


Figure 1. UR STEAM Impact Areas

Source: UR STEAM Creation Document.

with industry, for the development of human capital and design of solutions necessary for the fulfillment of the 2030 Agenda.

The experience related to UR STEAM Lab Based Campus underscores the need to create an effective bridge between academic institutions and the public and private sectors, highlighting the relevance of a collaborative approach to addressing contemporary challenges in Higher Education. This effort is oriented towards the co-creation of knowledge and the research development that not only takes place within of the academia, but also has a positive impact on society, industry and the economy.

The aim of this document is to describe the way in which UR STEAM Lab Based Campus bridge academia and other stakeholders. To do that, a short theoretical framework will be developed, then I will describe UR Steam as a strategic program, the approach and the operation model. After that, some reflections regarding the challenges we face and finally, some conclusions and further steps.

## 2. THEORETICAL FRAMEWORK

The relationship between universities and the business/industry sector has become increasingly important in recent years. This partnership plays a crucial role in driving innovation, economic growth, and societal advancement. That relationships are named as University-Business Linkages or University Industry Business linkages. (UB/IL).

UB/IL- is known as “interactions between all parts of the higher educational system and industrializing economy” (Gul et al., 2019). Several scholars define UBL/IL as strategic collaborations that seek to strengthen the relationship between higher education institutions and the private sector (Ishengoma & Vaaland, 2016).

The UB/IL framework provide opportunities to the academic staff and students to interact with business and get to know the profile required to get a job in the future (Gul et al., 2019). These alliances are essential to foster innovation, improve graduate employability (Gul et al., 2019), and contribute to local and global economic development (Ishengoma & Vaaland, 2016). In addition to being a mechanism for the transfer of knowledge, UBL/IL is well

recognized as a good way to contributes to sustainability (Hailu, 2024 ; Olphin et al., 2024)

## 3. CONTEXT OF THE DESCRIBED PRACTICE

### 3.1. General context of Universidad del Rosario

The Universidad del Rosario is a private university, created 370 years ago by Fray Cristobal de Torres y Motones. Since its foundation, it has been a benchmark in the social, political and economic life of the country. It is considered by many to be the cradle of the Republic and more recently, one of the institutions that significantly promoted the Political Constitution of Colombia of 1991.

Currently, the Universidad del Rosario has six academic campuses distributed in different parts of Bogotá and Cundinamarca, more than 12,000 undergraduate and graduate students and more than 72,000 undergraduate and graduate graduates.

### 3.2. UR STEAM Lab Based Campus: An Interdisciplinary Innovation Ecosystem

UR STEAM Lab Based Campus is an interdisciplinary ecosystem that integrates Science, Technology, Engineering, Arts and Mathematics – STEAM. The main objective of this integration is to generate innovative and sustainable solutions to the challenges that arise in society, the business and industrial sectors. The core philosophy of the UR STEAM Lab Based Campus is based on three fundamental pillars: Inspire, Transform and Transcend (Figure 2)

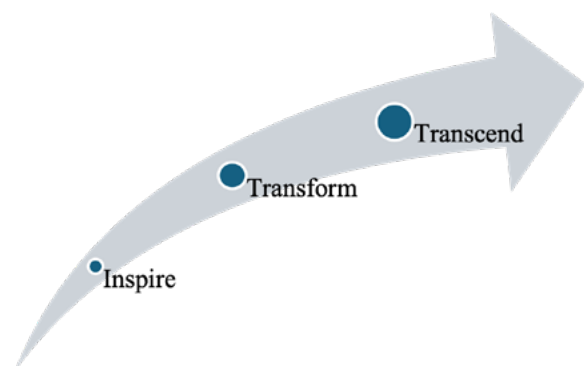


Figure 2. UR STEAM Pillars

Source: Authors.

- *Inspire*: The first pillar fosters an innovative environment where new knowledge is co-created through interdisciplinary collaboration. By engaging in cutting-edge projects at the intersection of science and technology, participants cultivate essential skills and creativity. These initiatives are designed to spark curiosity, encourage exploration, and push the boundaries of what is possible.
- *Transform*: This pillar emphasizes the practical application of knowledge and technology to drive real-world change. Through hands-on projects and innovative methodologies developed at the UR STEAM Lab-Based Campus, ideas are transformed into tangible solutions. These solutions are not only theoretically sound but also actionable, addressing pressing challenges and creating meaningful impact in various fields.
- *Transcend*: The final pillar ensures that the knowledge generated extends beyond academia, creating a legacy for industry and society. By adapting insights to diverse contexts, this pillar maximizes the value of innovation, contributing to socio-economic development and improving quality of life. It bridges the gap between theoretical advancements and their practical, far-reaching applications, ensuring that progress benefits everyone.

### 3.3. Operating Model

The UR STEAM Lab-Based Campus is more than a physical space—it is a dynamic operating model that fosters collaboration among students, researchers, businesses, and the broader community. By promoting applied learning focused on solving real-world challenges, this model empowers students and professionals to think critically, creatively, and innovatively. It serves as a hub where theory meets practice, driving meaningful progress and fostering a culture of problem-solving.

The operating model of the UR STEAM Lab-Based Campus is built on three key pillars: service provision, reciprocity agreements, and knowledge and technology transfer. Designed to be flexible and adaptive, this model enables businesses and

organizations to leverage the campus’s unique resources and capabilities. By integrating these elements, the campus creates a synergistic ecosystem where innovation thrives, and all stakeholders benefit from shared expertise and collaborative opportunities.

#### a. Reciprocity Agreements

The reciprocity agreements established at UR STEAM are designed to bring together academic institutions, industry partners, and non-governmental organizations. These partnerships aim to identify shared challenges, develop collaborative solutions to complex problems, and pool resources and expertise to achieve common goals. By fostering these alliances, UR STEAM not only accelerates progress on critical issues but also enhances access to national and international funding opportunities, ensuring sustainable and impactful outcomes (see Table 1).

Table 1. Examples of Reciprocity Agreements

Program/ Allie	Description of the ally	# of involved companies/ organizations	Rol of UR STEAM
Partnership Package	A program designed to build long-term relationships with businesses and organizations through collaborative projects. This package includes access to capacity building programs, applied research, and strategic consulting.	8	Managers
Econova Network	An open innovation network that connects diverse organizations to promote sustainable innovation. Econova Network focuses on the responsible management of	+100	Allies

Program/ Allie	Description of the ally	# of involved companies/ organizations	Rol of UR STEAM
	resources and the implementation of business practices that respect the environment and support Colombia's energy transition.		
Pacto Global Colombia-Sustainable Fashion	It is a platform created by Pacto Global Colombia to solve concerns related to business models, jobs and sustainable consumption and production.	+30	Allies

Source: Authors.

#### *b. Provision of Services:*

At UR STEAM, we offer tailored services to support professors, students, and academic leaders at Universidad del Rosario in their teaching, learning, and stakeholder engagement initiatives. Through collaborative efforts, we design immersive teaching-learning experiences rooted in laboratory-based activities and experiential learning pathways. These initiatives foster creativity, innovation, and skill development, empowering participants to tackle complex challenges and drive meaningful progress.

Additionally, we extend our services to a diverse range of external stakeholders, including universities, schools, associations, businesses, and public sector organizations. By providing a platform for creation, innovation, and development, we enable these partners to advance their goals and achieve impactful outcomes. Over time, this external engagement has evolved into a sustainable income-generating mechanism, further strengthening UR STEAM's ability to deliver value and expand its reach.

#### *c. Research and Development*

At UR STEAM Lab Based Campus we systematically search for resources to develop interdisciplinary

research, Mode 2, context-driven research with allies to provide solutions for real problems of organizations and the society in the following lines of research (Table 2).

Table 2. UR STEAM Research Topics

Research topics	Description
Trade, Industry and Technology	It seeks to solve major problems of the business fabric and its different economic sectors, generating technological solutions for all types of companies.
Circular economy, sustainable consumption and production	Applied research around the elimination of waste, the reduction of pollution and the increase of clean production.
Health technologies	Addressing health problems, using hardware/software technologies to generate solutions that contribute to the improvement of people's health.
Inclusive models, gender equality and women's empowerment	Generate innovative solutions aimed at gender equality and women's empowerment, through the use of technologies.
Materials Design, Creative and Cultural Industries	Applied research with the creative and cultural industry to develop new and innovative approaches to traditional materials and processes.
Urban technology, smart and sustainable cities and communities	Application of information and communication technologies (ICT) such as AI, robotics, data analytics, IoT, in the construction of Smart cities or Cities 4.0.

Source: UR STEAM Lab Based Campus Descriptive Document.

#### *d. Transfer of knowledge and technology*

On our campus, we also carry out processes of transfer of research results, using various formats such as Webinars, Hackathons, Bootcamps, around topics of interest in research and in partnership with ally's entities. An example of the above was the Webinar on diversity and inclusion in organizations, in which the Texmodas Foundation and the Juntanza Étnica Program participated in 2023. Similarly, in 2023 the Hackathon developed with 32 undergraduate students from the Universidad del Rosario and who responded to the call of Fedepapa, to answer the

question of how to make young people turn their gaze to the Colombian countryside.

## 4. MAIN RESULTS/REFLECTIONS

Although UR STEAM was created as a strategic project at the Universidad del Rosario a little over two years ago, the results obtained regarding its vision and scope have been varied and significant, as described below.

### 4.1. Partnership Package

The campus has collaborated with 7 companies in 33 ongoing projects, covering various areas of technological innovation. Among the outstanding projects are those related to Neuromarketing, which include:

*New Product Development with Undergraduate Students:* These projects use Neuromarketing methodologies to evaluate consumer reactions to new products. Tools such as Eye-tracking in the Shopper Lab make it possible to analyze consumers' visual attention and emotions accurately.

*Evaluation of Emotional Reactions to New Products.* Through advanced technologies such as Face Coding, users' emotional reactions to new launches are analyzed, providing companies with valuable data for the optimization of their products.

### 4.2. Econova Network

The Econova Network, in collaboration with the campus, has launched GreenFlow, an innovative proposal that promotes sustainable management in Colombia's energy transition. This program includes: i) Diploma in Management and Reverse Logistics for Sustainable Renewable Energy Management; ii) Export and Import Data Dashboards.

### 4.3. Sustainable Fashion by Pacto Global Colombia

The campus has co-created with Pacto Global Colombia a Sustainable Fashion Program that works on open innovation plans, using Industry 4.0 technologies to transform production processes in the fashion industry.

### 4.4. Internal services

From the creation of the laboratories for teaching at the School of Management to the implementation of the UR STEAM LAB Based Campus, the use of these services by students, professors and administrators has increased over time, especially for the development of teaching-learning activities, research and relations with other stakeholders.

### 4.5. Preliminary reflections

The adoption of links between the university and industry is a process that requires the transformation of the actors, since the transfer of knowledge does not occur in a vacuum, but from relationships that are based on communication and trust. At UR STEAM Lab Based Campus we have learned that in order to work in partnership with companies, reliability as a university is key to advancing projects. In addition to the above, we have understood that in collaborations of this type, all actors must develop competencies to identify and solve problems of mutual interest.

## 5. CONCLUSION

University-business linkages (UBLs) face several challenges that can hinder their effectiveness and sustainability. Discussions have pointed how universities and businesses differ in their knowledge creation processes, modes of thinking, timescales and in what is valuable. Additionally research has shown how scholars and managers can have different motivations and perceptions of useful outcomes (Olphin et al., 2024). Some of the main challenges are listed below.

### 5.1. Capacity development

During the time of operation of the UR STEAM Lab Based Campus, the need for skills development in Professors. The need to train teachers in applied research (mode 2) and mentoring was identified, to improve their ability to guide projects with real impact on the industry. As Bofo & Dornberger (2024) pointed out in their research, Higher Education Institutions should provide to

academics with training in industry practices and entrepreneurial skills to strengthen university–business linkages.

### 5.2. Differences in goals and organizational dynamics

There is a discrepancy in approaches and expectations between the academic and business sectors, which can hinder effective collaboration. Universities and companies often have different goals; while industries and companies seek innovation, competitiveness and economic outcomes in the market Higher Education Institutions focus on education and research. In both universities and companies, there can be resistance to change and the adoption of new forms of collaboration.

There are also differences in expectations between Higher Education Institutions and professors. In some occasions, teachers assume that their job is teaching and assume the relationship with industry as an additional burden in their work, so they prefer not to participate in this type of initiatives.

### 5.3. Data Confidentiality and Intellectual Property

Intellectual property protection and data confidentiality are critical issues in projects involving sensitive research or collaborations in the UBL/IL framework. In this context, legal agreements can be complicated and time-consuming for university–business collaborations. While Companies are looking to protect their investments, universities are looking to publish and share their findings.

### 5.4. Infrastructure and Resources

While this is not an issue for UR STEAM Lab Based Campus, many universities often struggle with the technical and physical infrastructure required to conduct applied research relevant to businesses. Additionally, the increasing scarcity of financial resources limits the ability of these institutions to engage in collaborative and impactful projects. In emerging economies like Colombia, institutional gaps and a lack of enforcement further hinder innovation and collaboration between universities and industries.

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# Enhancing University-Business Linkage via Process Optimization Challenge–Case study from Africa

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**Abstract:** This paper explores the role of hackathons as a powerful tool for bridging the gap between higher education institutions (HEIs) and industry, particularly in the context of skill development in the logistics sector in Tunisia and Ghana. Focusing on the “Process Optimization Challenge” (POC) hackathons, the study investigates how these events foster university-industry linkages and enhance the employability of students through collaborative, real-world problem-solving. Drawing on data from multiple hackathons, the paper examines the impact of hackathons on skill acquisition, including critical thinking, problem-solving, creativity, and digital literacy. The study also highlights the challenges involved in organizing such events. Ultimately, the paper argues that hackathons provide an effective platform for developing both technical and soft skills while promoting innovation, collaboration, and career development. The findings suggest that integrating hackathons into university curricula can significantly enhance student engagement and prepare graduates for the digital and interdisciplinary work environment of the future.

**Keywords:** University-Business Linkage, Process Optimization Challenge, Skill Development.

## 1. INTRODUCTION

In the dynamic intersection of academia and industry, hackathons have emerged as a pivotal platform for promoting innovation and collaboration. These intensive events, characterized by their time-bound and competitive format, involve participants from diverse academic and professional backgrounds who work together to solve real-world problems. The hybrid nature of hackathons integrates elements from both business and education sectors, leveraging the strengths of each to foster creativity, problem-solving, and rapid prototyping under constrained conditions.

Historically, hackathons have roots in the tech industry but have since expanded to include a wide range of disciplines, including marketing,

management, and data science. As Briscoe and Mulligan (2014) note, hackathons provide a platform for concept development of digital technologies at an advanced level, fostering a broad scope of innovation across various domains (Valjamae, et al., 2017; ). This paper examines the efficacy of hackathons in bridging the gap between Higher Education institutes (HEIs) and businesses, thereby enhancing educational programs and promoting skill development among students and professionals in the African context.

The objectives of this study are to explore how hackathons facilitate university-business linkages, to assess the impact of these events on skill development, and to identify the challenges and opportunities in the implementation of the hackathons as part of the university curriculum. To reach the study objectives, this case study investigates several

hackathons that exemplify successful collaborations and educational advancements. The study draws on empirical data and participant testimonials to evaluate the outcomes of these events in terms of stakeholder benefits, skill acquisition, and the fostering of a culture of innovation. The examined hackathons were conducted in Tunisia and Ghana as part of the project “*Creating Resilient Logistics and Supply Chain Systems through Digital Solutions*”<sup>1</sup> (in short: Digital Logistics), which is financed by the German Academic Exchange Service (DAAD).

## 2. THEORETICAL FRAMEWORK

This chapter presents the key concepts and theories to examine the role of hackathons in strengthening regional innovation and employability skills of students.

The conceptual foundations of hackathons as innovation management tools are explored through different distinct academic perspectives. One perspective views hackathon as a critical environment fostering innovation through time-constrained competitive collaboration, identifying essential attributes defining the hackathon’s framework (Mhlongo, Oyetade, & Zuva, 2020; Yuen & Wong, 2021; Halvari et al., 2020). This comprehensive view emphasizes their role in the innovation ecosystem, allowing for a structured analysis of their dynamics and outcomes. The other perspective integrates hackathons within the broader university innovation ecosystem, considering them as key components that enhance interconnections between academia and industry. This view underlines the transformative potential of hackathons in contributing to the educational and innovation-driven goals of universities, suggesting a systematic integration of hackathons into the university’s operational and strategic frameworks (Goncharenko & Krakhmalova, 2022). Hence this approach considers hackathons as tools of knowledge transfer within the actors of regional innovation systems.

Hackathons facilitate significant skill development in students by immersing them in environments

that necessitate rapid problem-solving, teamwork, and innovation. These events typically require participants to collaborate intensively in diverse teams to address real-world problems, thereby enhancing both technical and soft skills. Students gain experience in areas such as coding, project management, and presentation within tight deadlines. Hackathons also expose students to industry-specific challenges and the practical application of theoretical knowledge, which are crucial for their professional growth and employability (Halvari et al., 2020; Goncharenko & Krakhmalova, 2022).

Although Hackathons as a service-learning approach have various impacts on the employability of students (Buljac, 2024), international hackathons add cultural context to the service-learning experiences. Local service-learning involves students in community-based projects that enhance their academic learning, develop their social skills, and foster civic responsibility. Whereas, international service-learning extends these objectives across international borders, exposing students to cultural communication issues. This international aspect encourages deeper cultural exchange and understanding, often challenging students to apply their skills and knowledge in significantly different or resource-constrained environments (Bringle, Hatcher, & Jones, 2023).

Although the implementation of such hackathons offers various opportunities in terms of skill development and enhancing linkage among innovation system actors (specifically university and industry), sustainable execution of these events can be challenging for universities in the long term.

## 3. CONTEXT OF THE DESCRIBED RESEARCH/ PRACTICE

Logistics is a growing sector with great potential to support Africa’s economic development and job creation. With the integration of ICT and technological solutions, the sector can improve its resilience and minimize the impact of disruptions as experienced with the COVID-19 pandemic. A study by the African Development Bank (AfDB, 2019) suggests innovative solutions in logistics are essential for addressing critical challenges, including delays at

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1 [www.digilog-project.com](http://www.digilog-project.com)

borders, inefficient port operations, and poor infrastructure connectivity. The Digital Logistics project seeks to enhance the capacities of the partner universities to provide knowledge and hands-on experience training in process management and digital solutions for logistics, supply chains, and other related sectors in the partner countries. In the end, the project aims to contribute to improving the employability skills of graduates from partner universities to meet the increasing market demand for labor with digitalization know-how in the logistics and ICT sector. Hackathons under the name of “*Process Optimization Challenge (POC)*” were the main part of the service-learning pillar of the project.

This study focuses on the analysis of POC events that happened at the National School of Electronics and Telecoms of Sfax (ENET’COM) in Tunisia and Kwame Nkrumah University of Science and Technology (KNUST) in Ghana, between 2023 and 2024. During this period, each institute conducted one local and one international POC event annually. In each POC event over 40 students worked in interdisciplinary groups over the course of five days to find solutions for the process challenges of three local SMEs. The local POC events consist of local students of the hosting organization, whereas in international POC events, ten international students (five from Leipzig University in Germany and five from ENET’COM or KNUST) participated in the event. In Tunisia, the focus of the challenges was digital solutions for the logistic sector (with a focus on warehouse digitalization) and in Ghana, the challenge mainly targeted the logistic process of the food sector (agriculture, poultry, etc.).

On the first day of each challenge the companies present their challenges, and the students are randomly assigned to a team. On the second day, each team aims to define the problem while developing their team dynamics. In the next two days, the teams focus on solution development and preparation of the final presentation. During the challenge, students had the opportunity to interact with the SME representative (as a mentor) and the university experts (as coaches). On the last day of the event, the industry representatives select the best solution per challenge (per company), considering different aspects including feasibility, novelty, sustainability,

user-friendliness, etc. The winners of the challenges are invited by industrial partners for further development of their solutions in the form of an internship or master thesis project.

## 4. MAIN REFLECTIONS

In this chapter, the main findings and reflections collected during and after the events are shared. Data was collected in the forms of interviews and testimonies with students, participated SMEs, and the project coordinators of the partner universities.

### 4.1. University and Industry Collaboration

To ensure the sustainability of the collaboration, a lab was created in each University which acts as a platform to conduct practical projects, such as hackathons. These labs offer service-learning programs to the participants and equip them with the necessary tools to identify problems within the processes and create value-added solutions during the POC events. Although the concepts of the lab were designed based on the initial dialogue with local industry partners, the development of the labs’ activities and services through the project was shaped based on the practical projects (challenges) suggested by the industry. In this way, each lab has the flexibility to update its offers based on the actual industry need.

For instance, the Digital Warehouse Lab in Tunisia which was initially aimed to offer small digitalization solutions for warehouse management (e.g. warehouse management app development), turned into the industry 4.0 Warehouse Lab, which offers development of IoT-based solutions (software and hardware, e.g. sensors) to the Tunisian SMEs. The idea of such an upgrade was developed in the first International POC event in Tunisia in 2023 when an industry partner was inspired by the technical capabilities of the hackathon participants and hence suggested that ENET’COM cooperate on a bigger project and create a more sophisticated lab to conduct more complex hackathons. As a result, in 2024 the POC event focused on IoT-related challenges in warehouses, and the winners were invited by the industry to work on the solutions for six months in the form of master thesis projects and internships. Hence,

ENET'COM has positioned itself as an applied HEI in Sfax.

## 4.2. Skills Development

Hackathons offer a unique, hands-on opportunity to develop a wide range of skills (Yuen & Wong, 2021). This chapter aims to address the skill development of participants during the four POC events and compare them with the top ten required job skills for the future based on the World Economic Forum report on the job skills for 2025 (Whiting, 2020) and the Forbes report on the job skills for 2030 (Marr, 2023).

- *Analytical Thinking and Innovation & Creative Thinking*: POC events encourage participants to evaluate the processes, analyze process data, and come up with reasoned, effective solutions to reduce or eliminate the bottlenecks with the processes. In addition, working in interdisciplinary teams promotes out-of-the-box thinking during the solution development phase. As each team member has a different technical background (some in business and some in engineering) they address the solution from different perspectives. While some students focus on the value creation for the end user, others focus on the technical aspects of the solutions. Such an environment fosters creative thinking within the team.
- *Active Learning and Learning Strategies & Lifelong Learning*: During the POC participants engage directly with tasks and they need to continuously learn and apply new concepts, tools, and techniques to identify the problem, ideate the solutions prototype the results, and present outcomes to the client. Hence active learning is the key element of such an event. Moreover, participation in such events builds a habit of continuous learning, which is a key component of lifelong learning.
- *Complex Problem-Solving, Digital Literacy & Data Skills*: Problem-solving by adopting design thinking, is an important element of

a hackathon (Muramatsu, DeLong, & Ren, 2021) which was also applied during the POC events. During the design sprint participants practice a full cycle of problem-solving to solve complex problems under time constraints. This often involves data analysis, coding, and testing skills (e.g. image classification, customer prediction, data optimization, etc.) that directly contribute to the data skills.

- *Critical Thinking and Analysis & Critical Thinking and Analysis*: Both skill sets emphasize the ability to evaluate problems, analyze data, and come up with reasoned, effective solutions. Hackathons provide a platform to practice and refine these skills in real time through problem-solving exercises.
- *Resilience, Stress Tolerance, and Flexibility*: POC events create high-pressure environments in which participants need to handle stress, adapt to changing circumstances, and be resilient when facing challenges. Hence the participants learn how to form teams, manage their teams, and assign tasks in such environments, which are vital skills, particularly in fast-evolving work environments.
- *Virtual Collaborative Working*: During the COVID pandemic the importance of virtual collaboration was highlighted and is still emphasized in fast-paced and international working environments. In the POC events, participants need to deliver the results in a short time which often results in working overnight or early morning. Hence, they learn how to use/create new collaborative platforms which offer them flexibility for in-person and virtual collaboration.

## 4.3. Challenges And Opportunities in Conducting Hackathons

Organizing hackathons involves several challenges and opportunities that can considerably affect the success and results of such events. The main challenge is the logistic issues, especially for international hackathons in which international trips are

necessary. In such events, marketing and outreach strategies are key factors to ensure the correct audience is targeted. In addition, to ensure participants' engagement, content quality, interactive sessions, and networking opportunities should be considered during such events. While appropriate problem statement input from the industry is vital to designing value-added solutions, coaching and mentorships are necessary to guide the participants in the development of the solution prototype. Hence intense coordination is required by both university experts (as coaches) and industry experts (as mentors). One main characteristic of international hackathons is cultural exchange. Including cultural aspects in a hackathon can be a double-edged sword. Such exchange assists the soft skill development of the participants, but it also creates several challenges. As hackathons are short-term events, they require a high level of teamwork and communication skills. However, in international events such collaboration is challenging as the participants have a short time to develop their intercultural communication skills. To tackle such challenges, intercultural management coaching is necessary during the event. Moreover, understanding the context, (e.g. local norms, clients' expectations, legal frameworks, and standards), for international participants requires the involvement of industry experts as mentors, who can clarify the contextual framework.

Despite all these challenges, hackathons bring several opportunities. The first and foremost opportunity is that it promotes innovation and collaboration via cross-disciplinary teams of participants coming from various academic backgrounds working on real-world problems and finding innovative solutions considering multiple perspectives. It provides a platform for the industry to test the technical skills, as well as soft skills of the participant, and hence can serve as a recruitment tool.

## 5. CONCLUSION

Hackathons represent a unique platform for fostering collaboration between universities and industry, offering a hands-on environment where students can develop essential skills while addressing

real-world challenges. The findings from the "Process Optimization Challenge" (POC) events in Tunisia and Ghana demonstrate how these events successfully bridge the gap between academic learning and industry needs, fostering critical skills such as problem-solving, creativity, and digital literacy. By organizing hackathons with interdisciplinary teams, universities can enhance their role in regional innovation systems, promoting a culture of innovation and preparing students for the digital workforce. Organizing hackathons with interdisciplinary teams enables the exploration of diverse perspectives and fosters the generation of innovative, out-of-the-box ideas (Komssi, and al., 2015). Additionally, aligning the hackathon's objectives with industry needs and academic goals demands careful planning and clear communication between all stakeholders. While challenges such as logistical coordination, cultural exchange, and aligning academic and industry goals persist, the benefits in terms of skill development, industry engagement, and career advancement far outweigh these obstacles. Moving forward, universities should consider the long-term integration of hackathons into their curricula, addressing challenges proactively and leveraging the full potential of these events to cultivate future-ready graduates.

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# Agricultural crop waste and residue utilization, University-Business linkage experiences in the UTN

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**Abstract:** The National Technical University (UTN) was created to meet the country's development needs in regards to technical education, at all levels of higher education. In terms of research, the institution is oriented towards applied research, seeking to offer alternatives to the problems that plague the socio-productive sectors of the country. The purpose of this work is first, to present research projects that have been proposed to solve the problems in the use of organic waste of certain productive activities, and second, to show the importance of linking the university with important sectors within the regions where the UTN is present. The methodology used in this work is the presentation and analysis of cases of projects proposed in three of the university campuses, based on information established in reports of the projects already executed in two of the cases, and in the proposal of a project to be carried out during the year 2025.

The main results of the cases presented were the creation of a socio-environmental business model for the production of different biomaterials from pineapple waste biomass and the use of residue from the agricultural industry to produce bioferments, compost, and animal nutrition. Moreover, the projects allowed the participation of different actors like the Research and Transfer Area of the UTN campuses, companies representing agricultural activities, producers and supporting institutions, in addition to the incorporation of students, both at the level of professional practices and in the development of complementary research.

As a conclusion, it is important to establish different linkage mechanisms between the academia and the productive sectors of a territory, region or country. Such linkage allows the identification of opportunities to develop applied research projects aimed at solving real and relevant problems of different economic activities. Besides, it is clear that there is a need to incorporate undergraduate and graduate students in research projects linked to the productive sectors, which helps to generate their service-learning competencies through the practical experiences in which they participate.

**Keywords:** Bioeconomy, Utilization of agricultural residues, University-business linkage.

## 1. INTRODUCTION

The National Technical University (UTN) is the newest public university in Costa Rica, and it is part of the National Council of Rectors (CONARE). UTN was created to meet the country's development needs related to technical education at all levels of higher education, and almost 80% of the students who come from rural areas have scholarships. The university has 5 campuses in different areas of the country, more than 16,000 students, and more than thirty majors or degree programs in the areas of Humanities and Arts, Administrative Sciences, Agricultural Sciences, Education, Engineering and Technology.

In terms of research, the institution is oriented towards applied research, seeking to offer alternatives to the problems that plague the socio-productive sectors of the country. In this sense, one of its main strategic areas of research is Agri-Food and Biotechnology, in which different projects have been carried out especially in agricultural industries such as pineapple, coffee and sugar cane. These activities generate significant amounts of organic waste that are currently seen as a problem but which have the potential to be converted into valuable products.

The purpose of this work is to present research projects that have been proposed to solve problems in the use of organic waste of certain productive

activities, and to show the importance of linking the university with important sectors within the regions where the UTN is present.

## 2. THEORETICAL FRAMEWORK

The theoretical framework on bioeconomy, utilization of agricultural residues, and university-business linkage emphasizes the integration of sustainable practices in agricultural waste management. This framework highlights the potential of agricultural residues as a resource for bioenergy production, fostering a circular bioeconomy while also addressing the need for collaboration between academia and industry. The following sections elaborate on these key aspects.

Bioeconomy focuses on the sustainable use of biological resources, particularly agricultural residues, to produce energy and value-added products. Agricultural waste, primarily lignocellulosic biomass, can be converted into biofuels and biochemicals, thus reducing reliance on fossil fuels and mitigating greenhouse gas emissions (Sanchita & Mira, 2024) (“Utilization of Agricultural Waste Biomass and Recycling Towards Circular Bioeconomy”, 2022).

- **Sustainability:** Utilizing agricultural residues contributes to environmental sustainability by minimizing waste and promoting resource efficiency.
- **Energy Security:** The biorefinery approach enhances energy security by transforming agricultural waste into renewable energy sources, such as biobutanol and bioethanol (“Utilization of Agricultural Waste Biomass and Recycling Towards Circular Bioeconomy”, 2022).
- **Circular Economy:** The integration of agricultural residues into the bioeconomy supports a circular economy model where waste is repurposed, reducing overall environmental impact (SERÇİNOĞLU, 2023).

In relation to the University-Business Linkage, collaboration between universities and businesses is crucial for advancing bioeconomy initiatives. This linkage fosters innovation and the development of sustainable technologies.

- **Research and Development:** Universities can drive R&D efforts to explore new biomass conversion techniques and improve the efficiency of bioprocesses (Singh et al., 2023).
- **Knowledge Transfer:** Partnerships facilitate the transfer of knowledge and technology from academia to industry, enhancing the practical application of research findings (Singh et al., 2023).
- **Workforce Development:** Collaborative programs can prepare students for careers in bioeconomy, ensuring a skilled workforce that meets industry needs (Singh et al., 2023).

On the other hand, while the potential of agricultural residues in bioeconomy is significant, several challenges must be addressed. For example:

- **Food Security:** The extraction of agricultural residues must be balanced with the need to maintain soil organic carbon stocks and ensure food security (“The crop residue conundrum: maintaining long-term soil organic carbon stocks while reinforcing bioeconomy, compatible endeavors?”, 2022).
- **Environmental Impact:** Careful management is required to prevent negative impacts on ecosystems and biodiversity, particularly concerning land use and emissions (Singh et al., 2023).
- **Socioeconomic Factors:** Policies must consider the socioeconomic implications of biomass utilization, including land rights and community health (Singh et al., 2023).

In conclusion, the integration of agricultural residues into bioeconomy presents a promising avenue for sustainable energy production and resource management. However, it is essential to navigate the associated challenges through effective university-business collaborations and comprehensive policy frameworks. This approach does not only enhance environmental sustainability but also supports economic growth and social equity. Conversely, some critics argue that the focus on bioeconomy may divert attention from other renewable energy sources, potentially limiting the exploration of diverse sustainable practices.

### 3. CONTEXT OF THE DESCRIBED RESEARCH/ PRACTICE

The cases presented in this paper represent actions within the area of Research and Transfer of the Universidad Tecnica Nacional, specifically in three of its regional campuses. Two of them are presented as completed projects, and the third one as a research proposal for the year 2025. The first case corresponds to the project “Valorization of crop residues and waste” carried out by researcher Lilliana Rodríguez Barquero at UTN San Carlos Campus, which seeks to respond to the problem of organic residues generated by pineapple crops in the Northern Zone of the country where more than 40 thousand hectares are planted, since the inadequate management of such residues generates the proliferation of insects, the increase of transmitted diseases, as well as the contamination of water sources.

The second case corresponds to the project “Use of bioferments in coffee to replace fertilizers: the case of COOPEATENAS”, developed by researcher Manuel Amador Benavides of UTN Atenas Campus, a research study carried out during the years 2021 to 2023 in the Cooperative of Coffee Producers of Atenas (COOPEATENAS R.L.). This project was oriented to use coffee processing residues to generate less expensive alternatives for the nutrition of this crop, especially in the case of small producers.

Finally, the third case is a proposal for the use of alcohol industry residues entitled “Study of residual stillage from the production of ethanol with sugarcane and proposal for alternative uses in bioferments, compost, and animal nutrition”, which will be carried out by researchers Manuel Amador Benavides and María Fernanda Arias Araya at UTN Guanacaste Campus, taking into account that in the country there are about 60 thousand hectares planted with sugar cane and that its industrialization generates a potential environmental risk in relation to the residue called ‘vinasse’ which is generated in the production of alcohol.

It is important to point out that the three cases correspond to linkage efforts that the UTN, through the Research and Transfer areas of the regional headquarters, carries out with different productive sectors in order to contribute to solve existing problems. In

these cases, they are linked to aspects of bioeconomy applied to the use of residues and waste from agricultural crops and agroindustry.

### 4. MAIN RESULTS/REFLECTIONS

The results of the linkage actions between the university and the productive sectors are shown below:

#### Valorization of crop residues and waste, pineapple crop

The project, through the years of implementation and its different stages, has managed to build a socio-environmental business model for the production of edible oyster mushrooms (*Pleurotus ostreatus*) and different biomaterials from pineapple waste biomass. In addition, a license for the transfer of the innovative protocol has been granted worldwide to the pineapple producer NICOVERDE. The business model considers the inclusion of vulnerable groups in the area, specifically women and young people with disabilities, who have been trained by the UTN to supply the fungi to the NICOVERDE company, which will export the finished products. This is a model of Regenerative and Solidarity-based Circular Bioeconomy that, through the transfer of a technological package, promotes the generation of green jobs through a pilot production and community transfer plant. In addition to mushrooms, tests are being carried out to obtain other high-value products such as fiber, pellets, bio fertilizers, bio textiles, labels, cardboard, and paper.

This project has included the participation of academics and students of the Software Engineering (ISW) and the Information Technology Engineering (ITI) majors in collaborative learning communities through their contribution in the automation of production modules and the monitoring of variables for the production of edible mushrooms which will later be transferred to vulnerable groups through the Center for Research and Transfer in Agroindustrial Innovation.

Starting this year, the project entered an escalation stage to develop commercial prototypes with funding from the Spanish Cooperation, and

it is expected that both academics and students from different majors can continue to participate through professional internships and final graduation projects.

### Use of bioferments in coffee to replace fertilizers, the case of COOPEATENAS

In order to reach the achievements proposed in this project, the participation of different actors was required through a process of clear linkage. Among the actors involved is the Research and Transfer area of UTN Atenas Campus, which developed the design and was in charge of the execution of the research. On the other hand, the technical department of COOPEATENAS was in charge of logistical support in the field and the construction of the bioinputs plant. Another of the actors was the group of coffee producers, members of COOPEATENAS, who contributed their farms to carry out the research. Finally, the National Center for Biotechnological Innovations (CENIbiot), which belongs to the National Council of Rectors (CONARE), was responsible for characterizing the microbial community of bioferments.

As a result of the research, a reduction in the cost of application of multiminerals bioferments was achieved in comparison with conventional products of chemical composition. In addition, it was possible to increase the presence of beneficial bacteria in the areas where the bioferments were applied, which are also presented as non-polluting substances and therefore are less harmful to the treatment of workers and the environment. Another relevant result is that it was possible to integrate the resources of a private organization such as Coopeatenas with governmental research entities such as the UTN and CENIbiot in the search for alternatives of lower economic and environmental cost for the benefit of small producers.

Study of residual stillage from the production of ethanol with sugarcane and proposal for alternative uses in bioferments, compost, and animal nutrition:

This proposal, which is expected to be carried out during the year 2025, aims to develop innovative alternatives with environmental commitment for

the commercial use of residual stillage in alliance with the Costa Rican sugar industry. Therefore, it is expected that the Agricultural and Industrial Sugarcane League (LAICA) will be involved, which will allow for coordination with both sugarcane producers and industrial mills. The El Viejo Sugar Company will also participate, providing the raw material for the research (vinasse), and UTN Guanacaste Campus will be participating through the Research and Transfer area. The Chemistry and Applied Sciences Research Laboratory and the Water Quality Laboratory (LARED), as well as the National Center for Biotechnological Innovations (CENIbiot) will also give the project their support. The incorporation of students in the project is also expected, both at the level of professional practices and in the development of complementary research.

## 5. CONCLUSION

First, emphasis should be placed on the importance of establishing linkage mechanisms between the academia and the productive sectors of a territory, region or country. Such linkage allows the identification of opportunities to develop applied research projects aimed at solving real and relevant problems of different economic activities. This is important considering the need to have impact research proposals when seeking economic resources at the national level, and even more at the international level.

On the other hand, although in the cases presented there was no considerable student participation, it is clear that there is a need to incorporate undergraduate and graduate students in research projects linked to productive sectors. This makes it possible to generate service-learning competencies in students through the practical experiences in which they participate. To achieve the above, it is necessary to articulate the research areas with the different majors and programs existing in a university or campus, in order to establish the spaces in which students can participate in applied research actions.

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# Innovation and Entrepreneurship Ecosystem at Universidad Peruana Cayetano Heredia

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**Resumen:** This article discusses recent organizational changes at Universidad Peruana Cayetano Heredia (UPCH), which have led to the establishment of a more robust framework to support innovation and entrepreneurship within the institution. These changes include the evolution of the administrative structure from a traditional Research Vice-Rectorate to a model comprising three specialized directorates: the Research Management Directorate, the Regulatory Affairs Directorate, and the University Directorate of Innovation and Entrepreneurship (DUIE). The DUIE plays a central role in promoting the integration of academia and industry by setting intellectual property policies and providing targeted support to foster entrepreneurial activities.

Key initiatives undertaken by DUIE since its inception are highlighted, including the establishment of a partnership with AstraZeneca to launch a Digital Health Innovation Hub, the administration of the Incubators 2.0 Project funded with approximately \$500,000 to stimulate tech-driven startups, the development of UPCH's first prototype competition, and the implementation of a pilot biomedical engineering program focused on patent development within prototyping-oriented courses.

**Keywords:** Innovation, university, entrepreneurship.

## 1. INTRODUCTION

The interaction between academia and society is crucial for not only training skilled professionals but also for forming alliances with public and private sectors. These collaborations facilitate the creation of products, services, and processes that address a wide range of societal issues. Universities act as catalysts for significant technological advancements that industries can utilize (Etzkowitz & Leydesdorff, 2000).

Research is a core function of academic institutions; however, transferring research outputs to companies or governmental bodies necessitates the identification, protection, negotiation, and collaboration with entities that can benefit from these developments (Perkmann et al., 2013). In Peru, Law No. 30220, enacted in 2014, mandates that universities establish a Research Vice-Rectorate responsible for

coordinating research projects, promoting technology transfer, and integrating university activities with companies and governmental agencies (Congreso de la República del Perú, 2014).

Since 1998, UPCH has maintained a Research Vice-Rectorate, even before it became a legal requirement. Initially, this Vice-Rectorate included two directorates: one for science and technology research and another for scientific information, which managed libraries and collections. In 2012, the university established a service company to bridge academia and industry, which later transformed into a business incubator, thereby strengthening its ties to the national entrepreneurship ecosystem (UPCH, 2015). In 2021, to address project management challenges, UPCH restructured the Vice-Rectorate to reinforce its capacities in management, regulation, and innovation, integrating the business incubator within one of its directorates.

## 2. DEVELOPMENT

Upon its founding in 1961, UPCH established a research council, marking the beginning of its commitment to supporting research with a dedicated team for managing research funds, particularly from international sources (UPCH, 2020). Over the years, this office underwent various name and structural changes, maintaining its role until the establishment of the Research Vice-Rector in 1998. Initially, the Vice-Rector included two directorates: one for research and another for scientific information. In 2007, it was reorganized to consist solely of the University Directorate of Research, Science, and Technology, with multiple affiliated offices.

In 2021, UPCH authorities decided to establish three directorates with distinct and well-defined functions to improve and foster new activities (Figure 1).

Following a 2021 decision by UPCH authorities, three directorates with distinct and well-defined functions were established, thereby to improve and foster new activities. (Figure 2).

The new structure includes the DUIE, whose mission is to “Develop activities related to applied research, innovation, and entrepreneurship competencies within the UPCH community.” DUIE comprises four key offices that collectively enable the growth of an internal innovation and entrepreneurship ecosystem:

**Intellectual Property Office:** Develops a culture of respect for intellectual property rights within the UPCH community, identifies protectable intellectual property, and manages related infringements.

**Technology Transfer and Linkage Office:** Builds partnerships with corporate and government sectors to develop collaborative projects and commercialize technologies created by UPCH researchers.

**Business Incubator (Bioincuba):** Promotes entrepreneurship within the UPCH community, encouraging the creation of spin-offs and startups and supporting broader community entrepreneurship development.

**Services Office:** Facilitates research contracts leveraging the university’s research capabilities for collaborative projects.

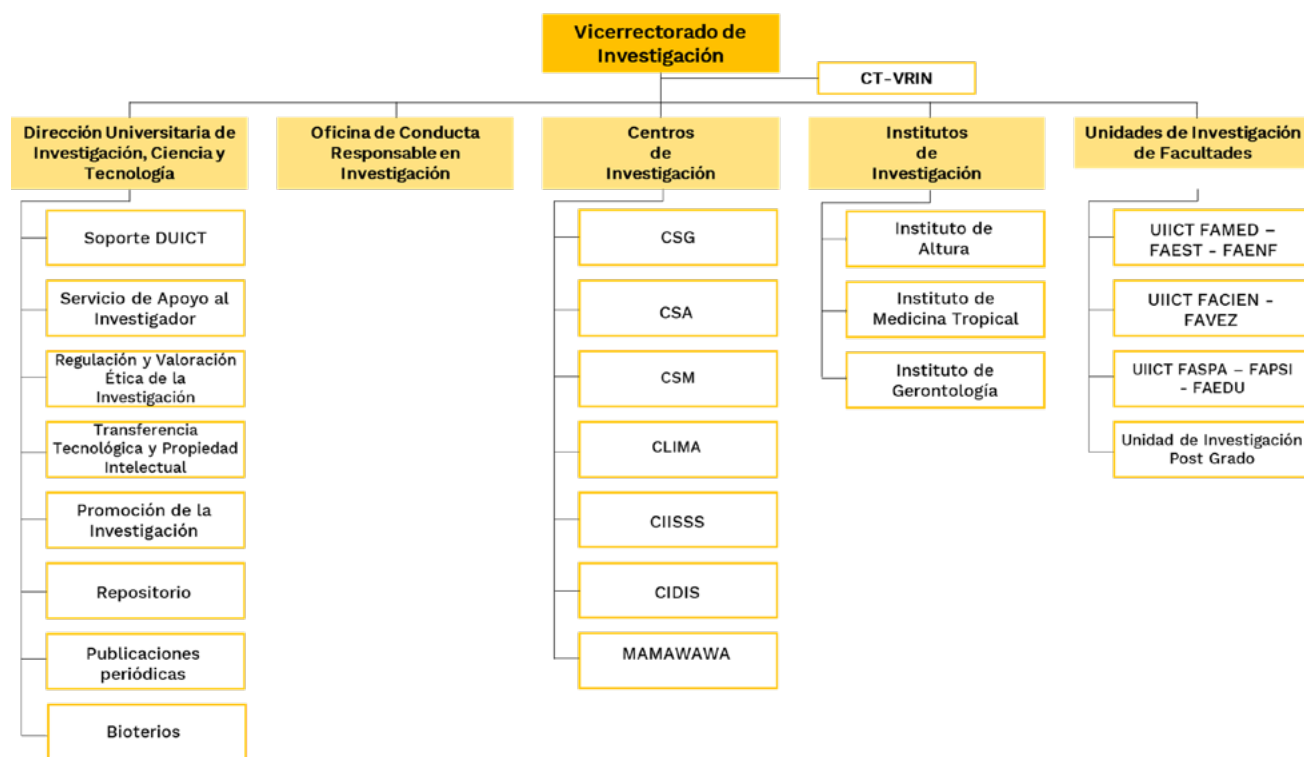


Fig. 1. UPCH Research Vice-Rector Organization Chart as of 2021

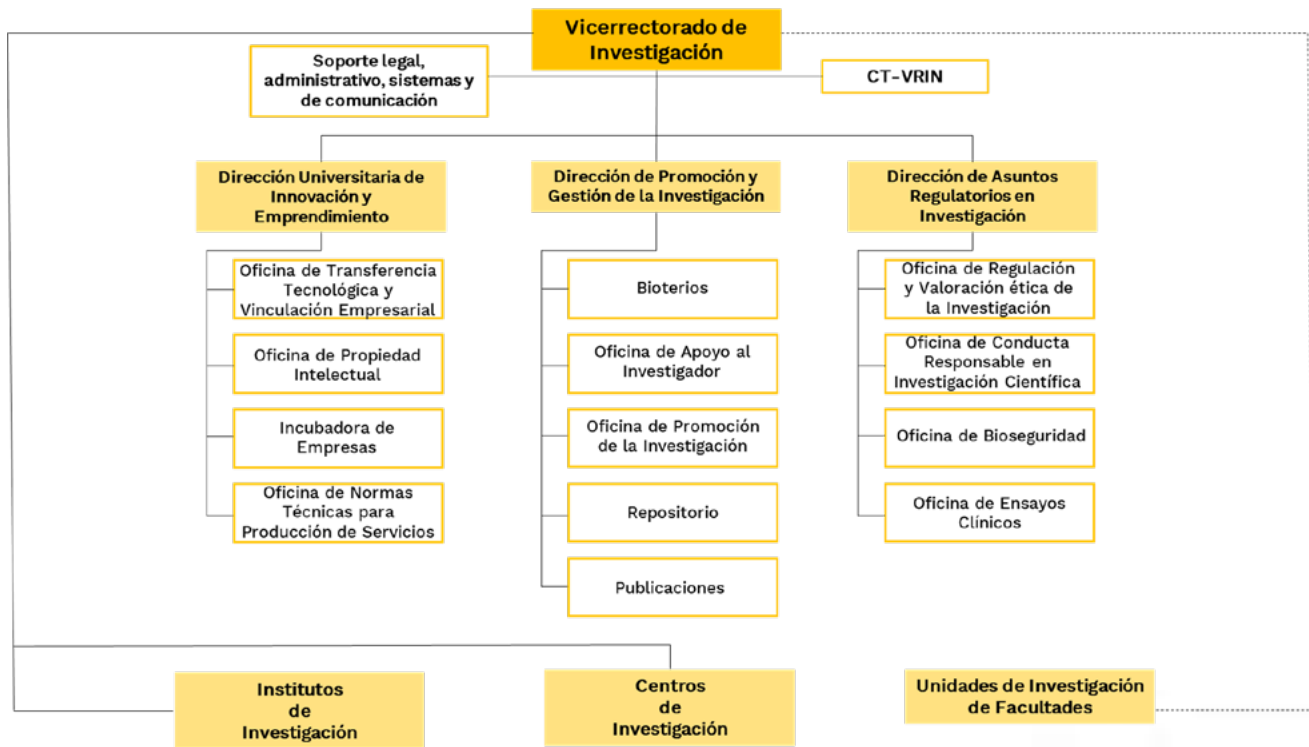


Fig. 2. Organigrama del Vicerrectorado de Investigación al 2024.

These offices are tasked with developing processes, policies, and manuals aligned with both national and internal regulations to ensure their activities are effectively managed.

### 3. INNOVATION AND ENTREPRENEURSHIP PROGRAMS

Since May 2022, DUIE has implemented various initiatives aimed at fulfilling its mandate, with a focus on fostering academia-industry linkages. Notable programs include:

#### A. Intellectual Property (IP) in the Curriculum

A pilot project in collaboration with a biomedical engineering professor adapted a prototyping course so that students' final reports consisted of invention disclosures. This adjustment resulted in nine invention descriptions, four of which were deemed patentable and subsequently protected by UPCH. This approach enhances student competencies in IP and has the potential to increase the university's patent output (Siegel & Wright, 2015).

#### B. Health Tech Innovation Hub

In collaboration with AstraZeneca, UPCH and DUIE launched the Health Innovation Hub to promote digital innovation in the Peruvian health sector. This initiative brings together public and private actors to advance health technology (AstraZeneca, 2022). The hub serves as a platform for fostering innovation in areas such as telemedicine, health informatics, and mobile health applications.

#### C. Lab to Market Program

As part of the ProInnovate-funded Incubators 2.0 project, the Lab to Market program invited 27 universities within the Peruvian University Network to participate (ProInnovate, 2021). Researchers and innovation personnel attended a nine-week training to develop entrepreneurial competencies and prepare technologies for productive or governmental applications. The program aims to spread a culture of innovation and entrepreneurship among university researchers.

## D. Prototype Competition

Organized by the Research Vice-Rector and DUIE, this competition encourages creativity and inventive development within the UPCH community. It rewards prototypes that integrate technology and innovation to provide socially and commercially impactful solutions. The competition has become a catalyst for student engagement in practical problem-solving and innovation (UPCH, 2022).

## 4. DISCUSSION

The development of an innovation and entrepreneurship ecosystem within a university setting is a complex endeavor that requires strategic planning and institutional support (Guerrero & Urbano, 2012). UPCH's efforts align with global trends where universities are becoming more entrepreneurial to contribute to economic development and societal well-being (Audretsch, 2014).

Despite its focus on basic research in medicine and human biological sciences and its emerging engineering programs, UPCH faces challenges in fostering a culture of innovation and entrepreneurship. The traditional emphasis on basic research often limits the translation of scientific discoveries into marketable products or services (Rothaermel et al., 2007).

However, the initiatives undertaken by DUIE demonstrate a commitment to overcoming these challenges:

**Institutional Support:** The support from UPCH authorities has facilitated access to various national funding opportunities, helping to energize the innovation ecosystem.

**Cultural Shift:** Building a culture of innovation focused on developing new or improved products for public or private sectors requires a paradigm shift within the university community.

**Industry Collaboration:** The collaboration with AstraZeneca has opened opportunities for health sector companies to engage with UPCH's science, engineering, and medical faculties, enhancing practical applications of research (Ankrah & AL-Tabbaa, 2015).

**Educational Integration:** Expanding the patenting program through prototyping courses across all disciplines could provide students with a foundational understanding of the patent system, encouraging innovation from an early stage in their careers.

**Community Engagement:** The prototype competition serves as a platform for the UPCH community to showcase the product, service, and process prototypes developed by students and faculty across various courses, fostering an environment of collaborative innovation.

## 5. CONCLUSION

Despite its focus on basic research in medicine and human biological sciences and its emerging engineering programs, UPCH faces challenges in fostering a culture of innovation and entrepreneurship. However, notable progress has been made:

1. The support from UPCH authorities has facilitated access to various national funding opportunities, helping to energize the innovation ecosystem.
2. Building a culture of innovation focused on developing new or improved products for public or private sectors remains challenging due to the university's emphasis on basic research.
3. The collaboration with AstraZeneca has opened opportunities for health sector companies to engage with UPCH's science, engineering, and medical faculties.
4. Expanding the patenting program through prototyping courses across all disciplines could provide students with a foundational understanding of the patent system.
5. The prototype competition, now in its second year, serves as a platform for the UPCH community to showcase the product, service, and process prototypes developed by students and faculty across various courses.

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# International Online Marketing Challenge

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**Abstract:** The International Online Marketing Challenge (OMC) is a unique opportunity for international professionals—graduates and MBA students—to gain practical experience in the real business world by designing and executing digital marketing campaigns for Saxonian companies using a budget of 500 euros. The objective of challenge is to create University-Business linkages and win-win opportunities for students and SMEs. With the OMC, students have the opportunity to work in teams to design an international online marketing campaign in collaboration with an SME and bring it to reality. Over the course of three months, students take on the role of online marketing managers, developing and executing campaigns with the budget, and strive to meet the marketing objectives set by the company to win the challenge. Thereafter, the student or graduate teams come together at a final event to pitch their results to the companies, share their experiences, and celebrate. The students gain more than practical experience and a certificate; they also benefit from participating in our Digital Marketing Bootcamp, where they receive specialized training and gain a deeper understanding of the most relevant social media marketing platforms, such as Facebook, Instagram, LinkedIn, TikTok and Google.

Provide a concise summary of the case study, including the context, objectives, methodology, main findings, and conclusions. The abstract should not exceed 200 words. (Text: Times New Roman, Bold, 9 pt, Justified).

**Keywords:** Digital Marketing, International Markets, Social Media, International Students, university-business linkages.

## 1. INTRODUCTION

Since 2017, the International Online Marketing Challenge initiative has been organized by the Small Enterprise Promotion & Training (SEPT) Competence Center at Leipzig University and the Internationalisierungsoffensive Sachsen (IOSAX) to merge the academic and business worlds and promote collaboration between international students and Small and Medium Enterprises (SMEs) from Saxony aiming to explore international markets. Since 2022, Hochschule Zittau/Görlitz has joined as a partner organization, and in 2024 the German Academic Exchange Service (DAAD) became a support organization.

The OMC adopts the University-Business linkage model to support internationalization of German SMEs from Saxony through connecting the international student's community with SMEs thereby improving the marketing skills of all participants. In this initiative, international students -at the post-graduate level-, BA graduates and alumni work

with German SMEs to design and run a digital marketing campaign tailored to the company needs and with focused on explore or expand to international markets. The goal of the OMC is to create win-win opportunities for both international students and German SMEs. The intended benefits for students include: First, all access to the Bootcamp on Digital Marketing consisting of 5 sessions on Digital Marketing Strategy & Planning, Facebook & Instagram, LinkedIn, TikTok and Google. The bootcamp training sessions are facilitated by experts at SEPT Competence centre, Leipzig University; professionals working at a digital marketing agency company based in Leipzig – Projecter GmbH. Second, the participants benefit from in-person coaching & practical workshops on Social Media Marketing on how to launch their marketing campaigns facilitated by digital marketing experts. Third, student gain hands-on practical experience in designing and running online marketing campaigns for SMEs with a real budget and putting their ideas into practice. Fourth, upon successful completion and presentation

of their practical projects, all students receive a certificate issued by Leipzig University and the SEPT Competence Center, IOSax, and signed by the partner company. Fifth, student teams get the chance to compete among peer to achieve the challenge provided by the companies and win a prize of 300 Euros. Finally, the OMC has also helped to develop strong professional networks and build career perspectives for university students. The experienced obtained in the OMC has helped them to obtain internship positions in the partner companies and to increase their employment opportunities in the German market.

On the other hand, the OMC provides benefits for the German SMEs and their internationalization goals. First, companies get the opportunity to obtain a digital marketing campaign tailored to their needs and targeting international markets. Second, by participating in the challenge, SMEs have been able to run effective online marketing campaigns and brand awareness using a small budget of 500 Euros and the expertise and creative ideas of student teams that they collaboratively work with. Third, as a result of the OMC, SMEs have the opportunity to establish contacts with potential customers abroad; obtained international visibility; and explore new potential international markets. Complementary, the OMC also offer managers or representatives from the SMEs, the opportunity to participate in the Digital Marketing Bootcamp aiming to boost their digital marketing skills. Finally, the OMC offers companies the opportunity to connect with international talent, young professionals that can potentially join the company as employees bringing a global perspective and experience. Since its creation, the OMC has collaborated with SMEs from a wide range of industries like IT-enabled businesses, Food & Beverages, Manufacturing, Automobile/E-mobility, Ed-Tech, Supply Chain & Logistics, Medicine/Med-tech, Engineering, Sport & Lifestyle etc.

## 2. THEORETICAL FRAMEWORK

The OMC adopts the University-Business Linkage (UBL) model to support internationalization of Saxonian SMEs through connecting the international student's community with Saxonian SMEs thereby improving the marketing skills of all participants.

In the process, the students engage in marketing service-learning activities aimed at career enhancement, while the companies cooperate with students to develop international business competencies at the individual and organizational level. The participating companies develop international market orientation in terms of their customers, partners and competitors (Knight & Kim, 2009). Also, by working with students, companies' managers/executives pursue international opportunity recognition and improve their inter-/cross-cultural competence and human capital (Kim et al. 2015). Moreover, OMC allows students to engage in experiential marketing education and the approach is designed to achieve the desired mutual learning outcomes for students and solving real-world business problems for companies (Jacobly, 2014).

The OMC approach involves five stages that include: 1. recruitment, 2. kick-off event, 3. bootcamp, 4. campaign execution, and 5. Final event. Stage 1: Recruitment: Open call for applications held each year from February to March, and matching students with German companies to create student or graduate teams. Stage 2: Kick-off event in Leipzig: The details about the OMC event, roadmap, and companies schedule presentations take place at the kick-off event; and the first meeting of companies & student teams. Stage 3: Bootcamp and Practical Workshops: students and companies participate in digital marketing bootcamp trainings from April to June each year consisted on five (5) Bootcamp trainings on digital marketing strategies, tools, and platforms. Participants also benefit from four (4) Practical workshop and two (2) complementary sessions to get feedback, solve questions, and set up the marketing campaigns. The participating student or graduate teams design and setup initial marketing campaigns which are subsequently reviewed and approved by the company managers or executives. Presentations sessions are held with OMC Alumni for tips and recommendations on how to create successful marketing campaigns.

Stage 4: Campaign execution: this stage involves getting campaign ideas approvals and marketing budget from companies- students further design & run campaigns with 500 € budget. There is also opportunity to get personalised consultation hours

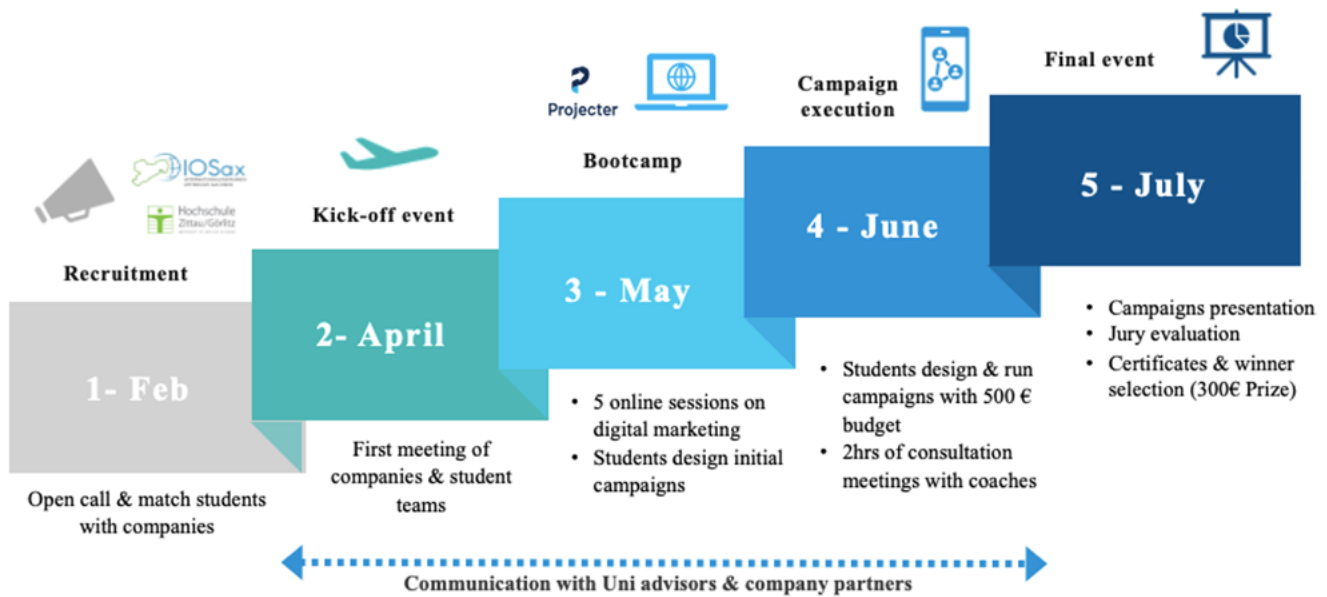


Figure 1. Stages of the Online Marketing Challenge

Source: SEPT Competence Center – Leipzig University.

and meetings with coaches and advisors. Stage 5: Final events took place online, in Leipzig or Dresden where the participants make campaign and main result presentations and pitches. The Jury who are composed of selected experts and experienced marketing professionals make questions & conduct the evaluation of the student or graduate teams campaign results presentation to determine the OMC top three winners. All the participants receive individual completion certificates, and the selected top three teams also receive prize certificates. The first-place team gets winning certificate and the 300€ Prize.

The Online Marketing Challenge Model also involve the key specific roles that students and companies to create mutual learning experiences for all participants and stakeholders. The role of the participating companies include:

1. Companies provide the marketing budget and payment mediums for running ads on the social media marketing platforms.
2. Companies provide access to appropriate channels, design materials, and brand resources
3. Companies also arrange meetings with students, physical visits to their offices, and the company contact person

While, the role of student teams include:

1. Student or graduate teams design and run the marketing campaigns
2. Student or graduate teams also participate in the bootcamps, workshops, meetings and coaching sessions
3. Students communicate and collaborate within teams, as well as with companies and OMC advisors
4. Student or graduate teams make the presentation of report on marketing strategies, project outcomes and milestones to the companies

### 3. MAIN RESULTS/REFLECTIONS

The OMC was an enriching opportunity to enhance their marketing skills, gain practical experience running digital campaigns, exchange knowledge with companies, and develop their local professional networks in Saxony. Since 2017, the Online Marketing Challenge has been running annually. Eight editions of collaborative work with more than 200 international students, 50 online marketing campaigns completed for 48 Saxonian SMEs with supports from 8 support partners that include

Internationalisierungsoffensive Sachsen (IOSAX), Talent Transfer, Fachkräfte Allianz, Hochschule Zittau/Görlitz, Technische Universität Dresden, University of Applied Sciences Dresden, Kreatives Sachsen, Projecter GmbH, and DISTART.

Participating students in the OMC initiative gain essential skills and competencies in international and digital marketing, including: International Marketing Skills: Understanding global markets, identifying target audiences, and tailoring campaigns to diverse cultural contexts. Digital Marketing Strategy and Planning: Mastering campaign management, audience targeting, and selecting effective channels and platforms. Students also learn to create impactful marketing materials such as videos and images, and measure campaign success. Advertising Expertise: Developing proficiency in Facebook and Instagram Ads for businesses, as well as using TikTok to promote brands effectively. LinkedIn for Business: Learning how to find customers and suppliers, run LinkedIn Business Ads, and optimize professional networking. Analytics and Optimization: Gaining hands-on experience with Google Analytics, Search Engine Advertising (SEA), and Search Engine Optimization (SEO) to improve business visibility and performance. This comprehensive training

equips participants with the tools and knowledge to excel in both local and international markets.

In addition, participating students also advance their soft business skills that include: Teamwork and collaboration skills through a team building and creativity workshop and the use of digital collaboration tools like Miro board and digital conferencing tools. The participants also engage in ideas brainstorming and iteration that develops their creativity and innovation skills. Business communication and ecommerce skills are developed through communicating with company customers, potential partners and internal stakeholders. The students also develop problem solving and project management skills to achieve digital marketing campaign goals, overcome marketing constraints as well as meeting their project requirements and expected outcomes. Above all, the cross-cultural competence of students is enhanced while working in international and diverse teams and for business that focus on expanding their products and services to international markets. Similarly, the OMC strengthens SME and startup owner-managers' international business competencies, including their international market orientation and global business mindset, with a focus on digital marketing strategies.

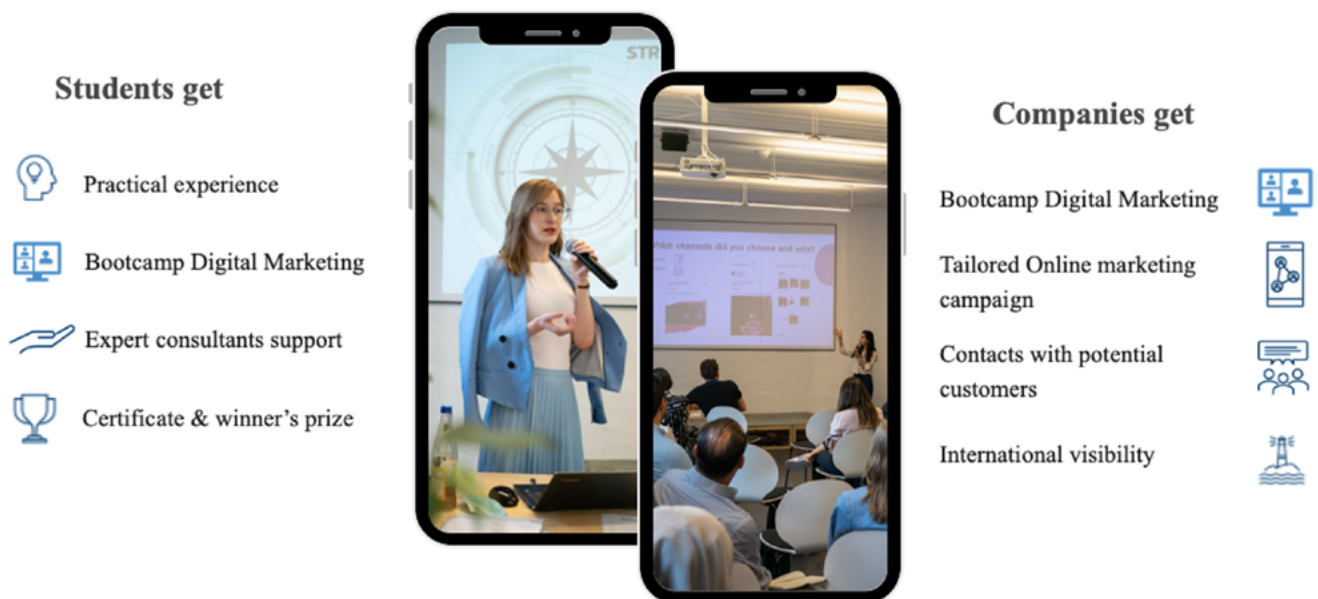


Figure 2. Win-win results of the Online Marketing Challenge

Source: SEPT Competence Center – Leipzig University.

#### 4. CONCLUSION

The OMC offers an exciting opportunity for international students and graduates from diverse backgrounds to work in teams and design and execute international digital marketing campaigns for SMEs in Saxony. The University-Business linkage approach helps to promote Saxonian company brands, products, and online sales through working with motivated and qualified intercultural student or graduate teams. The OMC has become a game-changing opportunity for students to participate in practice-oriented training, get job offers from companies and a launch pad for their future career prospects in dynamic professional fields. Through the real projects that students during the OMC, they gain invaluable hands-on experience and develop interdisciplinary skills as well as international networks. Participating companies benefit from international marketing insights, fresh business

strategy perspectives and the opportunity to build relationships with talented and creative students as potential future employees. Finally, student teams and participating companies receive specialized training, gain deeper insights into the most relevant online marketing tools.

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# From Transactional to Transformational: The Evolution of Service-Learning and Capacity Building in Higher Education Institutions

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**Abstract:** Over the past decade, service-learning and capacity-building in Higher Education Institutions have undergone a marked transformation, a process that accelerated notably after 2020. Drawing on a systematic review of 426 peer-reviewed documents retrieved from the SCOPUS database, the present study examines the institutionalization of service-learning, the evolution of university-community partnerships, and the role of digitalization in widening participation in service-learning initiatives. The analysis reveals that service-learning, which was formerly positioned as an elective or co-curricular activity, has transitioned into a structured, curriculum-integrated model reinforced by faculty incentives, accreditation mandates, and dedicated institutional resources. Central to this transition is the digital transformation occurring within higher education, where hybrid teaching formats, e-portfolios, AI-driven data analytics, and virtual reality have collectively enhanced the inclusivity, scalability, and empirical basis of service-learning experiences. In parallel, university-community partnerships have shifted from short-term, transactional engagements to more enduring, reciprocal collaborations, thereby expanding the social impact of these initiatives. The findings suggest that service-learning occupies a vital role in advancing social justice, sustainability, and global engagement in higher education, highlighting the need for stronger faculty support, enhanced technological infrastructure, and robust cross-sector partnerships to embed service-learning within institutional frameworks fully.

**Keywords:** Service learning, Capacity Building, Higher Education, Digital transformation, Transformational Partnerships.

## 1. INTRODUCTION

In recent years, Higher Education Institutions (HEIs) have undergone a significant transformation in their approaches to both capacity building and service-learning. Historically, service-learning was viewed as an ancillary component of academic offerings, driven largely by voluntary efforts and implemented through short-term, project-based interventions (Barrera-Rodríguez et al., 2023; Hirsch et al., 2023). Since 2020, however, service-learning has become progressively integrated into formal academic curricula and institutional strategies (Ciesielkiewicz et al., 2024), reflecting heightened

institutional commitment, more robust assessment frameworks, greater reliance on digital technologies, and an intensified emphasis on social justice and sustainability (Ribeiro et al., 2023).

Several factors have catalyzed this shift. First, service-learning has garnered recognition as a high-impact educational practice that effectively addresses the growing demand for experiential, community-focused learning (Chang et al., 2024; Mitchell & Perrotti, 2023). Second, the COVID-19 pandemic substantially accelerated the adoption of hybrid and digital service-learning models, which have now become integral to many academic programs (Ramaswamy et al., 2023).

In addition, the nature of university-community partnerships has evolved from predominantly transactional, short-lived collaborations to more sustainable, reciprocal relationships (Hirsch et al., 2023). Whereas many earlier service-learning initiatives primarily involved students providing services to communities in a one-directional fashion (Crone, 2023), contemporary models position community members as co-educators who share equal responsibility in shaping and delivering project outcomes (Goodman et al., 2023). This paradigm shift has not only strengthened the long-term impact of service-learning initiatives but also enhanced the quality of student learning (Nanjundan et al., 2024).

The increased emphasis on evaluating the impact of service-learning represents another important development in HEIs. Prior to 2020, assessment was typically qualitative, relying heavily on student reflections and anecdotal feedback. In the post-2020 landscape, many institutions have shifted toward quantitative, evidence-based metrics to evaluate student competencies, professional skill development, and societal outcomes (Compare & Albanesi, 2024; Cruz et al., 2024). Digital portfolios, longitudinal analyses, and competency-based frameworks have further enhanced the capacity of HEIs to monitor and improve learning outcomes (Ciesielkiewicz et al., 2024).

Equity, inclusion, and social justice have likewise emerged as guiding principles in contemporary service-learning programs. Early models tended to focus on broader civic engagement but did not always address systemic inequities (Ferrara & Klein, 2023). By contrast, post-2020 programs explicitly target underlying social inequalities, encouraging students to engage with marginalized communities, explore social entrepreneurship, and pursue projects aligned with the United Nations Sustainable Development Goals (SDGs) (Ribeiro et al., 2023). This evolution aligns with a broader trend in higher education toward community-centric, purpose-driven learning that equips graduates to become proactive agents of social change (Bawole, 2024).

Considering these transformations, the present article sets forth the following objectives:

- Analyze the evolution of service-learning and capacity building in HEIs before and after 2020.
- Identify the key institutional shifts that have facilitated the integration of service-learning into academic curricula.
- Examine the role of digitalization and hybrid models in expanding access to service-learning experiences.
- Evaluate the impact of long-term university-community partnerships on student learning and community engagement.
- Assess how service-learning initiatives foster social justice and sustainability goals within contemporary higher education.

## 2. METHODS

### 2.1. Data Collection

To examine the evolution of capacity building and service-learning in HEIs (HEIs), we conducted a systematic literature search using the SCOPUS database. The search was formulated using the following query:

“capacity AND building” OR “service learning”  
AND “higher education institution\*” OR HEI\*

This query was designed to capture a broad range of relevant literature focusing on capacity building and service-learning within HEIs. The search was limited to peer-reviewed articles, book chapters, and conference papers, ensuring a high standard of academic rigor. Additionally, we restricted the results to publications written in English to facilitate consistency in analysis. The search retrieved a total of 426 documents, which were then systematically analyzed.

### 2.2. Selection and Screening Process

Following the initial data retrieval, we carefully examined titles and abstracts to determine which studies warranted closer inspection. This preliminary review involved identifying those sources that explicitly addressed service-learning or capacity-building within higher education institutions,

particularly those that offered comparative insights into pre-2020 and post-2020 developments. Studies focusing on institutional policies, pedagogical strategies, digital learning approaches, or community engagement models were considered especially relevant. In contrast, investigations centered solely on K-12 education, private-sector capacity-building, or theoretical frameworks lacking empirical data were set aside. Applying these parameters reduced the dataset to 132 documents, each of which proceeded to full abstract analysis and contributed to the evolving understanding of how service-learning and capacity-building practices have transformed in recent years.

### 2.3. Analytical Approach

We used a qualitative content analysis methodology to examine how service-learning and capacity-building have evolved in HEIs over time. This involved three key phases:

**Thematic Coding of Abstracts:** Each abstract was read and coded to identify recurring themes and keywords. Pre-2020 and post-2020 trends were categorized based on institutional changes, teaching methodologies, digital integration, and partnerships. Specific attention was given to terminology shifts, for example, how “community partnerships” evolved from being transactional before 2020 to reciprocal after 2020.

**Comparative Analysis:** The abstracts were grouped into two temporal categories:

- Pre-2020: Documents highlighting traditional service-learning models, short-term university-community projects, and limited digital engagement.
- Post-2020: Studies showing integration of service-learning into curricula, expansion of digital tools, and greater emphasis on sustainability and social justice.

We compared these two datasets, identifying key trends such as the rise of hybrid learning models, shifts toward competency-based assessment, and institutional policy changes favoring long-term service-learning initiatives.

## 3. MAIN RESULTS/REFLECTIONS

### 3.1. Evolution of Service-Learning and Capacity Building in HEIs Before and After 2020

Over the past two decades, service-learning and capacity building in HEIs have evolved considerably, with the year 2020 marking a critical inflection point. This progression can be understood through several interrelated dimensions, including institutionalization, university-community partnerships, digitalization, impact assessment, equity and inclusion, internationalization, and faculty engagement. *Table 1* provides an overview of these key developments before and after 2020.

#### *Institutionalization of Service-Learning*

Prior to 2020, service-learning was often regarded as an elective or co-curricular pursuit, lacking both formal integration into degree programs and systematic evaluative frameworks (Lewing & Shehane, 2017). It typically operated without substantial institutional support or dedicated funding, while faculty participation was largely voluntary (Adamuti-Trache & Hyle, 2015; Soska et al., 2010). In contrast, the post-2020 period has seen service-learning emerge as a recognized high-impact practice, woven into the core curricula of many universities (Ramaswamy et al., 2023). This deeper level of institutionalization has allowed HEIs to better align service-learning initiatives with strategic objectives, sustainability targets, and accreditation standards (Mitchell & Perrotti, 2023). Consequently, greater access to funding and resources has stimulated faculty-driven research and course design centered on service-learning, signaling its growing prominence in higher education.

#### *University-Community Partnerships*

Before 2020, university-community partnerships frequently took the form of short-term, transactional engagements, with students participating in isolated service activities that emphasized volunteerism over sustained impact (Hurd & Bowen, 2020; Lough & Toms, 2018). Community members were often framed as passive beneficiaries rather than

co-creators of knowledge (Marks et al., 2015; Soska et al., 2010). In contrast, post-2020 models have shifted toward sustainable, community-driven collaborations, where local stakeholders play an active role in shaping and implementing service-learning projects (Hirsch et al., 2023). HEIs increasingly adopt co-creation models, in which students, faculty, and community partners collaborate as equal contributors, ensuring that academic goals align with genuine community needs (Barrera-Rodríguez et al., 2023; Shah et al., 2023). These reciprocal partnerships have enhanced both the societal impact and educational value of service-learning.

### *Digitalization and Hybrid Models*

Prior to 2020, service-learning was predominantly conducted in physical community settings, with digital resources used mainly for managing coursework (Lee, 2019). International opportunities were largely limited to expensive study-abroad programs, which often lacked sustained engagement with host communities (Lough & Toms, 2018). However, the onset of the COVID-19 pandemic accelerated the adoption of digital tools, giving rise to virtual and hybrid service-learning models (Cruz et al., 2024). In the current context, HEIs facilitate worldwide collaborations through online platforms, thereby democratizing global engagement and expanding access for students from diverse socioeconomic backgrounds (Kiely & Ka, 2023; Valencia-Forrester & Backhaus, 2023).

### *Measuring Impact and Learning Outcomes*

Historically, service-learning outcomes were predominantly evaluated through qualitative reflections and faculty observations, with limited standardized, longitudinal methodologies (Thompson et al., 2018). There was little quantitative assessment of students' skill acquisition or career readiness (Lewing & Shehane, 2017). Since 2020, institutions have increasingly embraced data-driven strategies for evaluating the long-term effectiveness of service-learning programs. Digital portfolios, structured rubrics, and extended follow-up studies now gauge competencies such as leadership, community engagement, and professional growth (Ciesielkiewicz et al., 2024).

These evidence-based tools have substantiated the positive impact of service-learning on both student development and community outcomes, thereby securing greater institutional support (Compare & Albanesi, 2024).

### *Equity, Inclusion, and Social Justice*

Before 2020, service-learning initiatives primarily emphasized civic engagement but often failed to address the systemic factors underlying social disparities (Queiruga-Dios, 2020). Many programs prioritized charitable interventions, sometimes overlooking the structural roots of inequality (Kiely, 2023). Following 2020, a growing number of HEIs have reoriented their service-learning curricula toward social justice and equity, embedding principles of anti-racism, sustainability, and community empowerment into project design (Ribeiro et al., 2023). This more inclusive perspective encourages students to scrutinize and challenge structural inequities, equipping them with the critical awareness necessary for meaningful social transformation (Ferrara & Klein, 2023; Grad & van der Zande, 2022).

### *Internationalization and Global Engagement*

Before 2020, international service-learning opportunities were largely restricted to students with the financial means to participate in study-abroad experiences, which frequently resulted in short-term engagements with limited long-term impact on host communities (Kiely, 2023; Lough & Toms, 2018). In the post-2020 era, HEIs have moved towards more inclusive global engagement models, embracing virtual collaborations and digital mobility programs that allow broader student participation (Kiely & Ka, 2023). These initiatives not only expand access to international learning experiences but also promote sustained, culturally responsive engagement, often aligning with the United Nations Sustainable Development Goals (SDGs) (Ribeiro et al., 2023; Wodon, 2022). As a result, global partnerships have broadened in scope and inclusivity, granting students worldwide a richer, more accessible learning experience. Technology-enabled internationalization has made it possible for students to engage in meaningful service-learning experiences across borders,

fostering long-term knowledge exchange and capacity building within global communities.

Further reinforcing this shift, recent studies highlight the role of university-business linkages in strengthening international competencies among students (Boafo & Dornberger, 2024). By integrating business-oriented global learning experiences into service-learning, HEIs are equipping students with essential international business competencies, intercultural communication skills, and entrepreneurial mindsets. This approach ensures that students not only gain exposure to international service-learning opportunities but also develop professional competencies that enhance their employability in global markets.

Moreover, these university-business linkages foster collaborations between HEIs, companies, and non-profit organizations, creating a synergistic environment where students apply their academic knowledge to real-world challenges. Unlike traditional study-abroad programs, this model ensures that students engage with diverse industries, develop problem-solving skills, and gain practical experience in international business settings while addressing community-driven sustainability initiatives (Boafo & Dornberger, 2024).

### *Faculty Engagement and Recognition*

Prior to 2020, faculty who incorporated service-learning into their courses often relied on personal initiative and received minimal institutional recognition or resources. Following 2020, however, universities have prioritized faculty development and incentivization through funding, professional development workshops, and tenure-track benefits (Christanti, 2024). This shift has encouraged broader faculty participation and led to more cohesive, interdisciplinary service-learning models that transcend traditional disciplinary boundaries (Compare & Albanesi, 2024). Moreover, the growing acknowledgment of service-learning as a valid form of scholarly work has strengthened its status as a cornerstone of teaching, research, and community engagement within higher education (Grad & van der Zande, 2022).

Table 1: Summary of Key Changes in Service-Learning and Capacity Building Before and After 2020

Dimension	Pre-2020 Trends	Post-2020 Trends	Implications
Institutionalization	Elective, co-curricular	Integrated into curricula	Structured learning, increased funding
University-Community Partnerships	Short-term, transactional	Long-term, reciprocal	Sustainable partnerships, real-world impact
Digitalization	In-person focus	Hybrid and remote learning	Increased accessibility and inclusivity
Impact Measurement	Qualitative, anecdotal	Data-driven assessment	Justifies continued investment
Equity & Inclusion	General civic engagement	Focus on empowerment and justice	Broader perspectives, deeper social impact
Internationalization	Expensive study-abroad programs	Virtual collaborations, SDG-aligned projects	Democratized global engagement
Faculty Support	Minimal incentives	Funding, tenure recognition	More faculty participation, stronger programs

Source: Authors.

### 3.2. Key Institutional Shifts Facilitating Service-Learning Integration

In the post-2020 higher education landscape, service-learning has undergone a significant transformation, evolving from a peripheral, voluntary practice into a central academic strategy. Whereas service-learning was once primarily co-curricular and optional, it is now embedded in institutional policies, funding mechanisms, and disciplinary frameworks. Several pivotal developments have driven

this shift, reshaping how universities conceptualize, support, and implement service-learning initiatives.

One of the most influential changes is the widespread recognition of service-learning as a high-impact educational practice. In their pursuit of experiential learning opportunities that connect theory to real-world contexts, universities increasingly view service-learning as an essential pedagogical method (Mitchell & Perrotti, 2023). As a result, many institutions have integrated service-learning into general education requirements, professional training programs, and capstone experiences. This broader embedding ensures that students across diverse academic disciplines engage in collaborative problem-solving with community partners to address urgent social issues. The outcome is a dual benefit: students acquire practical, career-relevant competencies, while universities fulfill their mandate as agents of social change.

The expansion of faculty incentives and institutional support has been instrumental in enabling service-learning to scale. Prior to 2020, faculty involvement in service-learning was frequently motivated by personal commitment, with minimal institutional acknowledgment. Presently, however, universities actively encourage faculty participation through grant opportunities, tenure-track recognition, and professional development programs (Compare & Albanesi, 2024). These measures incentivize faculty to integrate service-learning into their coursework, collaborate with community partners, and produce scholarly research on engaged learning practices. Furthermore, enhanced institutional backing promotes cross-disciplinary partnerships, as faculty from varied fields increasingly explore the educational and scholarly benefits of service-learning.

Policy reforms at both governmental and institutional levels have also profoundly influenced the proliferation of service-learning. Governments and accrediting bodies are gradually mandating community engagement as a foundational requirement for HEIs (Roy et al., 2024). These mandates drive universities to develop structured service-learning programs aligned with national education strategies and global sustainability objectives. Accrediting agencies now emphasize demonstrable community impact, a

shift that further compels universities to establish robust and sustained service-learning frameworks.

A noteworthy trend is the expansion of service-learning into disciplines beyond its traditional bases in the social sciences and education. While early initiatives often centered on humanities and community-focused programs, recent years have witnessed increased integration in STEM, business, and healthcare education (Lee, 2019; Mahmud & Ismail, 2024). For example, engineering students now engage in designing sustainable infrastructure solutions for local communities, while business students apply social entrepreneurship principles to address economic disparities. In healthcare education, service-learning has become integral to medical and allied health programs, enabling students to work with underserved populations and cultivate an understanding of the social determinants of health.

### 3.3. Digitalization and Hybrid Models in Service-Learning

The post-2020 digital transformation has fundamentally reconfigured service-learning, rendering it more inclusive, scalable, and adaptable than previously imagined. Before this paradigm shift, most service-learning programs relied heavily on on-site community engagement, limiting participation to students with the ability to physically access service locations. The necessity of remote learning during the COVID-19 pandemic accelerated the adoption of virtual and hybrid models, thereby broadening access across geographic and socioeconomic contexts (Ramaswamy et al., 2023). In response, HEIs have embraced emerging technologies to facilitate service-learning in unprecedented ways.

A key development in this new landscape is the widespread incorporation of ePortfolios. In earlier service-learning frameworks, students typically reflected on their community experiences through written submissions. With the advent of digital portfolios, however, students are now able to capture and showcase their learning trajectories using multimedia such as videos, photographs, and project artifacts (Ciesielkiewicz et al., 2024). These platforms also allow for longitudinal tracking of skills, providing students with a tangible record of

their civic engagement and professional growth. Simultaneously, institutions gain the ability to measure service-learning’s contribution to career readiness and academic development, using the aggregated data to refine program strategies.

Another pivotal innovation is the integration of Virtual Reality (VR), enabling students to engage with simulated communities and complex real-world scenarios. Disciplines ranging from healthcare to engineering and urban planning have adopted VR simulations that allow students to practice interventions and test designs in controlled environments (Chang et al., 2024; Hou et al., 2023; Tene et al., 2024). This immersive approach has proven especially valuable for contexts where in-person engagement may be infeasible or unsafe, such as during public health emergencies or in conflict zones.

Learning Management Systems (LMS) have likewise evolved beyond mere content delivery platforms, becoming integral to the coordination of service-learning initiatives. Systems such as Moodle, Blackboard, and Canvas now offer project management tools and collaborative features that facilitate asynchronous engagement among students and community stakeholders (Nanjundan et al., 2024). These functionalities empower faculty to orchestrate service-learning projects systematically while ensuring transparent communication and equitable resource sharing.

The emergence of Artificial Intelligence (AI) and data analytics represents yet another transformative shift in service-learning. AI-driven tools can monitor student progress, analyze reflection data, and evaluate the longitudinal impact of various interventions (Dubay & Richards, 2024). These systems not only assist institutions in assessing program outcomes but also generate individualized recommendations for students, steering them toward service-learning opportunities that align with their competencies and vocational interests. In parallel, data-driven insights enable HEIs to tailor service-learning initiatives more precisely to community needs, reinforcing the reciprocal benefits of these programs.

The proliferation of remote collaboration platforms, including Zoom, Microsoft Teams, and Google Meet, has also reshaped service-learning by removing geographic barriers. Students can now communicate

with community partners around the globe in real time, engaging in collaborative problem-solving and project design without the constraints of international travel (Ramaswamy et al., 2023). Such platforms have paved the way for cross-institutional partnerships as well, in which universities in different regions collaborate to develop and deliver integrated service-learning opportunities.

Looking to the future, scholars underscore that emerging technologies open new frontiers for advancing service-learning and capacity building. Blockchain-based credentialing, for example, offers secure verification of student achievements, while gamification and augmented reality hold promise for enhancing student engagement and real-world impact. *Table 2* summarizes pivotal technologies driving innovation in service-learning.

Table 2: Technologies Enhancing Service-Learning and Capacity Building

Technology	Application	Authors
ePortfolios	Digital reflection and competency tracking	(Ciesielkiewicz et al., 2024)
Virtual Reality (VR)	Simulated community engagement experiences	(Hou et al., 2023; Tene et al., 2024)
Learning Management Systems (LMS)	Online coordination of service-learning projects	(Nanjundan et al., 2024)
AI & Data Analytics	Measuring impact through automated tracking	(Dubay & Richards, 2024)
Remote Collaboration Tools (Zoom, Teams, etc.)	Virtual service-learning partnerships	(Ramaswamy et al., 2023)
Blockchain-based Credentialing	Secure verification of service-learning credentials	(Gwin & Foggin, 2020; Jackson & Meek, 2021) Lee & Nakamoto (2024)
Gamification	Enhancing engagement through interactive learning	(Folomieieva et al., 2024; Pelizzari, 2023)

Technology	Application	Authors
Augmented Reality (AR)	Immersive learning experiences for real-world problem-solving	(Cabrera-Duffaut et al., 2024; Cheng, 2023)

Source: Authors.

### 3.4. Community Partnerships in Student Learning and Community Engagement

In recent years, the evolving dynamic between HEIs and community partners has led to transformative outcomes for both student learning and community engagement. What were once short-term, transaction-based service projects have progressively matured into sustained collaborations that create shared value. A key result of this shift is the enhancement of HEIs' absorptive capacity—the ability to recognize, assimilate, and apply external knowledge (Cohen & Levinthal, 1990). Traditionally focused on knowledge production within academic domains, universities are increasingly positioning themselves as active contributors to societal problem-solving, providing enriched learning experiences for students and amplifying community voices in the process.

The first phase in this transformation is more intentional recognition of community knowledge. Historically, academic institutions viewed themselves as primary knowledge producers, relegating communities to a largely passive role in service-learning projects. Recently, however, local expertise has been embraced as a critical resource for shaping impactful service-learning initiatives (Hirsch et al., 2023). This paradigm shift has influenced curriculum design, prompting universities to integrate indigenous knowledge, localized innovations, and cultural practices into service-learning activities. The result is a more reciprocal model of learning, wherein students and faculty co-create solutions with community partners, rather than simply “serving” them.

Beyond recognition, the capacity to assimilate external knowledge has also significantly improved within many HEIs. Institutions now systematically collect and integrate community feedback to ensure that service-learning efforts deliver lasting benefits. In the past, community involvement often concluded with one-off, semester-long projects. Currently,

structured mechanisms for ongoing dialogue enable communities to guide iterative adaptations of initiatives, reinforcing long-term partnerships (Goodman et al., 2023). This iterative model has proven particularly fruitful in fields such as public health, environmental sustainability, and economic development, where sustained collaboration can address complex challenges more effectively than isolated interventions.

The final stage of this process involves exploiting or applying the integrated community knowledge to generate new opportunities for education and research. Insights gleaned from robust university-community partnerships increasingly inform novel pedagogical approaches, shaping the structure and scope of service-learning across a range of disciplines (Nanjundan et al., 2024). These partnerships also catalyze applied research, whereby faculty and students validate innovative solutions in real-world contexts. Thus, the practical value of service-learning now extends beyond student development to influence institutional research agendas, promoting socially responsible innovation ecosystems within HEIs.

Notably, these enduring collaborations bridge the gap between academic theory and community practice, fostering a mutually beneficial exchange of knowledge and resources. For students, sustained engagement with community partners facilitates a deeper, more nuanced understanding of social issues, moving beyond surface-level interactions to foster critical thinking, teamwork, and leadership competencies. Through exposure to real-world challenges and cross-sector collaborations, students develop problem-solving skills that enhance both their academic learning and professional preparedness (Boafo & Dornberger, 2024).

From the community perspective, these partnerships offer access to academic expertise, research capabilities, and technological advancements that can be leveraged to develop localized solutions. When universities integrate business-oriented service-learning approaches, as seen in university-business linkages, they equip communities with entrepreneurial and innovation-driven strategies that promote long-term sustainability (Boafo & Dornberger, 2024). These collaborations ensure that students gain practical insights into business models,

economic development, and global market trends, while communities benefit from capacity-building initiatives tailored to their specific needs.

### 3.5. Service-Learning, Social Justice, and Sustainability in Higher Education

Over the past decade, service-learning in higher education has transcended its earlier conceptualization as a form of civic engagement focused on volunteer activities. It now functions as a strategic mechanism for addressing social justice and sustainability challenges, effectively linking academic inquiry with real-world advocacy (Ferrara & Klein, 2023). Consequently, universities are emerging as pivotal actors in efforts to confront systemic inequities and global crises.

A principal shift in the contemporary landscape is the deliberate focus on counteracting racial and economic inequalities. Previously, many service-learning programs adopted a one-directional model, wherein students from relatively privileged backgrounds provided assistance to underserved communities without critically examining the structures that perpetuate marginalization. This approach has been largely replaced by a justice-centered paradigm that seeks to empower communities through mutually beneficial partnerships (Crone, 2023). Universities increasingly prioritize initiatives that dismantle barriers to healthcare, education, and economic opportunity for underrepresented groups. Through sustained engagements, students collaborate directly with community members to devise solutions targeting entrenched injustices.

Parallel to this emphasis on social justice is a growing commitment to sustainability as a cornerstone of contemporary service-learning programs. In light of urgent global challenges—ranging from climate change to widening socioeconomic gaps—many institutions have aligned their service-learning efforts with the United Nations Sustainable Development Goals (SDGs) (López-Santiago et al., 2024; Ribeiro et al., 2023; Vieira Da Silva et al., 2022). Projects now routinely address environmental conservation, poverty alleviation, and public health, drawing upon both community knowledge and cutting-edge research to devise innovative interventions.

Examples include climate resiliency partnerships, ecological urban planning efforts, and food security programs, all designed to yield durable benefits for both local and global stakeholders.

Equally significant is the role of service-learning in shaping ethically driven, socially responsible graduates. By embedding advocacy, activism, and community engagement within the core academic experience, universities cultivate a sense of civic agency that extends beyond traditional career preparation (Hirsch et al., 2023). Students gain critical thinking skills and develop moral frameworks that equip them to challenge systemic injustices rather than merely adapt to existing conditions. Engaging in long-term, community-centered projects furnishes learners with firsthand insights into the complexities of contemporary societal issues, ultimately inspiring them to pursue leadership pathways that foster structural transformation.

## 4. CONCLUSION

Over the past decade—especially in the wake of broader global changes after 2020—HEIs have undergone a profound shift in how they conceptualize and implement service-learning initiatives. What was once an optional supplement to traditional coursework has evolved into a central educational practice that directly contributes to institutional transformation, social justice, and sustainability (Mitchell & Perrotti, 2023; Ribeiro et al., 2023). At the heart of this evolution is the recognition that service-learning, when strategically integrated into curricula and supported by robust community partnerships, holds the potential to address a range of societal challenges while simultaneously deepening students' academic and personal development (Hirsch et al., 2023).

Recent studies indicate that universities are embedding service-learning into general education requirements and specialized training programs alike (Compare & Albanesi, 2024; Roy et al., 2024). This institutional commitment has been bolstered by policy reforms, accreditation directives, and well-defined faculty incentives—all of which ensure that service-learning becomes a fundamental component of higher education pedagogy rather than an isolated add-on (Mahmud & Ismail, 2024). Equally

transformative is the shift in how universities partner with local and global communities (Goodman et al., 2023). These collaborations increasingly operate as long-term, reciprocal engagements, enabling HEIs to enhance their absorptive capacity—their ability to recognize, assimilate, and apply community-based knowledge to promote shared, sustainable solutions (Hirsch et al., 2023).

Technological innovation has further broadened the scope and accessibility of service-learning. Digital platforms and tools—such as ePortfolios, virtual reality simulations, learning management systems, and AI-driven analytics—are enabling students to document their skill development, interact with diverse communities in virtual environments, and measure the social impact of their work more accurately (Ciesielkiewicz et al., 2024; Dubay & Richards, 2024; Hou et al., 2023). In addition, hybrid learning frameworks, which combine online components with onsite immersion, have allowed more students to participate in service-learning experiences, regardless of geographic or financial constraints (Culcasi et al., 2023; Nanjundan et al., 2024). These developments have solidified service-learning as a powerful vehicle for pursuing social justice and sustainability objectives (Crone, 2023; Ferrara & Klein, 2023). By aligning many of their initiatives with the United Nations Sustainable Development Goals (SDGs), universities are guiding students to tackle urgent issues related to inequality, environmental stewardship, and community resilience (López-Santiago et al., 2024; Ribeiro et al., 2023; Vieira Da Silva et al., 2022). In so doing, HEIs are not merely preparing students for the workforce; they are equipping the next generation with the critical thinking skills, ethical frameworks, and community-centered mindset required to drive positive, systemic change (Hirsch et al., 2023).

### Further recommendations for Higher Education Institutions

Despite considerable progress, HEIs still face important challenges in maximizing the transformative impact of service-learning and capacity building. Many universities, although recognizing the value of experiential community engagement, have yet to fully integrate service-learning across degree programs

in ways that ensure stable funding, consistent evaluation, and robust faculty support. In places where service-learning has become firmly woven into curricula, training opportunities and grant incentives for faculty can further institutionalize these efforts, ultimately embedding service-learning at the core of academic life. At the same time, investment in emerging technologies—ranging from AI-driven analytics to blockchain-based credentialing—has the potential to extend the reach and deepen the impact of service-learning initiatives. When digital infrastructure is developed thoughtfully and aligned with pedagogical goals, it can help track learning outcomes, facilitate immersive experiences through virtual reality, and verify students' contributions in a transparent, secure manner.

Additionally, meaningful community partnerships remain crucial for ensuring that service-learning responds directly to local and global concerns. Sustained, co-created projects that feature continuous dialogue with stakeholders can avert the pitfalls of one-off interventions, while also preserving the authenticity and relevance of each initiative. Equally vital is a commitment to equity, which not only ensures that marginalized voices are centered in program design but also exposes students to a wide array of social realities, thus cultivating a deeper sense of responsibility and engagement. Alongside equity, there is growing recognition of the need for more expansive international collaborations. With the rise of virtual platforms, HEIs can now foster cross-border dialogues that enhance cultural competencies, encourage collective problem-solving, and ultimately nurture a global mindset.

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