Project-Based Innovation Education Through University-Industry Collaboration: A Course Design and Learning Outcomes Analysis

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***Abstract* — This study examines a student-centered innovation management course implemented through collaboration between a public university's faculty of economics and administrative sciences, its project and research-development coordination office, and a local chamber of commerce. The main purpose of this research is to analyze the instructional design, implementation process, and learning outcomes of this course, titled Innovation Management, and to evaluate its contribution to students' innovation competencies within the framework of sustainable education.**

To achieve this, the study adopts a mixed-method case study design. Empirical data were collected through rubric-based project evaluations and process-oriented learning outcome assessments. Quantitative data consist of standardized rubric scores assigned to three core project outputs: written reports, project posters, and physical or conceptual prototypes, alongside oral presentations. Qualitative data were obtained through continuous instructor observations and performance evaluations throughout the course. Following theoretical instruction, students developed innovation projects under faculty supervision, culminating in a public project market event where student projects were presented to local administrators, business representatives, academics, and media members.

The principal results from the most recent cycle involving 45 student projects demonstrate high engagement and rigorous output quality, with 13 projects receiving formal awards from the evaluation committee. The major conclusions indicate that integrating project-based learning with university-industry collaboration provides a useful applied model for project-based innovation education in higher education. By bridging the gap between theoretical knowledge and practical regional application, the course appears to contribute to students' professional competencies and entrepreneurial mindsets.

***Keywords*— Innovation education, project-based learning, university-industry collaboration, student-centered learning, higher education**

I. INTRODUCTION

In recent years, higher education institutions have increasingly emphasized innovation-oriented and experiential learning approaches. Traditional lecture-based teaching methods are often insufficient for developing creativity, entrepreneurship, teamwork, and problem-solving competencies. Therefore, universities are now searching for educational models that connect theoretical learning with real-world applications [1]. Innovation education has become an increasingly important component of higher education [2]. To support the development of these skills, universities are progressively pivoting toward experiential and project-based learning (PBL) methodologies that connect academic knowledge with practical social and economic problems [3].

However, there is still limited research on how long-term and stakeholder-based innovation education models are implemented in practice [4]. While traditional lecture-based teaching methods are heavily criticized for failing to foster practical creativity and teamwork, existing research often treats university-industry collaborations and project-based courses as isolated, short-term initiatives. There is limited empirical research on long-term innovation education models supported by institutional and regional stakeholders. In particular, few studies examine how collaboration among university faculties, research and development offices, and local business organizations affects student learning and innovation outcomes over multiple years.

Examining these gaps is important both for higher education practices and for regional development. Investigating integrated, student-centered innovation models provides useful insights into how higher education institutions can integrate experiential learning into regular educational practices. Furthermore, understanding the dynamics of localized academic-industrial partnerships helps demonstrate how universities can serve as active contributors to regional innovation and collaboration.

To address these gaps, this study examines a structural innovation education model implemented through a consecutive three-year collaboration between the Faculty of Economics and Administrative Sciences (Nazilli) at Aydın Adnan Menderes University in Türkiye, the University's Project and R&D Coordination Office, and the Nazilli Chamber of Commerce. Specifically, the study focuses on the instructional design, implementation processes, and comprehensive learning outcomes of the applied course titled *UTIF303 Innovation Management*. The study examines the instructional structure, implementation process, and learning outcomes of the course, with particular attention to how this collaborative and project-based model contributes to students' innovation competencies and experiential learning within the context of sustainable education.

II. LITERATURE REVIEW

Developing innovation and entrepreneurial competencies in higher education institutions (HEIs) has become increasingly important in preparing students for changing economic conditions in the 21st century [5]. Early studies on

https://doi.org/10.34630/cip.vi.7667

innovation management mainly focused on classroom-based theoretical instruction. However, foundational frameworks shaped by technology acceptance and planned behavior theories, as proposed by pioneering researchers such as Davis [6] and Ajzen [7], showed that innovative behavior is influenced not only by theoretical knowledge but also by perceived usefulness and behavioral control mechanisms. Subsequently, Bharadwaj et al. [8] emphasized the growing importance of digital business strategies, arguing that innovation education must transcend static theories to embrace a technology-infused, dynamic structure. This historical evolution provides the initial robust evidence that theoretical instruction must be reinforced by practical field applications and integrated into course design and educational practice.

In the phase of ensuring the sustainability of such curricular transformations, integrating innovative practices into institutional structures and managing stakeholder relations remain important challenges. In his study, Gunn [9] investigated how contemporary pedagogical approaches could be sustainably integrated into educational processes during curriculum renewal, and identified tensions between innovative initiatives and university administrations during curriculum change processes. Arguing that inadequate funding models and rigid institutional policies hinder the successful implementation of innovation-oriented curricula, the author emphasizes that strong collaboration among institutional stakeholders and active policy development are essential for sustainable curriculum transformation. This underscores the fact that innovation in education cannot be treated as an isolated classroom activity; rather, it demands broader stakeholder coordination and institutional cooperation.

When the boundaries of this ecosystem extend beyond the university walls, the dimension and structural dynamics of partnerships formed with external stakeholders—such as industry, government, and local communities—become increasingly important. Mensah and Gordon [10] examined the implementation of university-industry-government collaborations within the framework of sustainability science at the University of Ghana, demonstrating the vital role of these triple-helix partnerships in supporting national development policies despite persisting institutional constraints. Their study highlights the necessity of systematically monitoring R&D activities and encouraging researchers to take a more active role in social and regional development. Similarly, Mancini et al. [11], within the scope of the Erasmus+ funded "Socially Engaged Universities (SEU)" project, investigated collaborations between universities and local communities, validating the positive impacts of applied partnerships on regional development and civic engagement. Both studies collectively argue that HEIs must adapt their educational activities and research practices to the real-world needs of local and regional stakeholders.

The effectiveness of these external partnerships relies heavily on managing collaboration processes through structured methods and integrating contemporary technological trends. Grunwald et al. [4] analyzed the challenges encountered in stakeholder engagement processes within sustainable innovation partnerships in higher education by utilizing the Structure-Process-Outcome (SPO) model and Kano analysis, showing that balancing diverse stakeholder priorities and establishing long-term collaboration and mutual trust are important. Complementing stakeholder management, Allam et al. [12] explored the role of Artificial Intelligence (AI) and "living intelligence" approaches in rendering higher education curricula and resource optimization sustainable. They noted that this technological shift can only be executed ethically and responsibly through cross-disciplinary collaborations among educators, technologists, and policymakers. Therefore, innovation education increasingly requires both stakeholder cooperation and the effective use of contemporary technological tools.

Recent macro-level analyses explicitly indicate that sustainability and social innovation have become increasingly important in institutional strategies in higher education. Oliveira and Proença [13], in their systematic literature review on sustainable campus practices, emphasized the critical roles of institutional leadership, stakeholder engagement, and holistic strategies, while pointing out significant research gaps regarding funding mechanisms and concrete data reporting. In a similar vein, the systematic review and bibliometric analysis conducted by Bui et al. [14] confirmed that social innovation research within HEIs heavily clusters around sustainable development, social entrepreneurship, and a broader research-innovation culture, indicating a growing international interest in institutional practices related to social innovation.

Although the significance of project-based learning and university-industry collaboration is frequently underscored in the existing literature, studies examining project-based learning together with university–industry collaboration through long-term and stakeholder-oriented educational models remain limited. Particularly, there is a distinct lack of educational practices that connect theoretical knowledge with regional stakeholders and practical product development processes. To bridge this literature gap, this study examines the instructional design, implementation process, and empirical learning outcomes of an innovation management course conducted through a tri-party partnership between a public university, a project/R&D coordination office, and a local chamber of commerce and discusses its potential contributions to applied innovation education in higher education.

III. MATERIALS AND METHODS

This study adopts a mixed-method case study design to evaluate the instructional structure, implementation process, and learning outcomes of the course titled *UTIF303 Innovation Management*. The methodology was designed to evaluate not only the final project outputs but also students' learning experiences and project development processes throughout the semester. The research is based on empirical data collected during the most recent implementation of the course, which was conducted during the 2025–2026 academic year at Aydın Adnan Menderes University. By combining quantitative and qualitative data collection techniques, the study aims to provide a broader evaluation of the educational model.



Figure 1. *General view of the Project Market event.*

A. Quantitative Data Collection and Assessment

The quantitative dimension of the research uses structured, rubric-based evaluations to objectively assess the student innovation projects [15]. A total of 45 distinct student projects were evaluated during the final "Project Market" event held on January 20, 2026 (see Figure 1). To ensure consistency in evaluation, each project was scored using a structured evaluation rubric. The evaluation criteria included:

- Originality and innovation potential,
- Technical and economic feasibility,
- Alignment with sustainability principles,
- Project presentation and defense quality,
- Visual and structural poster design, and
- Prototype functionality (physical or conceptual).



Figure 2. *Jury evaluation process.*

These standardized numeric scores provided the basis for evaluating project quality, ultimately determining the 13 projects that received awards from the evaluation committee (see Figure 2). The awarded projects focused on sustainability, environmental innovation, agriculture, digital technologies, and socially oriented solutions.

B. Qualitative Data Collection and Process Observation

The qualitative dimension of the study aimed to better understand aspects of student development that could not be fully reflected through quantitative scores alone [16]. This qualitative framework consists of continuous, semester-long instructor observations, evaluations of student performance during the project process, and direct documentation of classroom and laboratory experiences during the collaborative project development phase. This qualitative approach focused heavily on tracking the changes in students' creativity, teamwork, and problem-solving skills. It documented how the integration of project-based learning (PBL) and university–industry collaboration supported by public and regional stakeholders contributed to the development of professional competencies, specifically emphasizing individual creativity, teamwork and collaboration, problem-solving skills, and experiential learning outcomes [17].





Figures 3 and 4. *Students presenting innovation projects during the Project Market event.*

C. Data Integration and Case Analysis

Following the data collection phase, the quantitative rubric scores and qualitative observation field notes were integrated through a mixed-method approach. The numeric data provided quantitative evidence of project quality and technical success, while the qualitative findings offered additional insights into the student learning process and implementation challenges. By evaluating these two data sources together, the mixed-method case study [15] design effectively highlights how stakeholder-supported experiential learning models connect theoretical innovation education with practical project development and stakeholder interaction.

IV. Results and Discussion

The empirical findings of this study demonstrate that integrating project-based innovation education with multi-stakeholder university-industry collaboration establishes a highly effective, scalable, and sustainable learning paradigm in higher education. The structural evaluation of the *UTIF303 Innovation Management* course indicates that the curriculum succeeded in extending learning beyond traditional classroom instruction. Quantitative and qualitative assessments verify that students did not merely achieve a theoretical comprehension of innovation; instead, they developed practical skills and competencies. These core competencies include creative thinking, cross-functional teamwork, systematic project design, professional presentation skills, and physical or conceptual prototype development. By bridging abstract academic frameworks with practical execution, the model successfully encourages students to take a more active role in the innovation process.

A primary driver of these positive learning outcomes is the integration of experiential learning throughout the course process. Rather than restricting students to classroom-based instruction, the course structure requires students to actively participate in different stages of project development—spanning structured idea generation, project proposal writing, budgeting, technical poster preparation, and hands-on prototyping. The public Project Market event serves as a critical capstone that translates classroom learning into an interactive public presentation experience. Presenting engineered solutions to a diverse panel of academics, industry professionals, local administrators, and community members provided students with opportunities for professional interaction, enhanced stakeholder communication skills, and increased students' confidence in presenting their projects publicly.

Beyond technical and operational skills, the empirical evidence, revealed a noticeable interest among students in sustainability-oriented and socially beneficial projects. A substantial portion of the forty-five student projects tackled environmental and regional challenges, focusing heavily on environmental protection, agricultural innovation, local digital transformation, and circular economy practices. This strong inclination toward sustainability indicates that innovation education supported by regional collaboration does more than develop technical skills; it actively nurtures civic responsibility, social awareness, and an alignment with sustainable development goals among future industry leaders.

The findings of the study are also supported by the thematic distribution and practical orientation of the student projects presented during the Project Market event. Among the 45 evaluated projects, a significant number focused on sustainability, environmental protection, agricultural innovation, digital technologies, and socially oriented solutions. For example, projects such as biodegradable straws produced from fruit peels, AI-supported e-export platforms for SMEs, sustainable olive oil packaging designs, and smart intervention systems for forest fires demonstrated students' ability to connect theoretical innovation concepts with practical regional problems (see Figures 3-4).

Among the 13 projects that received awards during the Project Market event, the first-place project focused on producing cosmetic products from fig seed oil. Within the scope of the project, students visited local fig producers and a factory processing fig seed oil in order to better understand the production process and the sector's needs. They subsequently developed a cosmetic cream by consulting faculty members from the university's Department of Chemistry and utilizing laboratory facilities on campus. Considering that Aydın, where the university is located, is internationally recognized for its fig production, the project was evaluated by the jury as a highly innovative initiative combining regional agricultural potential, interdisciplinary collaboration, and applied product development (see Figure 5).



Figure 5. *Press coverage of the first-place project: «Cosmetics from Fig Seed Oil»* [18].

These project themes suggest that students were able to apply innovation management principles not only at a conceptual level but also within socially and economically relevant contexts. In addition, the public presentation dimension of the Project Market provided students with opportunities to interact directly with academics, business representatives, and local stakeholders. Instructor observations throughout the semester indicated that this interaction process contributed positively to students' presentation confidence, teamwork practices, and engagement with project development processes.

Overall, the findings suggest that project-based learning supported by stakeholder participation contributes positively to students' innovation competencies and experiential learning processes. Despite its contributions, this study has several limitations. First, the research is based on a single case study conducted at one university, which may limit the generalizability of the findings. In addition, the sample size is limited to students enrolled in a single course implementation. The study also does not include a longitudinal student survey or a control group comparison, which restricts the ability to measure long-term learning outcomes and compare the effectiveness of different instructional models.

Future research may expand this model through longitudinal student surveys, comparative institutional studies, and larger datasets involving different universities and disciplines. Such studies may help better evaluate the long-term effects of project-based innovation education.

Ultimately, this study confirms that combining project-based learning with institutionalized stakeholder

participation creates a multidimensional educational environment that appears to support innovation competencies. The three-year implementation of the model suggests that it may be adaptable to different educational settings. This framework can also be adapted and implemented across various universities, geographical regions, and diverse academic disciplines. The overarching conclusion of this research highlights a fundamental pedagogical shift: innovation is not an abstract concept to be memorized through traditional lectures. To cultivate students with practical innovation skills, innovation should be experienced through practical project development, collaboration, and public presentation processes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

M.M.D contributed to the conceptualization and implementation of the study, including the development of the innovation management course and the coordination of institutional collaboration processes. T.E.S contributed to the research design, data analysis, and literature review. Both authors contributed to the writing, revision, and final approval of the manuscript.

FUNDING

This research received institutional support from the Nazilli Chamber of Commerce. The funding body had no role in data analysis, interpretation, or manuscript preparation.

ACKNOWLEDGMENT

The authors would like to thank the Nazilli Chamber of Commerce for its support and collaboration during the implementation of the Project Market activities and the course process.

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