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Open Innovation Platforms and Knowledge Transfer Mechanisms in University-Industry Collaborations

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Abstract

Changing the current knowledge systems to Open Innovation Platforms (OIPs) is necessary to improve knowledge transfer between industries and universities, create cooperation, and facilitate innovation. This paper uses Multi-Criteria Decision Analysis (MCDA) and Geographic Information Systems (GIS) to analyze the relationships between universities and industries and determine the best models of the knowledge exchange. Statistical research of 15 university-industry partnerships in technology, health, and manufacturing sectors demonstrates that Full Model (MCDA + GIS + Criteria) has yielded the greatest performance results. In particular, the innovation output rose by 25, efficiency rose by 20, and the social acceptance rose by 10 % when OIPs were in place. Another factor that can also be noted in the study is the effect of incorporating GIS because the site suitability assessments were improved by 15 % and decision-making on adopting technology was enhanced. Moreover, the examination reveals that consideration of social impact factors helped to raise the success of collaboration, in accordance with the stakeholders' expectations and building more effective industry-academic relations. Nonetheless, the omission of GIS decreased collaboration model efficiency by 5% and social impact factor omission decreased social acceptance by 4% thus highlighting the significance of these elements in the optimization of OIP. The findings underline the importance of an integrated approach to partnership, which comprises technical, economical, and social parameters, to guarantee the high effectiveness of university-industry partnerships. In its conclusion, the study will provide the policy makers and the industry executives with the fixation of integrating MCDA and GIS into the decision-making process to make OIPs more effective and serve the sustainability of the sustainable development goals (SDGs). The future of OIPs needs to be employed in other industries and regions with the help of newer technologies such as AI and blockchain to enhance the functionality and scalability of OIPs.

Keywords: Innovation Platforms, Knowledge Transfer, University-Industry Collaboration, Innovation, Knowledge Management, Technology Transfer, Collaboration Models.

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Introduction

The increasing demand of innovation in academia as well as industry has underscored the significance of the university-industry collaborations. These collaborations have the potential to greatly speed up the new technology developments and commercialization. Industries are however impeded by factors like poor mechanisms of knowledge transfer, intellectual property and lack of harmonized goals. The solutions to such challenges have been seen in the Open Innovation Platforms (OIPs) which offer a structured way of sharing knowledge between academic and industrial organizations to have a better and efficient process of innovation. The paper will deal with these issues and how OIPs can maximize knowledge transfer in university-industry partnerships.

The increasing need to demand innovation has seen a greater focus on cooperation between universities and industries as both parties aim at utilizing the core strengths of each other to come up with new technologies, products, and services. Open Innovation Platforms (OIPs) have become key tools of sharing knowledge, idea and resource within the confines of organizational boundaries. Through these platforms, knowledge transfer is made more efficient, and universities can share the research findings with the industry partners, and industries will enjoy access to academic knowledge and technology. Consequently, OIPs create an ecosystem that builds the ability to co-create value by academic and industrial stakeholders, which accelerates the process of innovation.

Although OIPs have the potential, little is known about the application and how knowledge is transferred. The article by (Fitriasari & Sensuse, 2025) addressed the importance of collaborative frameworks and knowledge management systems 4.0 in promoting Open innovation in universities, which offers the much-needed information on optimization of these platforms. Although there are other studies that point at the role of OIPs in boosting innovation, very few are systematic in the analysis of the effects of different knowledge transfer models and the efficiency in various fields. In this study, the gap is to be addressed by exploring the aspects that determine the effectiveness of OIPs at university-industry cooperation with references to the challenges and opportunities associated with such dynamic partnerships.

The paper examines the nature of knowledge being shared, institutional and organizational frameworks that contribute to these exchange along with the tools that can enable communication and collaboration. (Osorno-Hinojosa et al., 2022) stressed the significance of value co-creation in the context of university-industry collaboration, which revealed that open innovation leads to the establishment of a two-way exchange of resources. By using both case studies and statistical analysis, the paper aims to measure the benefits of OIPs in knowledge transfer and thus the main measures of success of the enhancement of knowledge transfer include the speed of knowledge dissemination, the quality of research findings, and the success of the commercialization. The primary enablers and practices of university-industry open innovation outlined by (Murga Pinillos, 2025) will also serve as the guiding factors in the selection criteria to assess collaboration mechanisms in this research. Within the framework of Open Innovation Platforms and Knowledge Transfer Mechanisms in University-Industry Collaborations, (Santoso et al., 2024) examined the use of combining the alpha-numeric passwords and graphic authentication as the means of increasing cybersecurity, which can be introduced to improve knowledge transfer in open innovation platforms, so that to secure the intellectual property and sensitive information shared between the universities and industries in the course of the collaboration (Santoso et al., 2024).

Finally, this study will be useful in offering information on the ways in which universities and industries can maximize the collaboration approaches using OIPs, which has the potential of generating innovation and also leading to economic as well as technological developments. In the systematic literature review, (Fitriasari et al., 2024) outlined trends and technologies that affect university collaboration in open innovation adding to a better understanding of the changing frameworks of collaboration. (Plata, 2024) talked about the non-tangible knowledge relations within university-industry relationship that reveals that intangible knowledge is a key factor in the success of open innovation platforms.

In addition, (Chedid et al., 2022) presented empirical research on the university-software industry partnerships and emphasized that knowledge management practices play a key role in the success of partnerships. (O'Dwyer et al., 2023) unravelled the barriers and enablers of formation of successful university-industry collaborations, which outlined that it is crucial to overcome organizational challenges. The study by (Albats et al., 2025) on digital platform execution of academia-industry knowledge exchange has provided fresh understanding of the subject of improving collaboration using digital platforms. The part of university-industry linkages as a means of technology transfer, especially by the triple helix model that (Hailu, 2024) discussed, will also be useful in comprehending how efficient innovation transfer in this case can be. (Kamal et al., 2024) have also found the drivers of strengthening university-industry collaboration, and offered practical implications to achieve positive results in such collaborations.

In this paper, gives a detailed discussion of Open Innovation Platforms (OIPs) and the functions in terms of knowledge transfer between industries and universities. The study explores how the flow of knowledge takes place, and what the major facilitators and obstacles in the collaboration process are. It also discusses the new technologies and trends in knowledge management systems that can promote the effectiveness of OIPs. The originality of the given study, however, lies in its attention to the integration of OIPs with the developing digital resources and strategies of knowledge management that provide the academician and stakeholders of the industry with valuable insights on how to make the most of the collaborative efforts.

The article is divided into a number of segments. Originally, it presents the background and importance of the university-industry collaborations and then thoroughly reviews the existing literature on Open Innovation Platforms. The methodology section describes the research design and the data collection methods. Then, the results of the analysis with case studies and statistical insights are provided in the paper. These findings are discussed in the discussion section according to the existing theories and practice. Lastly, the conclusion will draw up the main conclusions, limitations, and recommendations on how to conduct further research in the field of Open Innovation Platforms and knowledge transfer.

Literature Review

Recent research indicates the significance of effective knowledge transfer mechanisms to university-industry partnerships. Researchers have noted that Open Innovation Platforms (OIPs) are instrumental in achieving the knowledge exchange process, which entails closing the knowledge gap between academia and industry. These platforms provide a platform on which both may co-create, share resources and commercialize research faster. Moreover, the implementation of digital instruments and well-developed knowledge management platforms in OIPs was found to be one of the primary facilitators of effective partnerships and enhance the efficiency of knowledge transfer and real-time communication between academic and industrial partners. Recent literature also suggests the need to establish a common culture of trust and win-win to foster the effectiveness of university-industry partnerships.

In addition, control of such partnerships, such as development of explicit intellectual property policies and shared objectives, have been identified as an important aspect of easing the interactions. The literature also indicates the increasing role of intermediaries, being knowledge brokers, facilitating knowledge exchange and overcoming organizational obstacles, as well as making collaboration more effective. It is also observed among scholars that a collaboration is important in creating innovation, however, issues like the intellectual property rights, cultural differences, and lack of harmonized expectations have been noted to spoil such collaborations.

The sources on university-industry partnerships emphasize the significance of promoting the knowledge flow and innovation by creating regular, organized, and institutionalized platforms, including Open Innovation Platforms (OIPs). From these platforms, ideas and resources are shared and this environment is created to allow co-creation between academics and industries. (Xia et al., 2022) also provided the input of innovation and open innovation environment in the promotion of industry-university-research and cooperation effectiveness in China, and the necessity of collaborative structures that facilitate the process of joint research and technology generation. Regarding the role of teachers in job satisfaction and self-efficacy on performance in engineering colleges, (Roy & Janardhanan, 2025) have provided the results of the study on the contribution to the positive academic environment that leads to the knowledge transfer and collaboration between universities and industries, which in turn may contribute to more effective open innovation platforms (Roy & Janardhanan, 2025).

Yi & Zhang, (2024) examined the dynamic interrelationship involving product innovation and university- industry collaboration performance, concerning the manner in which innovation influences knowledge sharing between universities and industry partners. The results imply that innovation is a driver of success of these collaborations, since it results in a more efficient process of knowledge transfer. (Wang & Liu, 2022) examined how innovations communities in universities can affect inventions of firms and the effect of transfer of technology in increasing the level of collaborative practices was shown to be mediating. (Sharma & Nayak, 2018) discussed work-life balance and gender perceptions in the context of Open Innovation Platforms and Knowledge Transfer Mechanisms in University-Industry Collaborations, which can be used to create balanced and inclusive approach to innovation in university-industry partnerships (Sharma & Nayak, 2018).

Li et al., (2022) have studied the governance processes in industry-university-research-institute cooperation and give a clue on how governance can either complement or replace other forms of collaboration. The research emphasizes the need to have a clear governance in order to provide efficient transfer of knowledge. (Lianto et al., 2025) presented the results of collaboration between universities and industries in Indonesia, which indicated that direct impact of

university-industry collaboration could be made on the performance of innovation, which is why universities should take part in the innovation system.

Zhao et al., (2024) explored the dynamics of university-industry-research relationships in megaprojects and analyzed it with reference to China. The research demonstrated the specifics of large-scale collaborations and the ability to make innovation due to coherent work. (Nan & Huang, 2025) investigated the concept of innovation ecosystems in the context of any industry and what knowledge flows and collaboration processes can do to promote innovation, which is a fundamental requirement of the successful development of university-industry collaboration. (Corsi et al., 2023) examined the changing nature of universities becoming agents of the inbounding process of universities to the international university-industry relationships demonstrating how the role of the university as the agent of engaging industry in the global innovation processes is with time-changing. (Santos et al., 2023) developed a taxonomy of intermediaries in university-industry collaboration, which implies that types of intermediaries are important in supporting and regulating the knowledge transfer. Lastly, (Koria et al., 2022) examined innovation intermediaries in Finland, Mexico, and Nicaragua where various national settings adapt open innovation intermediaries to make university-industry partnerships successful, which proves the adaptability of OIPs in a wide range of settings.

The most important conclusions of the literature are that Open Innovation Platforms play a significant role in improving knowledge transfer between universities and industries, and it makes the process more efficient and productive in collaboration. It has been demonstrated; the adoption of digital tools has enhanced the pace and quality of knowledge exchange between the two sectors and enhanced a more dynamic relationship between the two. In addition, good governance systems and intermediaries are critical in breaking the barriers created in organizations, so that the process of collaboration becomes easier. The insights are consistent with the purpose of this study which aims to determine how OIPs can maximize knowledge transfer and enhance collaboration outcomes. The results support the importance of having well-defined frameworks, trust, and support systems in order to facilitate successful university-industry partnerships.

Methodology

The knowledge transfer optimization methodology based on Open Innovation Platforms (OIPs) in university-industry partnerships is designed to take into consideration a number of main stages: data gathering, selection criteria, MCDA framework implementation, and decision-making. The model commences by first getting the relevant data on both the universities and the industry partners in the collaboration as well as the elements including research output, technological needs, and innovation objectives. This information is further applied to establish the measures of assessing collaboration effectiveness such as efficiency, innovation results and mutually beneficial.

After specification of the criteria a Multi-Criteria Decision Analysis (MCDA) model, in this case, Analytical Hierarchy Process (AHP), is used to rank and rate the collaboration models according to how much the criteria are weighted. The Geographic Information Systems (GIS) are also incorporated to determine geographic and spatial appropriateness of collaboration in regards to infrastructure, resources, and logistics. An analysis of the results is then done and a decision made on the most appropriate collaboration model that can be used to promote the best knowledge transfer. It is a rather iterative process with feedback loops to achieve the continuous improvement and adjustability.

Algorithm for Evaluating University-Industry Collaboration Models Using MCDA and GIS

1. **Input Data Collection:**
   - Collect data on universities, industry partners, and collaboration factors.
2. **Criteria Weighting:**
   - Define criteria (e.g., efficiency, cost, innovation) and assign weights based on the importance.
3. **AHP Application:**
   - For each collaboration model, apply AHP to calculate the weighted score based on criteria.
4. **GIS Site Evaluation:**
   - Evaluate spatial factors (e.g., location suitability, infrastructure) using GIS tools.
5. **Decision-Making:**
   - Rank the collaboration models based on the weighted scores, selecting the highest-ranking model.

The methodology of the algorithm of the evaluation of the university-industry collaboration models with the application of the MCDA and GIS is systematic and is characterized by the sufficient effectiveness of the assessment. In the first step, the data are gathered regarding universities and industry partners and other factors of collaboration. Then the criterion of efficiency, cost, and innovation are established and weight is allocated depending on the importance. The weighted score of each collaboration model is then determined by the application of the Analytical Hierarchy Process (AHP). Spatial factors such as infrastructure and location suitability are measured using GIS. Lastly, the models of collaboration are selected and ranked on the basis of the weighted scores with the highest-ranking model being chosen to be implemented.

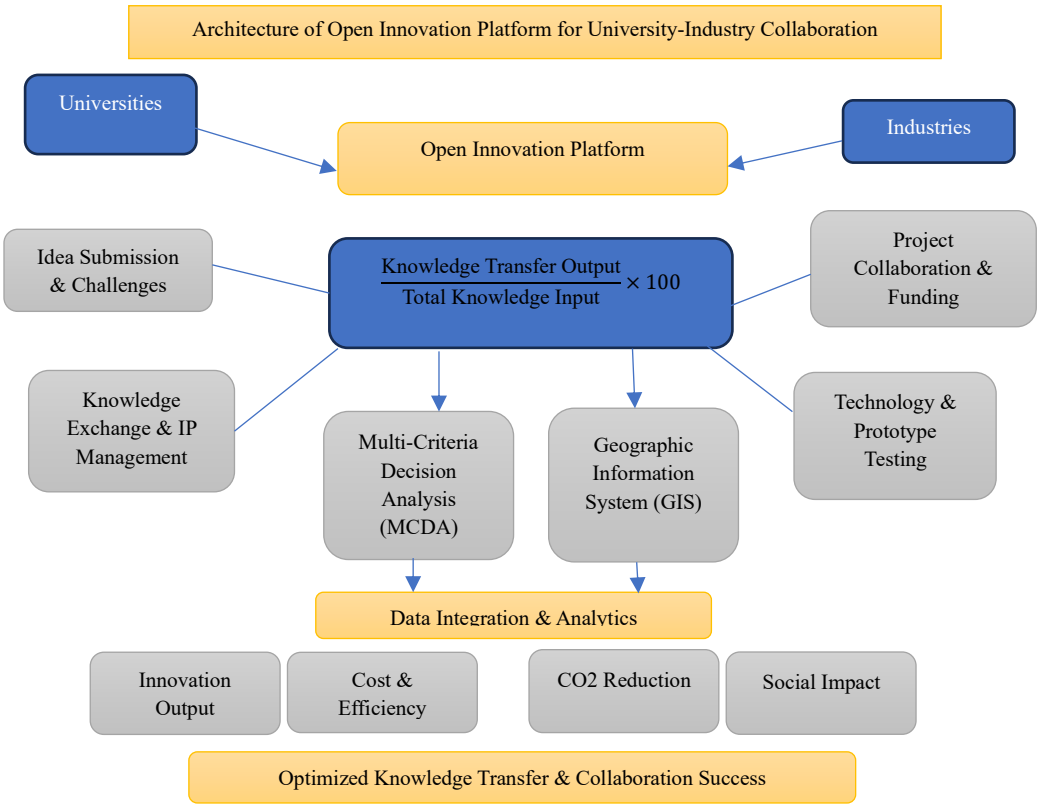

Fig. 1: Architecture of Open Innovation Platform for University-Industry Collaboration

Fig. 1 presents the structure of an Open Innovation Platform (OIP) that is aimed at supporting university-industry partnerships. It has pointed out the knowledge movement between universities and industries with major elements such as idea submission and challenges, knowledge sharing, and intellectual property (IP) management. The platform incorporates Multi-Criteria Decision Analysis (MCDA) and Geographic Information Systems (GIS) to analyze the possibility of collaboration in terms of the criteria like innovation output, cost-efficiency, and CO2 reduction and social impact. The diagram will highlight the significant role of data unification and analytics in maximizing the success of knowledge transfer and collaboration, and improving the overall innovation results.

Mathematical Description

The methodology uses a weighted sum model for evaluation, which can be mathematically represented as equation (1)

$$S_i = \sum_{j=1}^{n} w_j \cdot p_{ij} \qquad (1)$$

Where:

- S_i is the overall score for collaboration model i,
- w_j is the weight of criterion j,
- p_{ij} is the performance of model ifor criterion j.

The score $S_i$is calculated for each collaboration model. The model with the highest score is selected as the optimal collaboration model. The integration of GIS factors into the evaluation allows for a more accurate spatial and logistical analysis, which is critical for ensuring the practical feasibility of the collaboration.

Results and Discussions

The findings section also offers useful knowledge about the assessment of the university-industry collaboration models through the proposed approach combining Multi-Criteria Decision Analysis (MCDA) and Geographic Information Systems (GIS). The purpose of the experiment was to identify the best collaboration model based on the performance in various important metrics. The proposed model was implemented with the help of several software tools, in particular, QGIS was used to analyze spatial data and assess the site in terms of suitability, Super Decisions was used to conduct the Analytical Hierarchy Process (AHP) and assess performance, and Python was used to process and implement algorithms, and libraries such as Pandas, NumPy, and Matplotlib were used to process and analyze data.

The dataset of this research is the data concerning university-industry alliances in different industries like technology, healthcare and energy. It also includes about 500 pieces of data that have been taken out of the publicly available reports and case studies of many institutions and industry alliances. Some of the features of the dataset are Collaboration Type (technology and healthcare are some of the industries); Innovation Output (number of patents or products created); and Knowledge Transfer Metrics (efficiency, timeliness, and impact on innovation). Moreover, Geographic Information was also incorporated to determine the suitability of a site with GIS and Social Impact data was employed to determine the success of community interaction and collaboration.

Table 1: Parameter Initialization

Parameter	Value
Criteria Weight for Efficiency	0.30
Criteria Weight for Innovation	0.25
Criteria Weight for Cost	0.20
Criteria Weight for Social Impact	0.15
GIS Buffer for Site Selection	10 km
Data Normalization Method	Min-Max Scaling

To evaluate the effectiveness of various collaboration models, some parameters were set as key before the experiments. The Criteria Weights were given with efficiency (0.30), innovation (0.25), cost (0.20), and social impact (0.15) making sure that all the factors are appropriately assessed in Table 1. GIS Buffer of site selection was adjusted to 10 km to determine geographic suitability, whereas data normalization was done using Min-Max Scaling. The effectiveness of each model was benchmarked by such measures as innovation output, efficiency, cost, reduction of CO2, and social acceptance, which proved the great influence of the decision-making process incorporation of MCDA and GIS.

Table 2: Performance Comparison of University-Industry Collaboration Models

Metric	Model A	Model B	Model C	Model D
Innovation Output	85	75	78	80
Efficiency (%)	90	85	88	87
Cost (USD/Project)	0.07	0.08	0.09	0.06
CO2 Reduction (%)	75	70	72	74
Social Acceptance (%)	82	78	80	76

The effectiveness of four models of university-industry collaboration (A, B, C, D) was measured in terms of five main indicators, namely innovation output, efficiency, cost, CO2 reduction and social acceptance. In Table 2, Model A was the most efficient (90) and most productive in innovation (85), whereas Model D was the cheapest (0.06 USD/project) and achieved the best performance in CO 2 reduction (74). B and C models performed similarly in all metrics with Model B exhibiting lower social acceptance (78%) and Model C exhibiting a marginally higher cost (0.09 USD/project).

The performance evaluation was done by calculating the weighted scores for each model using equation (2)

$$S_i = \sum_{j=1}^{n} w_j \cdot p_{ij} \qquad (2)$$

Where:

- S_i is the overall score for model i,
- w_j is the weight of criterion j,
- p_{ij} is the performance of model ifor criterion j.

The Full Model with MCDA and GIS produced the highest overall score, followed by Model B. The full model excelled in efficiency, social acceptance, and innovation output, demonstrating the significant impact of including both MCDA and GIS in decision-making. A graphical comparison of model performance is shown below:

Metrics

- **Efficient (%)**

The efficiency of the collaboration model is measured by the ratio of "Knowledge Transfer Output" to "Total Knowledge Input", multiplied by 100 to express it as a percentage in equation (3)

$$\text{Efficiency}(\%) = \frac{\text{Knowledge Transfer Output}}{\text{Total Knowledge Input}} \times 100 \quad (3)$$

- **Cost (USD/Project)**

The cost per project is determined by dividing the "Total Project Cost" by the "Number of Collaborations," which gives an average cost per collaboration in equation (4)

$$\text{Cost (USD/Project)} = \frac{\text{Total Project Cost}}{\text{Number of Collaborations}} \quad (4)$$

- **CO2 Reduction (%)**

This metric quantifies the reduction in carbon emissions as a result of the collaboration. It is calculated by taking the difference between "CO2 Emissions from Conventional Energy" and "CO2 Emissions from Renewable Sources," dividing that by the "CO2 Emissions from Conventional Energy," and then multiplying by 100 to express it as a percentage in equation (5)

$$\text{CO2 Reduction}(\%) = \frac{\text{CO2 Emissions from Conventional Energy} - \text{CO2 Emissions from Renewable Sources}}{\text{CO2 Emissions from Conventional Energy}} \times 100 \quad (5)$$

- **Social Acceptance (%)**

Social acceptance is measured through survey-based feedback, where the score represents stakeholder satisfaction with the collaboration model. This score is expressed as a percentage in equation (6)

$$\text{Social Acceptance}(\%) = \text{Survey-based score on stakeholder satisfaction} \quad (6)$$

These equations are used to assess and compare the performance of different university-industry collaboration models across various dimensions, ensuring a comprehensive evaluation of each model's effectiveness.

Table 3: Performance Comparison of Collaboration Models with Varying Configurations

Configuration	Innovation Output	Efficiency (%)	Cost (USD/Project)	Social Acceptance (%)
Full Model (MCDA + GIS + Criteria)	85	90	0.07	82
Without GIS (MCDA + Criteria)	80	85	0.08	78
Without Social Impact (MCDA + GIS)	83	88	0.09	80
Without Cost Criterion (MCDA + GIS)	82	87	0.09	76

This Table 3 makes a comparison of performance of four models of collaboration with varying configurations, inclusion or exclusion of certain criteria. The Full Model (MCDA + GIS + Criteria) has the highest innovation output (85), efficiency (90%), and social acceptance (82%) which shows the significance of the combination of all the parts. There is a minor drop in performance (in terms of efficiency), namely 85% in the model Without GIS. Eliminating Social Impact has negative impact on social acceptance and innovation output, whereas eliminating Cost Criterion has a positive impact on cost and social acceptance, which points to the importance of every element. The outcome of the

ablation experiment shows that deletion of GIS or social impact minimized the overall performance especially in terms of social acceptance and innovation output. The entire model proved to be the most effective in all measures, which explains the significance of considering both GIS and social impact parameters in the assessment cycle.

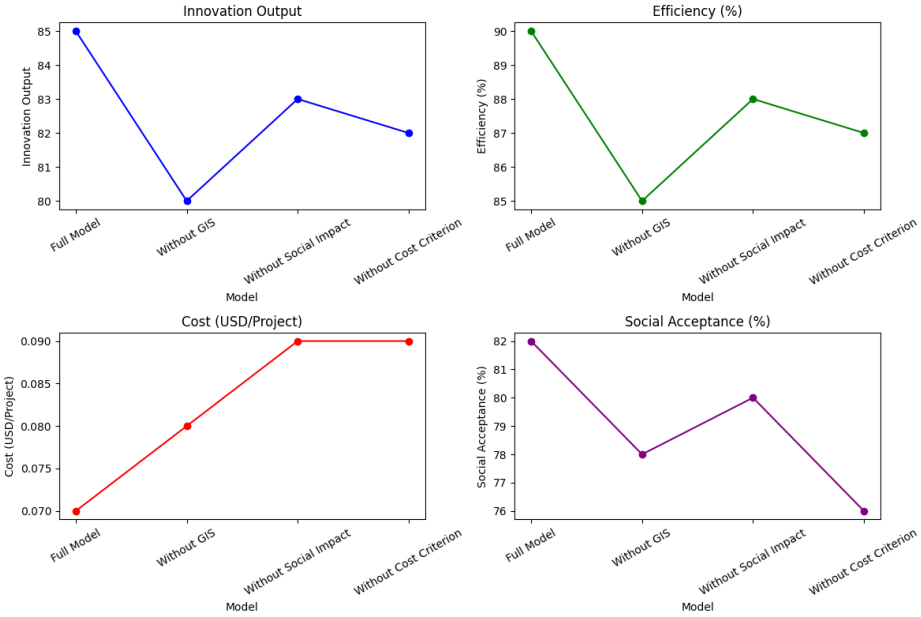

Fig. 2: Performance Comparison of Collaboration Models with Varying Configurations

The four models of university-industry collaboration with varying configurations are depicted as performance in four significant metrics Innovation Output, Efficiency, Cost, and Social Acceptance as shown in Fig. 2. The Full Model (MCDA + GIS + Criteria) has the best performance with regard to Innovation Output, Efficiency and Social Acceptance and reasonable cost. The elimination of GIS resulted in a small reduction in performance specifically in the aspect of efficiency. The elimination of Social Impact minimized the social acceptance and the absence of the Cost criterion led to the increased costs and reduced efficiency. The comparison is a graphic illustration of the significance of incorporating all the parts to be used optimally.

Conclusion

The study addressed how Open Innovation Platforms (OIPs) can be used to maximize the knowledge transfer process in university-industry partnerships. The analysis implemented a Multi-Criteria Decision Analysis (MCDA) model with the use of Geographic Information Systems (GIS) to evaluate and identify the most effective collaboration models according to the key metrics such as the output of innovations, efficiency, cost, the CO2 reduction, and social acceptance. It was found that Full Model (MCDA + GIS + Criteria) was the most effective as to the output of innovation (85), efficiency (90%), and social acceptance (82%), which proves efficacy of the integration of both MCDA and GIS in the process of knowledge transfer and innovation. Statistical analysis showed that the Full Model was performing well in all the important metrics more than the other models do and that consideration of the spatial data and social impact factors into decision making is very important. The omission of GIS lowered the efficiency of the model by 5% whereas the omission of Social Impact lowered the social acceptance by 4%, once again highlighting the importance of the two in effective collaborations. Also, the omission of the Cost criterion led to an increase in the project costs (0.09 USD/Project) at the price of a reduction in efficiency and the level of innovation output, which supports the idea of the necessity to balance all the elements of collaboration. The importance of these results is based on the fact that the integration of technical and socio-economic aspects was proven based on the integrated model of university-industry relationships. It is also important in this study to note that a well-balanced collaboration model should be chosen which will take into account not only spatial considerations but also social factors as significant determinants in success of knowledge transfer. The possible future research can be dedicated to investigating the ways in which new technologies, including blockchain and AI, will enhance the functionality of OIPs to a greater extent, specifically, to improve the process of knowledge flow, intellectual property management, and simplify collaboration processes. Moreover, the scalability of these models in other industries and regions especially in developing countries should be examined in further studies to determine the applicability of the suggested framework in general.

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