

Collaborative Synergy: Leveraging Competitive Advantage In University-Industry Innovation

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ABSTRACT

Collaboration between universities and industry is a strategic collaboration that aims to connect the world of education with the world of industry, creating concussion benefits for both. Universities improve curriculum relevance, prepare work-ready graduates, and pursue innovation. Industry can access young talent, face challenges with new thinking, and contribute to the development of science and technology. Through this collaboration, lecturers and students are involved in research and industrial work practices, develop professional skills, and get direct feedback. This collaboration also enhances the transfer of knowledge and technology, with universities disseminating knowledge through research to industry and industry applying it to business innovation. Despite the challenges of different interests, cultures, and timelines, the benefits of collaboration can positively impact both parties and society to increase innovation and competitive advantage.

KEYWORDS: University and Industry Collaboration, Knowledge Transfer, Innovation, Competitive Advantage

INTRODUCTION

In today's competitive environment, universities must achieve high performance, lead innovative academic processes, and meet the demands of students and graduate users. To achieve open innovation, both universities and industries may currently lack the necessary skills. Therefore, the most effective approach to meet the requirements is through collaboration. This collaborative effort yields numerous benefits, including cost reduction, access to multidisciplinary expertise, enhanced reputation for all partners, and specialized knowledge sharing (Draghici et al., 2015). Consequently, such collaborations result in a series of advantages that positively impact open innovation and overall competitiveness. University-industry partnerships are increasingly gaining attention due to their potential to foster a high rate of innovation (Guan & Zhao, 2013).

The importance of this collaboration, considering that the task of higher education today is not only the Tri Dharma of Higher Education, because it cannot excel if it is only "teaching-oriented." Commitment to improving the quality of education is not yet sufficient due to the obsession to become only a research university, not learning. In contrast to Education 4.0, its existence is due to the Industrial Revolution 4.0, known as innovative learning characterized by "student-centered." This concept demands new knowledge and skills, which is the vision of the future of Indonesian education. This approach develops knowledgeable graduates and has a new mindset that can respond to change challenges and increase innovation in various aspects (Tan et al., 2018).

Minister of Education and Culture, Nadiem Makarim, prioritizes the practical application of knowledge rather than mere theoretical understanding. To achieve this, he introduced the independent campus program, including learning through university-industry collaboration, as outlined in PERMENDIKBUD No.3 of 2020. Universities play a crucial role in supplying skills and fostering innovation for businesses. However, this collaboration is not a simple transaction; it is multidimensional, sustainable, and focused on producing high-quality and long-lasting outcomes. According to (Wilson, 2012), the attribute of durable and impactful partnerships between universities and industries can only be achieved through their strong collaboration.

Anatan, (2011), in his study in South Korea, found that educational investment policies became a source of economic strength, which made South Korea the 6th largest exporting country in the world. Its economic strength is supported by industrial competitiveness, which cannot be separated from the important role of government policy in integrating the education and industrial sectors through the integration of research and cooperation in all fields, especially in developing industrial technology capabilities. The scientists involved in the collaboration must be able to transfer knowledge and highly commit to the collaboration.

Paulin & Suneson, (2011) defines knowledge transfer at the individual level: "how the knowledge acquired is applied in one situation (or fails to apply) to another situation. The problem of knowledge transfer within organizations goes beyond the individual level and includes transfer to higher levels of analysis. There are four categories of knowledge transfer from university to industry or vice versa, namely: focus on company issues (resource allocation and partnerships); focus on strategic issues (licenses, incentives for patents produced, and intellectual property policies); focus on geographical issues (localized spillover of university-industry relations and their influence on the success of knowledge transfer); focus on knowledge transfer channels (publications, patents, and consulting) (Agrawal, 2001).

University-industry collaboration is a form of interaction between higher education institutions and industry to facilitate the exchange of knowledge and technology (Ankrah & AL-Tabbaa, 2015) (Franco & Haase, 2015). This collaboration offers many benefits to both the company and the industry. Companies can access expertise and knowledge they do not have, reduce costs, enable a multidisciplinary approach, increase the reputation of collaborators, and provide access to specialized expertise in certain fields (Ivascu et al., 2016). In terms of open innovation, UIC attracts wide attention because it can increase innovation and economic growth.

This study identifies UIC understanding by conducting a systematic review of motivation, formation, activities, support and constraints, and university-industry collaboration and synthesizing the findings to develop a conceptual framework model for UIC that can guide universities and partners in implementing UIC more effectively.

LITERATUR REVIEW

Definition of UIC

UIC is regarded as a scientific partnership involving the cooperative efforts of two or more scientists to facilitate the development, completion, and dissemination of knowledge (Sonnenwald, 2007). When implementing modern management practices, a shared vision and mission, along with effective program management and development, are essential for institutions to synergistically work together. Each partnering institution must take on a primary role in ensuring the success of the collaborative program. Scientists engaged in this collaboration must bring additional expertise and demonstrate a strong commitment to the partnership (Gulbrandsen & Thune, 2010).

This collaboration thrives on the strengths and weaknesses of each institution, creating a spirit of cooperation based on sharing knowledge for complementarity, mutual growth, and mutual benefits (mutualism). The principle of understanding among partners is crucial and must be upheld throughout the implementation process. It includes the principles of active participation, effective cooperation, transparent communication, and adherence to legal aspects such as rights, obligations, rewards, and penalties (Healy et al., 2014).

Sustainability is also a fundamental principle in university-industry collaboration, ensuring the continuity and long-term success of the partnership. By abiding by these principles, universities and industries can foster a productive and harmonious relationship, fostering innovation, advancing research, and ultimately benefiting society as a whole.

Organizational culture differences exist between industry-university partners due to the utilization of industry knowledge for product and service development. However, knowledge

transfer, including intellectual property, may not be a central focus in these collaborations (Banal-Estañol & Macho-Stadler, 2010).

Table 1: Differences in organizational culture in universities and industry

No	University	Industry
1	Public mission	Shareholder values
2	Publication	Income
3	Research	Practical research
4	Develop theoretically	Yield driver
5	Sharing resources	Pivot resource
6	Results sharing	Generate returns
7	Creating knowledge	Capture knowledge
8	Openness	Private resource
9	Requires investigation	Market needs
10	Education	Retain know-how

According to (Draghici et al., 2015), successful university-industry collaboration for open innovation relies on six key factors:

1. Efficient research project support structure within the university.
2. Effective project management with strong communication and oversight.
3. Developing a generation of young researchers who have a deep understanding of the economic landscape and are able to face future challenges.
4. Build new partnership relationships and support existing projects to pursue emerging opportunities.
5. Encouraging the creation of a culture of openness within the organization, so that it can establish close cooperation with industry and create mutually beneficial synergies.

Implementation of University and Industry Collaboration

Universities and industry are two institutions or institutions that operate in different fields and have other goals and visions. Healthy collaboration generates benefits for both parties and also national economic growth. However, there are many challenges for universities, namely how to transfer knowledge and expertise for graduates to be applied in the industrial world so that they can make a real contribution to the development of the industrial world which will automatically have an impact on national economic growth (Mattoon, 2006). To achieve this goal, the university and industry gap in the knowledge transfer process is a solution through university and industry collaboration.

Through university and industry collaboration. It is hoped that both parties can invest in developing research capabilities focused on research areas to find the best solution to the problems. The thing to think about is how to build a knowledge-based industry. The university as higher education can provide an increase in the knowledge-based economy through mutually beneficial cooperation with industry, and the impact is also expected to be felt by the community through small and medium-scale enterprises.

In general, these companies do not have adequate research and development units because there is an opinion that these activities are costly. To develop these industries, the active role of the university is needed. The comparative advantage of the industry must also be considered, and industrial development must be able to absorb a large number of workers.

METHODE

The research uses a Research and Development (R&D) approach to produce products and test product effectiveness. However, the ten steps in R&D (Gall et al., 1996) are summarized into three

main steps: preliminary study, development, and validation. The initial stage is conducted through qualitative research to obtain data to develop a factual and university-industry collaboration model to answer the challenges of competitive advantage innovation. Sampling technique through purposive-sampling. namely: SWCU-Salatiga, Unika-Sugiyapranata, Unissula-Semarang, Udinus-Semarang, UMS-Surakarta, Unisbank-Semarang. In this technique, the researcher collects data from parties who know the real conditions of university-industry collaboration management. Data collection techniques used interviews, documentation and FGD, as well as questionnaires and documents. For data analysis using descriptive analysis and test the effectiveness of the model.

The development stage aims to bring a hypothetical model as a development model based on the weaknesses of the factual model after improvements have been made. The final university-industry collaboration model is carried out through Delphi validation, which is validation carried out by experts and practitioners to validate the model. The three steps of developing the model can be briefly described in the following table 2:

Table 2. Steps for Developing a University-Industry Collaboration Model

Stage	Data source	Data collection technique	Data Analysis	Model-Outcome
Research	Foundation; Higher Education; Leaders; Lecturer; Industry leader.	<ul style="list-style-type: none"> • Field Study • Interview • Questionnaire • Documentation 	Descriptive Inferential	Fakcal
Develop-ment	The prototype model is in the form of a model guideline for University-Industry Collaboration	<ul style="list-style-type: none"> • Need Assessment, • FGD • Delphi validation limited test: 	descriptive Descriptive	Hypothetical Model
Validation test	<ul style="list-style-type: none"> • Education Specialist • Industrial Practitioners 	<ul style="list-style-type: none"> • FGDs • Questionnaire 	Quantitative	Final Model

RESULT AND DISCUSSION

The interviewees' responses to university-industry collaboration yielded some interesting findings. Here are some key findings from the industry:

1. **Benefits for the Industry:**
Industry sources generally view collaboration with universities as an opportunity to access academic resources and young talent. They recognize that collaboration allows them to gain new knowledge and skills that can help increase innovation, competitiveness and operational efficiency of the company.
2. **Quality Improvement of Research and Innovation:**
Industry sources often welcome collaboration with universities as this can improve the quality of research and innovation in their companies. This collaboration brings a stronger scientific and academic approach, helping to identify real-world relevant problems and find solutions that are more academically tested.
3. **Appropriateness of the Education Curriculum:**
In university-industry collaboration, resource persons from industry also have the opportunity to provide input on the suitability of the education curriculum to the needs of the world of work. They can convey the skills expected of graduates and assist universities in adapting curricula to produce graduates that are more suited to industry needs.
4. **Administrative and Cultural Challenges:**

5. While collaboration is considered beneficial, there are administrative and cultural challenges that need to be overcome. Industry may have different needs and goals than academia, and finding a mutually beneficial understanding can be challenging.
6. **Student Engagement:**
Students involved in collaborative projects often evaluate the experience as valuable and enriching. They get the opportunity to approach the world of work and learn from industry practitioners directly, enhancing the quality of their learning.
7. **Impact on Society:**
Resource persons may see this collaboration as a way to contribute to society and provide solutions to certain social or environmental challenges. By combining expertise and resources, these collaborations can have a greater impact on society as a whole.
8. **Need External Support:**
The resource person identified a need for external support, such as support from the government, donor agencies or industry associations. This support can facilitate collaboration by providing additional resources and overcoming administrative barriers.

Insights from interviews with industry leaders highlight various aspects of university-industry collaboration. While recognizing the challenges, industry leaders highlighted valuable benefits and emphasized the importance of talent acquisition, managing administrative elements, and building lasting partnerships to foster impactful collaborations with academia. The university's response to university-industry cooperation resulted in several relevant findings:

1. **Increasing Curriculum Relevance:**
The higher education institution welcomes collaboration with industry because this helps increase the relevance of the education curriculum. They recognize that working with industry helps ensure that the material taught is more in line with the needs and latest developments in the world of work.
2. **Access to Resources and Technology:**
Colleges see collaboration with industry as an opportunity to gain access to resources and technology that may not be available on campus. This collaboration opens opportunities to access industrial facilities, data, and state-of-the-art equipment that enhances research and teaching capabilities.
3. **Research Opportunities and Joint Projects:**
Collaboration with industry provides universities with the opportunity to engage in joint research projects that focus on real problems in the industrial world. This gives lecturers and students the opportunity to apply their academic knowledge in a practical context and contribute to innovative solutions.
4. **Improved Academic Profile:**
Through university-industry collaboration, universities can increase their academic profile. This collaboration enhances the university's reputation and image as an institution that is open to collaboration and real-world oriented.
5. **Internship and Career Opportunities:**
University sources saw this collaboration as a way to open internship and career opportunities for students. Through industry connections, students can gain valuable work experience and enhance their career prospects after graduation.
6. **Challenges of Academic Independence:**

While beneficial, collaboration with industry can lead to challenges regarding academic independence. Universities must ensure that the association does not compromise its core goals as educational and research institutions.

7. **The Importance of Sustainable Partnerships:**
College leaders highlight the importance of ongoing partnerships with industry. Long-lasting collaborations allow universities to understand industry needs and expectations better to create more significant benefits in the long term.
8. **External and Financial Support:**
Universities recognize that external and financial support is critical in facilitating university-industry collaboration. Support from government, donor agencies, or industry associations can help overcome financial and administrative constraints on collaboration.

Interviews with university leaders shed light on the multifaceted nature of university-industry collaboration. While recognizing the challenges of cooperation, university leaders acknowledged the great benefits of successful partnerships, emphasizing the importance of effective communication, trust building, and sustainable strategies for long-term partnerships. Lecturer responses vary depending on experience, views, and individual understanding. The following are responses related to university and industry collaboration:

1. **Recognition of the Importance of Collaboration:**
Lecturers positively welcome the collaboration between universities and industry. They can recognize that this collaboration is important to overcome the gap between theory and practice in the real world; besides, such collaboration can benefit students in better understanding of the challenges in the industry.
2. **Recognition of Challenges in Collaboration:**
Some lecturers realize that collaboration between universities and industry has its challenges. For example, adjusting the curriculum to reflect industry needs or finding effective ways to integrate industrial projects into student learning.
3. **Expectation of a Positive Outcome:**
Lecturers hope that the collaboration will produce more relevant and applicable research and provide opportunities for students to be involved in real projects that improve the quality of graduates.
4. **Beware of Conflicts of Interest:**
Some lecturers are wary of potential conflicts of interest between universities and industry. They want to ensure that academic integrity is maintained and that industry does not influence research.
5. **Support for Collaboration Plans:**
Lecturers are also ready to support concrete collaboration initiatives, such as attending workshops, providing advice or support, or being actively involved in collaborative projects.
6. **Attention to Sustainability:**
The lecturer focuses on the continuation of this collaboration. They wanted to ensure that the collaboration was not just a temporary project but sustainable and had a long-term positive impact.
7. **Collaborative Experience:**
In addition to providing feedback, lecturers are interested in conducting further research on university-industry collaboration experiences. Research can help gain a deeper understanding of the challenges, benefits, and strategies that can be implemented to enhance future collaboration.

Findings from interviews with university lecturers reveal the complex nature of university-industry collaboration. Collaboration offers significant benefits, but some challenges must be

overcome to create stronger partnerships that drive innovation, knowledge exchange, and socioeconomic growth.

Company Connection with the Scientific Community

Literature on company characteristics that affect the ability to utilize scientific knowledge from outside, particularly from universities, has developed rapidly. Marco-lajara et al., (2018) explain the concept of absorptive capacity, which states that companies that invest in R&D can apply research at universities to their commercial advantage. (Bittencourt & Giglio, 2014) It adds that companies must connect with the open scientific community through publications and research collaborations to increase the absorption capacity of companies and emphasizes that company connectedness is a significant factor in creating absorptive capacity, of which R&D investment is only one component.

Many of the findings are related to the critical success factors for the effectiveness of university and industry collaboration, described in Table 3 below:

Table 3: Benefits of University and industry collaboration

Researchers	Description	Indicator
Iqbal et al., (2015)	The synergy between businesses and universities brings forth a powerful force for innovation, problem-solving, and sustainable growth. By embracing these five critical elements, collaborations can thrive, creating a profound impact on both academia and industry.	<ol style="list-style-type: none"> 1. Business-university collaboration involves curriculum design aligned with industry needs, Outreach to stakeholders for continuous improvement. 2. Graduates gain practical experience, making them desirable employees. 3. Student exchange programs provide a global perspective and cross-cultural skills. 4. Lifelong learning initiatives cater to upskilling. 5. Entrepreneurship education nurtures innovators with mentorship and practical insights, fostering a thriving entrepreneurial ecosystem.
Wilson, (2012)	Eight items of university and industry cooperation	<ol style="list-style-type: none"> 1. R&D Collaboration: Joint efforts driving innovation and solutions. 2. Academic Mobilization: Knowledge exchange for mutual growth. 3. Student Mobilization: Real-world experiences and networking for students. 4. Commercialization of Research Results: Transforming research into marketable solutions. 5. Curriculum Development: Industry-aligned academic programs. 6. Lifelong Learning: Continuous upskilling and growth. 7. Entrepreneurship: Fostering innovation and business ventures.
Ivascu et al., (2016)	An evaluation matrix for assessing university-industry collaboration strength.	<ol style="list-style-type: none"> 1. Knowledge sharing 2. Cultural alignment 3. Financial support 4. Communication
Banal-Estañol et al.,	Several things need to be implemented in university-industry collaboration.	<ol style="list-style-type: none"> 1. Curriculum management 2. Education personnel management

Researchers	Description	Indicator
(2015)		3. Efficient utilization of educational staff 4. Financial management and financing 5. Facilities and infrastructure management, including procurement and maintenance.

Knowledge Transfer and Intellectual Ownership from University to Industry

The transfer of knowledge and intellectual property from University to Industry is a significant concern because more and more universities are involved in research and research, which produces valuable findings that can potentially be applied commercially. Thus, the university's role as a source of innovation and technology transfer is increasingly relevant for advancing industry and society.

Research in this field covers many aspects, including intellectual property policies in universities, the licensing strategies used by universities, and the characteristics of the inventors who produced these findings. Several studies investigating the impact of discoveries resulting from government-funded research are driving research into how these policies affect university intellectual property management and the incentives for professors to commercialize their research (Banal-Estañol et al., 2015). Other studies (Kaloudis et al., 2019; Thomas, 2019) focus on the role of university technology licensing offices in writing license agreements involving equity rather than cash payments to further shift universities' interests to companies. In addition, research has also highlighted the importance of tacit knowledge transfer (Ankrah & AL-Tabbaa, 2015), which involves direct interaction between inventors and receiving companies to ensure successful commercialization in the early stages of invention.

Steps to Increase University Involvement in Collaboration

1. Higher Education Proactivity: Universities are more proactive in commercializing research results, formulating guidelines for steps to apply research findings to industrial interests in relevant contexts, and promoting higher education research findings; they also need to understand the business requirements. This action helps universities to align research goals with a more significant impact.
2. Collaborative Platform: Universities are facing problems regarding digital platforms. To overcome this problem, universities build discussion forums to explore relevant ideas and provide online media to connect people to share works and new ideas. However, concerns about people's willingness to share research ideas can be addressed by adopting strategies to encourage people to network, share and solve problems together.
3. Entrepreneurial skills to drive research adoption: Researchers build networks and promote research by hiring entrepreneurial people who aim to realize specific goals. In addition, universities need to engage and prepare academically qualified staff who understand analysis and its significance and who can speak it.
4. Postgraduate and Postdoctoral investment is carried out as a strategy to achieve goals by meeting the need for skills and alternative career paths to standard academic trials. Universities can also take advantage of the potential of academics about to retire. Internal collaboration is needed to explore and mature application-side research by increasing technology readiness.
5. Awareness of market demand for new products and services (Business): Members are familiar with the value of understanding that researchers have about something new and its contribution to its environmental life cycle. This will enhance engagement between researchers and industry.
6. Academics and researchers need to develop themselves through further education and training to increase their ability to think outside the boundaries through research and publication of their

findings and apply them in the real world. There is a need to create awareness among researchers regarding the correct applications for the industry to make an impact.

7. Enhancing the role of alumni: Collaborative members highlight important values the university carries and are very significant, primarily aimed at essential people and alumni. Therefore the university maintains relationships with influential people and alumni in such a way as always to be willing to share success with his alma mater.

UIC model development

The expected UIC model is a form of strategic partnership between the university and the industrial world that is mutually beneficial and sustainable. This model is designed to facilitate the exchange of knowledge, resources and expertise between the two parties to impact academia, research, and industry positively. Some of the key features of the expected university-industry collaboration model include:

8. Collaboration between universities and industry must be designed to have clear goals and create mutually beneficial benefits for both parties. Both parties must understand each other regarding the results to be achieved from the collaboration, including strengthening efforts in research, innovation, and product development and increasing the human resources of researchers.
9. Long-term and sustainable partnerships are essential, not just short-term projects. This collaboration model must encourage forming long-term relationships to maximise and sustain the results obtained over a more extended period.
10. In this collaboration, the main focus is the exchange of knowledge, skills and technology between universities and industry. Universities can provide academic and research resources, while industry contributes with industry insights and practical applications.
11. Joint innovation and research is a critical point in university-industry collaboration. Through this collaboration, the two parties jointly address challenges faced by industry and universities by developing innovative products, knowledge and exchange of knowledge & skills.
12. Explicit mechanisms for managing intellectual property from collaboration must be established transparently beneficial intellectual property rights management. This can build trust.
13. It is essential to have the involvement of third parties, such as governments or other non-profit organizations, as they can provide additional resources, help overcome industry barriers and challenges that promote sustainable development, and increase the positive impact of this collaboration.

With the expected university-industry collaboration model that fulfills the above characteristics, it is hoped that this collaboration can become a source of innovation, increase industrial competitiveness, and make significant contribution to the advancement of science and society.

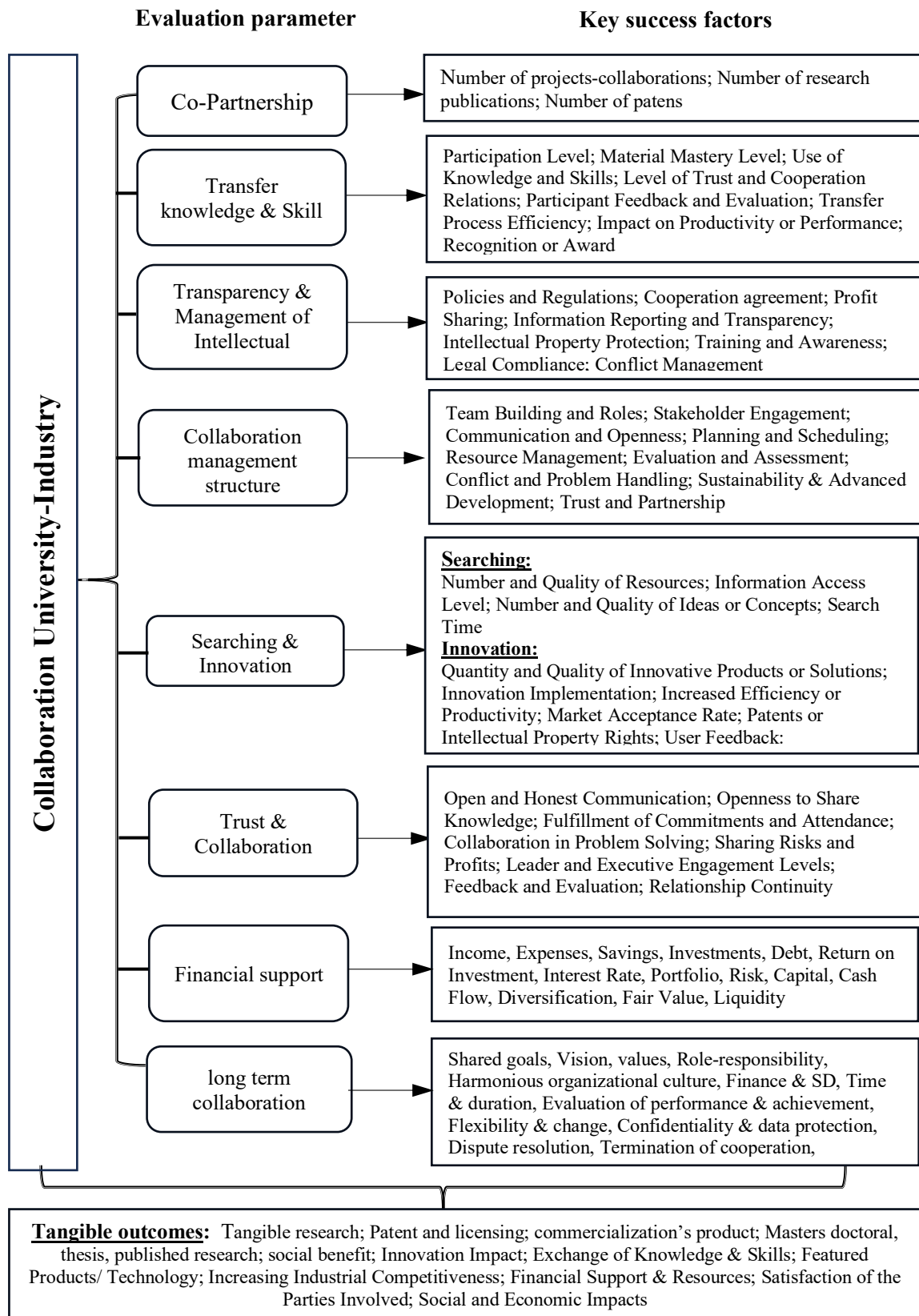


Figure 1: UIC Model

CONCLUSION

Collaboration between universities and industry is a strategic collaboration between higher education institutions and the industrial or business sector. The main goal is to connect the world of education with the world of work, thereby creating concussion benefits for both parties. Through this collaboration, universities can increase the relevance of the curriculum, prepare more job-ready graduates, and pursue impactful innovations. Meanwhile, the industry can access young talent, face complex challenges with new thinking, and contribute to the development of science and technology. In addition, university-industry collaboration opens doors for lecturers and students to be involved in research projects and practical work in industrial environments. This provides them with a valuable opportunity to combine theory with practice and develop the professional skills required in the world of work. Industry can also provide direct feedback to students, helping them to improve the quality and relevance of their skills continuously.

Collaboration between universities and industry can also enhance knowledge transfer and technology. Universities play a role in disseminating knowledge generated through research to drive, and the sector contributes to applying academic expertise to genuine innovations in the business world. Universities must be open to adapting to changing industry needs and create an environment that encourages innovation. On the other hand, the industry needs to invest in this partnership by providing students with financial support, facilities, and job opportunities. In conclusion, collaboration between universities and industry offers mutual benefits. Universities can increase the relevance of curricula and prepare more employable graduates, while industry can access young talent and contribute to technological innovation and development. Through this collaboration, the world of education and work are mutually integrated, creating a more relevant and holistic learning environment for students and increasing the industry's competitiveness. Challenges in collaboration between universities and industries include different interests, cultures, and timelines. However, when collaboration is successful, the benefits gained can positively impact both parties and society as a whole.

REFERENCE

- Agrawal, A. (2001). University-to-industry knowledge transfer: Literature review and unanswered questions. *International Journal of Management Reviews*, 3(4), 285–302. <https://doi.org/10.1111/1468-2370.00069>
- Anatan, L. (2011). Telaah Konseptual Transfer Pengetahuan Melalui Kolaborasi Universitas Dan Industri. *Universitas Kristen Maranatha Bandung*, 14(2), 67–81. https://www.neliti.com/id/publications/112537/kolaborasi-universitas_industri-tinjauan-konseptual-mekanisme-transfer-pengetahu
- Ankrah, S., & AL-Tabbaa, O. (2015). Universities-industry collaboration: A systematic review. *Scandinavian Journal of Management*, 31(3), 387–408. <https://doi.org/10.1016/j.scaman.2015.02.003>
- Baleeiro Passos, J., Valle Enrique, D., Costa Dutra, C., & Schwengber ten Caten, C. (2023). University industry collaboration process: a systematic review of literature. *International Journal of Innovation Science*, 15(3), 479–506. <https://doi.org/10.1108/IJIS-11-2021-0216>
- Banal-Estañol, A., Jofre-Bonet, M., & Lawson, C. (2015). The double-edged sword of industry collaboration: Evidence from engineering academics in the UK. *Research Policy*, 44(6), 1160–1175. <https://doi.org/10.1016/j.respol.2015.02.006>
- Banal-Estañol, A., & Macho-Stadler, I. (2010). Scientific and commercial incentives in R&D: Research versus development? *Journal of Economics and Management Strategy*, 19(1), 185–221. <https://doi.org/10.1111/j.1530-9134.2009.00250.x>

- Bittencourt, P. F., & Giglio, R. (2014). An empirical analysis of technology absorption capacity of the Brazilian industry. *CEPAL Review*, 2013(111), 175–190. <https://doi.org/10.18356/bb0c1382-en>
- Bruneel, J. (2009). *UNIVERSITY-INDUSTRY COLLABORATION Investigating the factors that diminish the barriers to university-industry collaboration*.
- Draghici, A., Baban, C.-F., Gogan, M.-L., & Ivascu, L.-V. (2015). A Knowledge Management Approach for The University-industry Collaboration in Open Innovation. *Procedia Economics and Finance*, 23(October 2014), 23–32. [https://doi.org/10.1016/s2212-5671\(15\)00377-9](https://doi.org/10.1016/s2212-5671(15)00377-9)
- Fernandez, R. (2015). *Collaboration between universities and business in the UK*. NCUB National Centre for Universities and Business. https://www.ncub.co.uk/index.php?option=com_docman&view=download&alias=335-state-of-the-relationship-may-2015&category_slug=reports&Itemid=2728
- Franco, M., & Haase, H. (2015). University-industry cooperation: Researchers' motivations and interaction channels. *Journal of Engineering and Technology Management - JET-M*, 36, 41–51. <https://doi.org/10.1016/j.jengtecman.2015.05.002>
- Gall, M. D., Borg, W. R., & Gall, J. P. (1996). *Educational research: An introduction*. psycnet.apa.org. <https://psycnet.apa.org/record/1996-97171-000>
- Guan, J., & Zhao, Q. (2013). The impact of university-industry collaboration networks on innovation in nanobiopharmaceuticals. *Technological Forecasting and Social Change*, 80(7), 1271–1286. <https://doi.org/10.1016/j.techfore.2012.11.013>
- Gulbrandsen, M., & Thune, T. (2010). University-Industry Collaboration: Towards a Dynamic Process Perspective The. *Summer Conference 2010 on Opening up Innovation: Strategy, Organization and Technology, January 2010*, 1–15. <https://www.researchgate.net/publication/228453292>
- Healy, A., Perkmann, M., Goddard, J., & Kempton, L. (2014). Measuring the impact of university-business cooperation (full report). *Publications Office of the European Union, Final Report*, 100. <http://bookshop.europa.eu>
- Iqbal, A. M., Khan, A. S., Bashir, F., & Senin, A. A. (2015). Evaluating national innovation system of Malaysia based on university-industry research collaboration: A system thinking approach. *Asian Social Science*, 11(13), 45–60. <https://doi.org/10.5539/ass.v11n13p45>
- Ivascu, L., Cirjaliu, B., & Draghici, A. (2016). Business Model for the University-industry Collaboration in Open Innovation. *Procedia Economics and Finance*, 39(November 2015), 674–678. [https://doi.org/10.1016/s2212-5671\(16\)30288-x](https://doi.org/10.1016/s2212-5671(16)30288-x)
- Kaloudis, A., Aspelund, A., Koch, P., Lauvås, T., Mathisen, M., Strand, Ø., Sørheim, R., & Aadland, T. (2019). *How Universities Contribute to Innovation: A Literature Review-based Analysis* (N. (Norwegian U. of S. and Technology) (ed.)). ntnu (Norwegian University of Science and Technology). https://www.ntnu.edu/documents/1272711283/1276140112/Rapport_How+universities+contribute+to+innovation_web.pdf/86b6a699-0499-820e-0f52-35a7b7101de5?t=1574848729613
- Marco-lajara, B., Claver-cortés, E., Úbeda-garcía, M., García-lillo, F., & Zaragoza-sáez, P. C. (2018). The role of internal knowledge generation and external knowledge acquisition in tourist districts. *Journal of Business Research*, December, 0–1. <https://doi.org/10.1016/j.jbusres.2018.12.045>
- Paulin, D., & Suneson, K. (2011). Knowledge transfer, knowledge sharing and knowledge

- barriers-three blurry terms in KM. *Proceedings of the European Conference on Knowledge Management, ECKM*, 2(January), 752–760.
- Sonnenwald, D. H. (2007). Scientific collaboration. *Annual Review of Information Science and Technology*, 41, 643–681. <https://doi.org/10.1002/aris.2007.1440410121>
- Tan, S. Y., Al-Jumeily, D., Mustafina, J., Hussain, A., Broderick, A., & Forsyth, H. (2018). Rethinking Our Education To Face the New Industry Era. *EDULEARN18 Proceedings*, 1(September), 6562–6571. <https://doi.org/10.21125/edulearn.2018.1564>
- Thomas, B. (2019). University-Industry Collaboration and Regional Innovation Systems in East Asia : An Overview. *International Journal of Research in Business Studies and Management*, 6(12), 1–19.
- Wilson, T. (2012). A Review of Business–University Collaboration. *Christopher Millward Higher Education Funding Council for England, February 2012*.