

COLLABORATIVE EFFORTS IN SCIENCE AND TECHNOLOGY WITHIN HIGHER EDUCATION INSTITUTIONS INSIGHTS AND REFLECTIONS

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Submitted: 24-01-2024, Revised: 01-02-2024, Accepted: 13-04-2024

ABSTRACT

In today's era of extensive international integration, collaboration in the realm of education and science and technology is undeniably essential within higher education establishments. Specifically, both bilateral and multilateral cooperative efforts in science and technology are being increasingly highlighted and encouraged in various forms. This article delves into the landscape of scientific and technological collaboration within higher education institutions, exploring the frameworks, experiences, and lessons learned from various perspectives. The development of science and technology stands as a cornerstone in the global integration agenda, with nations around the world emphasizing the importance of diversified and multilateral cooperation. Vietnam, in its pursuit of scientific excellence and technological prowess, has embraced international integration schemes and policies aimed at enhancing cooperation and investment in the realm of science and technology. This commitment is reflected in governmental decisions, policies, and strategic plans that underscore the significance of collaboration in research, development, and knowledge dissemination. Furthermore, international experiences, particularly from countries like Germany, the Czech Republic, Sweden, and China, offer valuable insights into different models of collaboration between higher education institutions, businesses, and research entities. These models encompass a spectrum of activities ranging from institutional exchanges, student programs, and scientific workshops to in-depth research partnerships and technology transfer initiatives. The article also delves into regional collaboration experiences, highlighting exemplary institutions such as Hanoi National University and the University of Labor and Social Affairs, showcasing their achievements, policies, and strategic initiatives in fostering collaborative endeavors in science and technology. Through case studies and analysis, we aim to extract lessons, best practices, and recommendations that can further enhance collaborative frameworks, communication channels, and resource utilization in the pursuit of scientific advancements and technological innovations. By examining the intersection of academia, industry, and international partnerships, this article aims to contribute to the ongoing discourse on effective strategies for promoting collaboration, knowledge exchange, and technology transfer within higher education ecosystems.

Keywords: *keywords science and technology; higher education institutions; experience, cooperation*

1. INTRODUCTION

In the realm of higher education and scientific advancement, the collaborative efforts between institutions, industries, and international partners play a pivotal role in fostering innovation, knowledge exchange, and technological progress. This article delves into the landscape of scientific and technological collaboration within higher education institutions, exploring the frameworks, experiences, and lessons learned from various perspectives. The development of science and technology stands as a cornerstone in the global integration agenda, with nations around the world emphasizing the importance of diversified and multilateral cooperation. Vietnam, in its pursuit of scientific excellence and technological prowess, has embraced international integration schemes and policies aimed at enhancing cooperation and investment in the realm of science and technology. This commitment is reflected in governmental decisions, policies, and strategic plans that underscore the significance of collaboration in research, development, and knowledge dissemination.

Furthermore, international experiences, particularly from countries like Germany, the Czech Republic, Sweden, and China, offer valuable insights into different models of collaboration between higher education institutions, businesses, and research entities. These models encompass a spectrum of activities ranging from institutional exchanges, student programs, and scientific workshops to in-depth research partnerships and technology transfer initiatives.

The article also delves into regional collaboration experiences, highlighting exemplary institutions such as Hanoi National University and the University of Labor and Social Affairs, showcasing their achievements, policies, and strategic initiatives in fostering collaborative endeavors in science and technology. Through case studies and analysis, we aim to extract lessons, best practices, and recommendations that can further enhance collaborative frameworks, communication channels, and resource utilization in the pursuit of scientific advancements and technological innovations. By examining the intersection of academia, industry, and international partnerships, this article aims to contribute to the ongoing discourse on effective strategies for promoting collaboration, knowledge exchange, and technology transfer within higher education ecosystems.

2. RESEARCH METHOD

This study adopts a mixed-methods approach to comprehensively examine the experiences and outcomes of collaboration in science and technology activities among higher education institutions, focusing on both qualitative and quantitative data.

Qualitative data will be collected through: In-depth interviews with key stakeholders from Hanoi National University (HNU), the University of Labor and Social Affairs (ULSA), collaborating universities, industry partners, and government representatives. These interviews will explore perspectives, experiences, challenges, and success factors related to collaborative initiatives in science and technology. Document analysis of policies, regulations, reports, and scholarly articles related to international collaborations, regional partnerships, industry collaborations, and innovation initiatives in higher education institutions.

Quantitative data will be gathered through: Analysis of institutional data from HNU and ULSA, including research outputs (publications, patents), international collaboration metrics (partnerships, conferences), funding sources, and technology transfer activities. Surveys or questionnaires distributed to faculty members, researchers, and students involved in collaborative projects to assess their perceptions, satisfaction levels, and outcomes of collaboration.

The qualitative and quantitative data is integrated to provide a comprehensive understanding of collaboration in science and technology activities. Data analysis techniques such as thematic analysis for qualitative data and statistical analysis for quantitative data is employed. Triangulation of data from multiple sources enhance the validity and reliability of findings.

3. RESULTS AND DISCUSSIONS

The development of science and technology is one of Vietnam's key tasks in the international integration process. On May 18, 2011, the Prime Minister issued Decision No. 735/QĐ-TTg approving the "International Integration Scheme on Science and Technology" with the viewpoint of "diversifying and multilateralizing cooperation and investment with foreign countries in the

field of science and technology." This affirmed the important role of cooperation activities in science and technology, which are essential for Vietnam to selectively absorb the experiences of advanced countries, maximize opportunities to enhance research capacity, and technological development, thereby contributing to the comprehensive development of the country. The Party and State have issued numerous policies to promote scientific and technological activities, with a focus on enhancing scientific and technological activities in higher education institutions. On November 4, 2013, the Central Executive Committee issued Resolution No. 29-NQ/TW on "Fundamental and Comprehensive Innovation in Education and Training to Meet the Requirements of Industrialization, Modernization in the Orientation of Socialist-Oriented Market Economy and International Integration," affirming the need for innovation in higher education, focusing on "Improving the quality and efficiency of scientific research and application of science and technology" with a focus on enhancing cooperation in science and technology. Scientific and technological activities in higher education institutions are clearly regulated in Article 2 of Decree No. 109/2022/ND-CP dated December 30, 2022, of the Government on regulations on scientific and technological activities in higher education institutions, specifically "Scientific and technological activities in higher education institutions are research activities, research and implementation of experiments, application of technology, scientific and technological services, promoting innovation, and other creative activities to develop science and technology integrated with training high-level human resources, contributing to the socio-economic development of the country." In this Decree, the Government also clearly defines one aspect of scientific and technological activities as "Domestic and international scientific and technological cooperation." Through the Decree, the Government also emphasizes the necessity of international cooperation in science and technology, specifically:

- a. Encouraging higher education institutions to enhance cooperation with foreign organizations and individuals in science and technology in line with cooperation agreements on science and technology between the Government of Vietnam and foreign governments or cooperation agreements between higher education institutions and foreign organizations or individuals in accordance with the law.
- b. Higher education institutions select reputable and experienced foreign partners for research cooperation, implementation of scientific and technological activities, innovation, take responsibility for the content and scope of cooperation, ensure political security and national secrets, invite or hire foreign experts to participate in research and high-level training, support scholarships for teachers and learners, training, exchange academic experiences abroad, or provide remuneration for foreign experts from the development fund for science and technology of higher education institutions.
- c. Higher education institutions cooperate to establish laboratories between educational institutions and foreign partners in line with international cooperation programs on scientific research and technological development as regulated.
- d. Higher education institutions enhance international cooperation in publishing scientific papers in prestigious scientific journals, promote the quality of scientific journals of higher education institutions to regional and global standards, organize or participate in international scientific conferences in strong fields, invite foreign scientists to co-chair, establish professional and reputable international peer review networks, publish proceedings and other scientific publications according to international standards.
- e. Higher education institutions invite experts and sign contracts with reputable scientists, foreign doctoral students for cooperation, work, conduct scientific research and doctoral training at units, send officers, lecturers, doctoral students, research team members abroad for study and research.

- f. Higher education institutions use funds for scientific and technological tasks to sign professional contracts with foreign experts, receive funding in cash or equipment from foreign partners for scientific and technological activities and use as agreed with partners according to regulations.
- g. Higher education institutions create conditions and sign professional contracts with officers, lecturers to participate in research groups of foreign scientific and technological organizations, take responsibility for appointing, managing officers, lecturers participating in cooperation and research activities with foreign countries as regulated.
- h. It can be seen that the current mechanism for promoting scientific and technological cooperation is creating momentum for higher education institutions to achieve scientific and technological achievements. Domestic higher education institutions have continuously made efforts to innovate and enhance scientific and technological cooperation nationally and internationally. In the Summary Report of 10 years of implementing Resolution 29 published at the Scientific Conference organized by the Ministry of Education and Training on October 11, 2023, it demonstrated the increasing scientific and technological potential of higher education institutions thanks to domestic and international cooperation. By 2021, the country had established 47 high-tech incubators, high-tech enterprises, and other incubators, 43 incubators, centers, and startup support clubs, 636 scientific and technological enterprises established in higher education institutions nationwide. Cooperation activities in higher education institutions have brought remarkable achievements for science and technology in Vietnam, specifically in 2021, higher education institutions accounted for 95.78% of international publications on Scopus, equivalent to 17,625 publications, contributing to Vietnam's ranking 5th in ASEAN, 12th in Asia, and 45th in the world in terms of international publications on Scopus. In 2022, among the top 10 organizations with the highest number of publications on Scopus in Vietnam, 9 were higher education institutions. The reality shows that cooperation in science and technology at higher education institutions is a strategic activity in the national scientific and technological development.

International collaboration in science and technology is a matter of great concern and emphasis by the leadership of all higher education institutions worldwide. In the article "International Cooperation among Higher Education Institutions: Trends and Prospects," author Kiselova conducted research at higher education institutions in Germany, the Czech Republic, and Sweden, gathering information from the European Commission, the European University Center, the European University Association, and highlighted that collaborative activities among higher education institutions include:

- a. Institutional exchange to attract educators and staff from higher education institutions to participate in teaching, research, or professional activities.
- b. Student exchange programs to provide students with experiences in different educational environments.
- c. Organizing scientific workshops, conferences, symposiums, forums on education and technology.
- d. Exchanging information on the development prospects of education processes, student progress, and research conducted at higher education institutions.
- e. Ensuring suitable conditions for academic cooperation among scientists, lecturers, and students across higher education institutions.
- f. Planning and coordinating all activities related to cooperation between partners - higher education institutions and anticipated organizations.

- g. Providing readily available information related to the activities of higher education institutions, especially in research areas and educational resources.
- h. Holding regular meetings of representatives from higher education institutions within the framework of cooperation.

Thus, it can be seen that higher education institutions in Germany, the Czech Republic, and Sweden always link collaborative activities in science and technology with educational cooperation. Collaboration in science and technology is carried out through various forms such as organizing conferences, ensuring conditions for participation in scientific and technological activities, and linking to provide information serving educational and scientific research activities. These are valuable experiences for higher education institutions in Vietnam regarding international cooperation in science and technology.

In addition to collaboration among higher education institutions, universities can collaborate with businesses to enhance scientific and technological activities. We can explore China's experience in promoting cooperation between businesses and higher education institutions. In China, there are five models of cooperation between businesses and higher education institutions in the field of science and technology:

Model I: Small and Medium Enterprises (SMEs) directly purchase R&D achievements from higher education institutions.

Model II: Small and medium-sized enterprises develop R&D achievements in cooperation with higher education institutions.

Model III: SMEs outsource R&D tasks to educational institutions.

Model IV: SMEs establish R&D organizations with higher education institutions.

Model V: SMEs recruit technology personnel from higher education institutions.

During cooperation, different collaboration models lead to different economic efficiencies in the operations of small and medium-sized enterprises. Models II & V have a more positive impact on the economic efficiency of private small and medium-sized enterprises compared to the other three models.

Alongside the positive factors impacting cooperation between businesses and higher education institutions, there are existing barriers, including barriers from both the business side and higher education institutions. Business-side barriers include:

- a. Lack of effective management mechanisms for communicating R&D achievements from high-level educational organizations.
- b. Unreasonable cost transfer mechanisms for R&D achievements from higher education.
- c. Incomplete production technology to apply R&D results from higher education institutions.
- d. Difficulties in commercializing R&D achievements.
- e. Unclear ownership rights of R&D achievements.
- f. Lack of superiority compared to similar R&D achievements in other countries.
- g. Market instability and lack of consensus on R&D achievements.
- h. Ineffective monitoring processes and market value assurance of R&D achievements.
- i. Barriers from higher education institutions include: Lack of effective communication channels with small and medium-sized enterprises; Unreasonable cost transfer mechanisms regarding R&D achievements; Unclear ownership rights of R&D achievements; Lack of protection and assurance for R&D achievements; Ineffective transparency for businesses;

Lack of understanding about businesses; Limited ability to commercialize R&D achievements.

Among all barriers to cooperation between higher education institutions and private small and medium-sized enterprises, "Lack of effective communication channels" and "Unreasonable cost transfer mechanisms" are identified as crucial factors significantly impacting cooperation in science and technology between businesses and higher education institutions. This indicates a serious issue in communication channels between educational institutions and businesses. It is necessary to establish and develop an effective communication channel between cooperative partners. Successful cooperation depends not only on the strength of research capacity but also on effective information exchange between businesses and higher education institutions, which is crucial for the successful transfer of scientific and technological achievements between businesses and higher education institutions. From both perspectives, businesses and higher education institutions, urgent improvements are needed in coordination mechanisms, transmission mechanisms, and guarantee mechanisms. For cooperation between universities and businesses, the collaborative framework mechanism is crucial for the entire process and success of collaboration. This cooperation mechanism also reduces the cost of transferring scientific and technological achievements from universities in particular and higher education institutions in general to businesses.

Thus, looking at international experiences, higher education institutions can closely collaborate with other institutions and businesses in the field of science and technology. For educational institutions, collaborative activities mainly focus on research links, academic exchanges, experience exchanges, and student and researcher exchanges. For businesses, collaboration emphasizes transferring and applying scientific and technological research results. There are various forms of knowledge transfer suitable for the specific characteristics of each higher education institution and business. Both businesses and higher education institutions need to improve collaboration mechanisms and enhance communication activities to improve the effectiveness of collaborative activities in science and technology.

Within the national higher education system, it can be said that the Hanoi National University (HNU) is at the forefront of education and scientific research. In 2023, according to the Times Higher Education (THE) Impact rankings, Hanoi National University was listed among the top 70 educational institutions globally for quality education, with an impressive achievement of over 1600 international research papers. HNU comprises 09 laboratories/centers of excellence under the HNU system for the 2023-2028 period and 30 strong research groups under the HNU system. To achieve such remarkable success, HNU has implemented policies to manage research and development (R&D) activities, creating legal frameworks and developing R&D products, such as regulations on intellectual property management at HNU, guidelines for the development and support of strong research groups, policies supporting international publications, regulations on the recognition, management, and development of laboratories/centers of excellence under the HNU system, and the strategic development plan for science, technology, and innovation at HNU for the 2021-2030 period. With the goal of developing HNU into a smart, innovative university, the policies regarding science and technology emphasize the promotion of collaboration in science and technology. HNU has partnered with various prestigious universities, including RMIT University, to implement innovation projects. Annually, HNU collaborates with universities in the US, UK, Australia, Singapore, and others to organize international scientific conferences, and the conference proceedings are published by reputable publishers such as Springer and Emerald. HNU also enhances the development of strong

research groups and potential research groups by attracting external researchers to participate in research groups with appropriate support mechanisms. In addition to collaboration with universities, HNU has collaborated with businesses to enhance scientific and technological activities. Specifically, the HNU Knowledge Transfer and Entrepreneurship Support Center has signed cooperation agreements with Ho Guom Group, Phan Anh Fund, and VICO Multi-platform Technology Joint Stock Company to implement research results transfer and application of scientific and technological research results. It can be seen that HNU has absorbed international experiences and comprehensively implemented collaborative activities in the field of science and technology. HNU has pioneered scientific and technological collaboration activities, which have indeed been effective and have contributed to HNU's development into a smart, innovative university.

The University of Labor and Social Affairs (ULSA) has also achieved significant success in science and technology collaboration. Collaboration activities at ULSA include student exchanges, research collaborations through sponsored research contracts, joint research, and implementation of part of the international research tasks. The university conducts training sessions to enhance the expertise of lecturers sponsored by external partners, alongside study tours abroad and student exchanges with foreign universities. Given its focus on social sciences, ULSA's transfer of research results to businesses and external institutions lacks a standardized technological process but involves specific tasks such as organizing labor standards, designing salary scales for businesses, legal advice on social insurance, social insurance collection management, resolving social and environmental conflicts within a community (community development), consulting on personal and family social work, consulting on rehabilitation and education methods for socially disadvantaged individuals held in custody, psychological therapy support for working with disabled individuals, mentally ill persons, orphans, and lonely elderly individuals, providing assistive devices for the disabled, legal consultation in labor disputes, and legal procedure support for business establishment and dissolution. ULSA has been and continues to strengthen cooperation activities in science and technology, where research-linked collaboration activities have become regular, and research result transfers are yielding significant outcomes in the university's strong specialized areas.

4. CONCLUSIONS AND SUGGESTIONS

Strengthening collaboration in science and technology is a key task in the development and integration process of higher education institutions. State-supported universities create conditions through policy frameworks and legal mechanisms to overcome administrative, organizational, and operational barriers that hinder research activities and the transfer of scientific and technological knowledge.

Based on the implementation of government decrees and policies, and the assimilation and refinement of international and domestic experiences, several lessons can be drawn for higher education institutions as follows:

- a. Improve collaboration processes and regulations regarding international and domestic scientific and technological activities.
- b. Issue internal regulatory documents governing collaboration activities in science.
- c. Enhance collaboration with domestic and international universities in scientific research activities, establish strong research groups, organize international scientific conferences, and publish proceedings through reputable domestic and international publishers.

- d. Strengthen student and faculty exchanges to enhance research capabilities.
- e. Expand collaboration with businesses to transfer and apply research results.
- f. Develop an innovative ecosystem linked with national and international social partners to promote entrepreneurship and innovation within the institution.
- g. Implement intellectual property protection effectively.
- h. Professionalize communication activities related to scientific and technological collaboration.
- i. Establish support mechanisms, financial mechanisms for technology transfer, and reasonable use of scientific and technological funds to promote effective collaboration activities.

The demand for collaboration between universities, research institutes, and businesses is high and is an inevitable trend in the current integration context. Higher education institutions need to research and identify specific objectives, resources, and barriers to build effective collaboration strategies, promote product visibility, develop technology markets, and establish research structures. This approach aims to enhance the institution's scientific and technological achievements and rankings, leading to comprehensive development, brand establishment, and reputation building for the institution.

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