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Research on the Use of Education Quality Assurance Theory for the Improvement of Criteria for Evaluating the Effectiveness of Scientific and Technological Activities for Medical and Pharmaceutical Universities in the Context of the 4.0 Revolution

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Abstract

In the context of the transformation of higher education towards comprehensive quality assurance and adaptation to the 4.0 Revolution, scientific and technological activities for universities in the field of Medicine and Pharmacy increasingly play a central role in the implementation of the mission of training, research and community service. However, the current system of criteria for evaluating the effectiveness of scientific and technological activities is still prone to measuring academic output, not fully reflecting the specificity, practical application and social impact of research in the field of Medicine and Pharmacy. On the basis of the theoretical approach to educational quality assurance and the multi-dimensional evaluation model, the paper proposes to improve the system of criteria for evaluating the effectiveness of scientific and technological activities for universities in the field of Medicine and Pharmacy in accordance with the development context of the trend of autonomous development and university governance as well as the characteristics of scientific and technological activities of universities in the field of Medicine and Pharmacy based on the theory of educational quality assurance.

Keywords: Quality assurance, scientific and technological activities, Medicine and Pharmacy sector, 4.0 revolution

1. Introduction

The emergence of the knowledge economy in the context of the 4.0 Revolution requires the quality of human resources that require the participation of education and training activities as well as scientific and technological activities in perfecting professional qualifications and professional skills for high-quality human resource training activities. The driving force of innovation often comes from research results as well as the efficiency of science and technology

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activities. For universities, scientific and technological activities are not only aimed at developing knowledge to create new knowledge as well as practicing academic research skills but also scientific and technological activities at universities directly affect the performance of universities, including the effectiveness of the field of training as well as the applicability of research results to solving existing problems of organizations and society.

With the philosophy of science and technology, innovation is the pioneering driving force of education and training activities at universities, especially for applied sectors and affecting the efficiency like the medical science and pharmacy sectors. The requirements and urgency for scientific research results and the effectiveness of the research results for the Medicine and Pharmacy sector must be shown by results that ensure to meet the increasing healthcare needs of society and the community. Scientific and technological activities at universities in the field of Medicine and Pharmacy must both ensure the development of new knowledge related to the field and demonstrate the effectiveness in the quality of human resource training in the field of Medicine and Pharmacy and applications in the field of health care for the community.

In Vietnam today, institutions with typical training functions in the field of medicine and pharmacy can be mentioned as Hanoi Medical University (HMU), University of Medicine and Pharmacy at Ho Chi Minh City (UPM HCM), Vietnam Military Medical Academy (VMMA), these are training institutions that leave their mark and show their effectiveness in scientific and technological activities. For example, during the complicated development of the COVID– 19 epidemic through a process of research and development as well as international cooperation, Hanoi Medical University has implemented international research projects on vaccines and drugs with the largest sample size in Vietnam, such as the clinical trial of ARCT-154 vaccine manufactured by Arcturus – USA and COVID-19 drugs manufactured by Shionogi – Japan. These studies have contributed to improving the reputation of the university in the international arena and contributing to the prevention and control of epidemics in Vietnam.

From the above achievements, it can be affirmed that the scientific and technological activities of the Medicine and Pharmacy sector have a lot of potential for development and quality to affect the community, which requires the evaluation activities to have a method of evaluating the performance by quality assurance theories. From the method of observation and research of documents, it is found that in the current reality, the evaluation of the effectiveness of scientific and technological activities at universities in general as well as universities of Medicine and Pharmacy in particular still has some limitations: The evaluation indicators mainly focus on the number of scientific publications, but not the actual quality and impact of the research on the community and the Medicine and Pharmacy sector. This leads to a lack of information on the actual effectiveness of scientific and technological activities affecting the decision-making process and development strategy planning of the school.

In addition, the current trend of quality assurance is a trend affecting the existence and development of universities. The context of universities is increasingly improving autonomy

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with the emergence of university governance trends, which leads to the theoretical consequence of quality assurance (QA) that has been widely applied in higher education administration as a tool to ensure, maintain and improve the quality of training. However, the application of QA as a theoretical foundation to design criteria to evaluate the performance of science and technology. Currently, the use of quality assurance theory often focuses on only one of the three basic functions of the university, which is the training function, there is no research expanding into the field of science and technology as well as the function of serving the community.

For the characteristics of universities in the field of Medicine and Pharmacy, this is a special major with the characteristics of combining the theory of training and research activities as well as clinical factors affecting the performance of scientific and technological activities. This requires the development and completion of a system of criteria for evaluating the effectiveness of scientific and technological activities to ensure three basic factors.

First, the evaluation criteria must quantitatively reflect the quality of the research results;
Secondly, the evaluation criteria must be consistent with the scientific and technological activities of the Medicine and Pharmacy sector.

Third, the evaluation criteria must be geared towards driving continuous improvement based on quantitative data and stakeholder feedback.

Therefore, this study was conducted with the aim of applying education quality assurance theory to complete a set of criteria to evaluate the effectiveness of scientific and technological activities at universities in the field of Medicine and Pharmacy, in line with the context of the 4.0 Revolution. Thereby, the research wishes to contribute a new approach in quality management of scientific and technological activities, contributing to promoting the comprehensive and sustainable development of higher education in the current period.

2. Method for evaluating the effectiveness of scientific and technological activities for medical and pharmaceutical universities by quality assurance

2.1. Theoretical overview of educational quality assurance

Assurance (QA) is a system of policies, procedures and actions to maintain and improve the quality of education. In particular, a number of quality assurance models are built based on theoretical approaches as well as a number of typical quality assurance systems for quality assurance systems that are prescribed and used in accordance with higher education institutions.

Harvey and Green (1993) in Defining Quality. Assessment & Evaluation in Higher Education, 18(1), 9–34 introduced quality assurance system approaches through a number of criteria to assess the quality of education quality assurance activities. Approaches are used such as excellence, quality as fitness for purpose, quality as value for money and quality as transformation. From these approaches, it can be seen that education quality assurance (QA)

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theory is the policies, procedures, tools, and mechanisms to ensure that educational programs, research activities and services of educational and training institutions to meet and exceed the set standards, and promote the improvement of the quality assessment system of universities through the process of improving operations based on the results of quality assessment and performance through educational quality assurance criteria.

For education quality assurance system for higher education and training institutions, it is based on self-assessment (internal assessment) and external assessment of educational and training institutions with accreditation functions or of State management agencies in charge of quality assurance and accreditation activities.

In terms of internal quality management, it can be identified that the system exists right inside the universities. Boele, E.B. (2007) in Handbook Internal Quality Assurance in Higher Education has identified the quality assurance system of universities in Europe according to the levels of quality, the quality is assessed through the process including the starting and ending factors of a cycle and the effectiveness of that process with university activities.

In addition to international approaches, domestic approaches also indicate that quality assurance in Vietnam is identified through the accreditation function held both inside and outside of higher education and training institutions. Author Tran Anh Vu (2015) in the scientific article Quality assurance of education inside Vietnamese universities from domestic and foreign studies, the Journal of Education, No. 51 mentioned that quality assurance assessment is the responsibility of the university as well as the State management agencies. At the same time, quality assurance activities have also been approached through the basic function of a university, which is training activities, the use of quality assurance functions to help the organization of activities. training ensures the quality and efficiency shown through the quality of training human resources to meet the requirements of the labor market.

Another approach to education quality assurance theory that is also used is quality assurance implemented through the use of quality assurance models with the orientation of using these models to review the quality, evaluate and improve the quality of activities at the university. The popular and relatively suitable model for higher education and training institutions in Vietnam is the AUN – QA model, which can be described and identified through the following characteristics:

Firstly, this is a model with a combination of internal assessment activities (IQA) and external quality assurance (EQA), the use of both of these assessment activities is consistent with the characteristics and development trends of autonomy and administrative functions for the basic areas of university activities such as training, science and technology, community service.

Second, in the AUN – QA model, quality is defined as conformance and similarity to the university's development goals.

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Third, quality assurance activities in the AUN – QA model use a constructive cycle for each quality assurance cycle through the operations "Planning" (P); Implementation (D); Inspection (C); Improvement (A) associated with each process in the AUN – QA model. The use of this approach is appropriate and identifies the limitations to be able to conduct improvement activities in accordance with the development strategy of the universities.

Quality perspectives also emphasize the developmental nature based on the development strategy of the activity, Sallis (2014) in Total Quality Management in Education. Routledge has affirmed that quality must have a legacy and development that is of a sustainable development nature.

From the above theories, it can be affirmed that quality assurance to evaluate the performance associated with the functions of universities is feasible and in line with the development trend of universities. The use of QA in university governance trends contributes to improving the effectiveness of the University's internal governance function but also plays a role in strategic positioning, improving credibility and attracting resources. However, for QA theory, which is only used in basic functions such as training, the application of QA theory in non-training areas suitable to university functions such as scientific and technological activities is appropriate and has potential for development. In addition, quantitative criteria in the direction of quality assurance have not been clearly described and most of them focus on outputs, but not enough on inputs, processes and impacts. For the Medicine and Pharmacy sector, the effectiveness of scientific and technological activities should be considered based on the application of QA theory to design and complete the system of criteria for evaluating the effectiveness of scientific and technological activities. This will be a necessary step to ensure the comprehensiveness, system and promote continuous improvement in scientific and technological activities.

2.2. The effectiveness of scientific and technological activities in universities of Medicine and Pharmacy

Scientific and technological activities are one of the three basic functions of a university in addition to the functions of training and community service. Universities of the Faculty of Medicine and Pharmacy carry out scientific and technological activities, contributing to improving the effectiveness of human resource training activities, in addition to the application of the results of the studies shown through the effectiveness of medical examination and treatment activities as well as preventive medicine and health care activities for the community. For the determination of the effectiveness of scientific and technological activities in medical and pharmaceutical universities, in addition to the evaluation of the number of scientific research results, quality assurance can be considered through the application of scientific research results, social impacts as well as technology transfer activities to scientific research results for the medical and pharmaceutical sector.

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2.2.1. Characteristics of learning activities and technology in universities of Medicine and Pharmacy

Scientific and technological activities of the Medicine and Pharmacy branch, in addition to common characteristics, have their own characteristics affecting the efficiency of scientific and technological activities.

Firstly, scientific and technological activities of the branch of Medicine and Pharmacy can be confirmed that this is an interdisciplinary scientific activity, for example, scientific and technological activities of the branch of Medicine and Pharmacy with the participation of both scientific and technological activities as well as other types of science including molecular biology, pharmaceutical chemistry, biotechnology, artificial intelligence (AI), big data..., From these specialized approaches, it is possible to identify scientific and technological activities of an interdisciplinary nature,

Secondly, scientific and technological activities in the field of Medicine and Pharmacy are complex in nature and have time for research and implementation at high length as well as the volume of tasks and objectives to be completed. For example, – testing – application to clinical practice requires a long time and many strict review steps, the testing of drugs/vaccines through clinical phases).

Thirdly, the effectiveness of scientific and technological activities in the field of Medicine and Pharmacy has an impact on the health of the community. Successful research is not only measured by publication but also by the effectiveness of improving people's health and reducing the burden of disease.

From the above characteristics identified by the scientific and technological activities of the Medicine and Pharmacy sector, it can be seen that this activity has distinct characteristics that are different from the basic scientific and technological activities, this requires research and inherits the evaluation of operational efficiency from the current indicators of scientific and technological performance and is consistent with the performance of scientific and technological activities of the Medicine and Pharmacy sector.

2.2.2. Situation of assessing the effectiveness of scientific and technological activities at universities of Medicine and Pharmacy

Scientific and technological activities in the field of Medicine and Pharmacy are currently assessed at universities to have features that are consistent with the development of scientific and technological activities, and at the same time, it is necessary to conduct research to specifically assess the effectiveness of this activity at universities.

For the evaluation of scientific and technological performance at the University of Medicine and Pharmacy of Ho Chi Minh City. Based on the method of observing and studying documents on

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scientific and technological activities at this university, it is possible to give generalizations and summaries on the effectiveness of scientific and technological activities at the University of Medicine and Pharmacy at Ho Chi Minh City. University of Medicine and Pharmacy at Ho Chi Minh City with more than 76 years of formation and development, is currently implementing more than 160 training programs at 5 levels of study, including postgraduate training, and has trained more than 1,700 postgraduate students in 2023. Of these, 39 articles were published in specialized international journals, achieving a student satisfaction rate of over 93%.

From the above example, it can be seen that the evaluation of scientific and technological performance at the University of Medicine and Pharmacy of Ho Chi Minh City is mainly based on the number of scientific and technological publications, and the number of potential inventions coming from scientific research results. The assessment of the effectiveness of scientific and technological activities for the Medicine and Pharmacy sector has not yet identified factors affecting the performance, which affects the process of collecting information on the effectiveness of scientific and technological activities at the university as well as the university's governance activities in the decision-making process and planning of the university's development strategy.

The second example can be identified through the case of Hanoi Medical University (HMU) with more than 100 years of construction and development, is one of the leading medical training institutions in Vietnam. The university has conducted many valuable scientific studies, especially in the field of vaccines and drugs for COVID-19. However, the evaluation of scientific and technological activities at the university still has some limitations, mainly focusing on the number of scientific publications, but not the actual quality and impact of the research on the community and the medical industry.

At a different level in terms of scale of development, Thai Nguyen University of Medicine and Pharmacy (TUMP) has achieved achievements in scientific and technological activities. The university has done a lot of scientific research in the field of public health and has had a number of research products applied in practice. However, the evaluation of scientific and technological activities at the university is limited, mainly based on the number of scientific articles and research products, but there is no comprehensive system of evaluation criteria and suitable to the characteristics of the pharmaceutical industry.

From the general characteristics at universities of Medicine and Pharmacy, it can be seen that the assessment of scientific and technological performance has gaps in the assessment of scientific and technological performance. The evaluation of scientific and technological performance needs to be completed based on the identification of gaps and completion requirements for the evaluation of this performance at universities in the field of Medicine and Pharmacy.

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2.2.3. Gaps and requirements to complete the system of criteria for evaluating the performance of science and technology in the field of Medicine and Pharmacy

From the above examples, it can be affirmed that scientific and technological activities in the field of Medicine and Pharmacy are a basic function in universities, but there are still some gaps that can be identified in the evaluation of scientific and technological activities.

Firstly, the evaluation of the effectiveness of scientific and technological activities in the field of Medicine and Pharmacy currently still uses general evaluation indicators for scientific and technological activities. This poses a requirement for learning activities and technology of the Medicine and Pharmacy sector to have a difference in duration for this activity, with a long research period where the results of activities can be successful or unsuccessful and often at a potential level through high application value in clinical practice.

Secondly, the issue of academic output indicators is an issue that should be considered in evaluating the effectiveness of scientific and technological activities expressed in the number of international articles, citation indicators, the number of acceptance topics often used as the main criteria. These are important indicators, but the indicators to evaluate the process of scientific and technological activities as well as the inputs and operational efficiency are still not fully identified in the evaluation of operational efficiency.

Thirdly, the effectiveness of scientific and technological activities in the field of Medicine and Pharmacy has not been properly evaluated in terms of the impact of research results on policies in the field of Medicine and Pharmacy. This, if fully evaluated, will be the basis for completing issues related to the policy of Medicine and Pharmacy science activities as well as the effectiveness of treatment, improvement of medical examination and treatment processes, or the satisfaction of patients and employees participating in medical activities.

Fourthly, the evaluation of the effectiveness of scientific and technological activities for the medical and pharmaceutical industry has not paid attention to the improvement through static evaluation activities, which are often used to evaluate the effectiveness of scientific and technological activities of the medical and pharmaceutical sector, the lack of assessment factors related to the response and interaction to the impact from the research results and the effectiveness of scientific and technological activities of the medical and pharmaceutical sector with the subjects including hospitals, health management agencies, learners and the community.

Fifth, the integration of efficiency assessment in the field of science and technology has not yet been considered as a criterion in the use of science and technology performance assessment in association with education quality assurance theory. Schools have only applied QA for training, while science and technology is still assessed discretely, lack of linkage with the overall strategy of comprehensive quality development of the school.

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From the gap to the improvement of the criteria for evaluating the performance of science and technology in the field of Medicine and Pharmacy in the context of the 4.0 Revolution and the trend of autonomy and university governance, there are urgent requirements for the improvement of the innovation in evaluating the performance of science and technology at medical and pharmaceutical schools.

Firstly, improving the criteria for evaluating the effectiveness of scientific and technological activities in association with the characteristics of the medical and pharmaceutical sector. The set of evaluation criteria should be designed in an integrated way, not only measuring research products but also evaluating the research process, innovation, transferability and socio-health influence. Factors such as “clinical efficacy”, “community application”, and “contribution to the health system” need to be specified in the criteria system.

Second, study the application of education quality assurance theory through a multi-dimensional evaluation model. The evaluation of scientific and technological performance, in addition to evaluation based on the results of scientific research publications, should use quantitative and qualitative criteria and indicators, combining both expert assessment, feedback from units using research results (e.g. hospitals, health facilities), and impact assessment.

Thirdly, it is necessary to clarify the role of scientific and technological activities to evaluate the effectiveness of scientific and technological activities that need to be structured as an evaluation part in the quality assurance of the Medicine and Pharmacy sector. The evaluation of scientific and technological activities needs to be based on the strategy of training activities development, human resource quality and community service activities.

Fourthly, it is necessary to involve technological factors in completing the criteria for evaluating the effectiveness of scientific and technological activities. Digitizing research data, applying artificial intelligence in scientific impact analysis, or using dashboards to monitor progress and research results will help improve the efficiency of information evaluation and transparency.

Fourthly, it is necessary to develop indicators to evaluate the effectiveness of scientific and technological activities in the field of Medicine and Pharmacy in association with the mission of health activities for public health. On that basis, it is necessary to determine a strategy for evaluating the effectiveness of scientific and technological activities that should aim at the highest goal of improving the quality of life, improving the efficiency of health care and contributing to the sustainable development of the country.

3. Proposing to improve the system of criteria for evaluating scientific and technological performance on the basis of quality assurance theory

Scientific and technological activities for the Medicine and Pharmacy sector are activities that play a role in promoting innovation in training activities and high-quality human resources. However, current criteria still largely focus on academic output factors such as the number of

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articles or citation indicators, while not fully reflecting specific characteristics such as clinical effectiveness, practical application, and social impact of research. On that basis, the proposal to improve the system of criteria for evaluating the effectiveness of scientific and technological activities of the Medical and Pharmaceutical sector according to the theory of ensuring the quality of education should be built based on the requirements to complete this system of criteria for evaluating the effectiveness of activities.

3.1. Integral orientation in building a system of criteria for evaluating the effectiveness of science and technology in the field of Medicine and Pharmacy

In the context of the development of the renovation of university-level education and training activities, the development of a system of criteria for evaluating the effectiveness of scientific and technological activities needs to be reoriented, especially for highly specific industries such as Medicine and Pharmacy. In fact, the current evaluation criteria at many medical education and research institutions mainly focus on the measurement of outputs, such as the number of scientific publications, citation indicators, or patents, while not fully considering the research process, innovation, technology transfer ability, as well as the social impact of the medical and pharmaceutical sector on research results.

On that basis, the development of integrated evaluation criteria should pay attention to the results of scientific research activities as well as measure the quality and effectiveness of the entire research cycle – from problem identification, research design, implementation, to the application of results. In particular, in the field of Medicine and Pharmacy, the criteria system needs to concretize three central and specific elements of integrated assessment.

Firstly, research must create knowledge, which must create therapeutic value, improve health, thereby requiring assessment to be closely tied to clinical outcomes, community intervention capabilities and health policy relevance.

Second, scientific research in the field of Medicine and Pharmacy often undergoes a complex, interdisciplinary, and highly ethical process, requiring evaluation criteria to consider non-technical factors such as research ethics compliance, patient participation, and social consensus.

Thirdly, scientific and technological activities in the field of Medicine and Pharmacy have a close relationship between research establishments and the units receiving the transfer of scientific research results, so the design of efficiency assessment criteria should be measured at the microscopic level of hospitals as well as health systems at the local or national level.

From the integrated central factors of the Medicine and Pharmacy sector, it is possible to develop a system of criteria to evaluate the effectiveness of scientific and technological activities for the sector based on evaluation criteria combining qualitative and quantitative criteria.

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Table 1. Integrated criteria for evaluating the performance of science and technology in the field of Medicine and Pharmacy

Evaluation criteria	Evaluating content	Indicator
Output quality of scientific and technological activities	Scientific publications, patents, technical solutions, awards	Quantitative (number of works)
Creditworthiness	Clinical efficacy, hospital/community applicability, technology transfer	Quantitative and Qualitative
Process and Governance	Research design, innovation, process transparency, data digitization, research ethics	Qualitative
Social impact of the health sector	Contributing to the strategic development orientation of the medical and pharmaceutical sector Feedback from employers	Qualitative
Develop a strategy for the development of the medical and pharmaceutical sector	Adapting and developing a sustainable health development strategy	Qualitative

[Source: Author's calculation]

3.2. Research on the application of education quality assurance theory through the multi-dimensional evaluation model of scientific and technological activities in the field of Medicine and Pharmacy

On the basis of the assessment of scientific and technological performance of the Medicine and Pharmacy sector with an integrated nature as well as a combination of qualitative and quantitative indicators to evaluate the performance of scientific and technological activities for the Medicine and Pharmacy sector based on the identification of appropriate evaluation dimensions.

Firstly, the academic dimension: The evaluation of the productivity and quality of scientific research activities through academic indicators such as international publication, impact indicators, citation indicators.

Second, innovation and application dimension: Determine the level of innovation and creativity and feasibility in the application of medical activities based on a specific model.

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Thirdly, the social impact dimension and the Medicine and Pharmacy sector, this is the dimension that determines the level of influence that the research results bring to public healthcare activities.

Fourth, the management dimension of scientific and technological activities: Based on the evaluation of management and research processes and the participation of technological elements of activities.

Fifth, the way to respond to stakeholders, including assessments from hospitals, health facilities, state management agencies, as well as from people – beneficiaries of research results.

3.3. Evaluating the effectiveness of scientific and technological activities as a component of the quality assurance system of the pharmaceutical industry

In many medical and pharmaceutical training institutions in Vietnam, scientific and technological activities are still often considered as a "complementary" field to training, and evaluating the effectiveness of scientific and technological activities is mainly based on single quantitative indicators such as the number of articles, topics or awards. However, in the context of transforming the university model into applied research, and with high requirements for output standards, quality of human resources and capacity to serve society, the evaluation of scientific and technological activities needs to be restructured as a core part of the overall quality assurance system of the Medicine and Pharmacy sector. This identifies the assessment of the effectiveness of scientific and technological activities that need to be identified, contributing to ensuring the effective quality of high-quality human resource training activities based on basic orientations.

Firstly, combining the criteria of scientific and technological activities associated with the training program evaluation standards associated with the content in the output standards, teaching content and training methods.

Secondly, the study proposes to integrate the evaluation of lecturers and researchers based on pedagogical competence and research and implementation (R&D) capacity.
Third, establish a social-community impact assessment system of the study, associated with the results of performing local tasks, improving public health or policy influences.

3.4. Technological factors in evaluating the performance of science and technology in the field of Medicine and Pharmacy

The integration of technological elements into the development and operation of the system of criteria for evaluating the effectiveness of science and technology is an indispensable requirement, both to meet the requirements of assessment methodology innovation and to improve the governance, monitoring and transparency of the entire research and implementation process for scientific and technological activities.

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Firstly, building a digital database of scientific research in the field of Medicine and Pharmacy, which contributes to the interoperability integration between universities, research institutes and hospitals; ensuring transparent traceability.

Second, the research and application of artificial intelligence (AI) and machine learning (ML) systems allow for the rapid evaluation of clinical or community research effectiveness in real-time.

Third, real-time analytics plays a role in proactive research management and data-driven decision-making.
Fourth, building block chain technology contributes to fraud prevention and increases data reliability in interventional or clinical studies.

Thirdly, research to improve the electronic feedback platform from beneficiaries to help measure the effectiveness of scientific and technological activities in the field of Medicine and Pharmacy.

The participation of technological factors in completing the criteria for evaluating the performance of science and technology in the medical and pharmaceutical sector is a requirement that cannot be delayed. Technology not only provides technical support but also reshapes assessment thinking, aiming for transparency, reflecting the true nature and impact of research on the health system and public health. This is an inevitable direction to modernize the quality research and management system in digital health education.

3.5. Developing indicators to evaluate the effectiveness of scientific and technological activities in the field of Medicine and Pharmacy in association with the mission of medical activities for public health

In the context of transforming the research-oriented university model and serving the community, scientific and technological activities cannot be evaluated only by the number of publications, topics or academic awards, but also need to reflect the practical impact on the health system, people's health and sustainable development.

Therefore, it is necessary to build an integrated system of science and technology efficiency indicators that both ensures science and reflects a close relationship with the mission of the medical sector to public health.

The proposed indicator system consists of five main groups: (1) an indicator group of academic quality and basic research, focusing on community-oriented new knowledge generation; (2) an indicator group of clinical application and practice efficiency, measuring the level of conversion of research into treatment and health care processes; (3) an indicator group of social – community impact, reflect the pervasiveness and contribution of research to equity and quality of life; (4) group of indicators on technology transfer and policy influence, demonstrating the role of research in institutional improvement and for sustainable development; and (5) group of

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indicators on research capacity development and health workforce training, emphasizing the integration of research activities into education and support grassroots health.

The implementation of this indicator system not only helps to quantify and monitor the effectiveness of scientific and technological activities over time, but also helps medical and pharmaceutical training institutions to orient research strategies in accordance with the practical needs and national health policies. At the same time, this is also an important tool in strengthening social accountability, transparency in the quality of scientific activities, and promoting the harmonious development of training – research – community service in modern medical universities.

4. Conclusion:

The article used a theoretical approach in science, technology, and quality assurance theory for the feasibility of scientific and technological activities in the field of Medicine and Pharmacy. Based on the research results, the article has confirmed that the use of quality assurance theories in evaluating the effectiveness of scientific and technological activities for the medical and pharmaceutical sector is appropriate in the context of the 4.0 Revolution and the trend of university autonomy and governance.

The completion of the criteria as well as the development of the proposed indicator framework not only serves the objectives of internal management and quality accreditation but also contributes to the strategic direction of sustainable development, enhancing the position of the University of Medicine and Pharmacy as a knowledge and innovation center serving the community. The article also recommends a national-level policy to standardize S&T assessment indicators for this specific sector, closely linked to the health mission and development of healthcare human resources in the era of digital transformation.

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