Development of a Multi-Criteria Tool in the Assessment of Readiness of Higher Educational Institutions (HEIs) Regarding Technology Transfer: A Case of Don Honorio Ventura State University (DHVSU) in Bacolor, Pampanga

John Vincent G. Tongol [1], Aaron S. Malonzo [1], Joefil C. Jocson [2]

[1] Don Honorio Ventura State University, Pampanga, Philippines.

[2] Graduate School, Nueva Ecija University of Science and Technology, Nueva Ecija, Philippines.

Corresponding Author: jgtongol.13@gmail.com

Abstract: This study focuses on the development of a comprehensive multi-criteria tool to assess the readiness of Higher Educational Institutions (HEIs) in the domain of technology transfer. Technology transfer plays a crucial role in bridging the gap between academic research and its practical application, thereby fostering innovation and economic growth. The research specifically investigates the case of Don Honorio Ventura State University (DHVSU) in Bacolor, Pampanga, to evaluate its technology transfer preparedness. The study employs an action research approach in establishing the assessment framework. A multi-criteria decision-making model is designed using the Technological, Organizational, and Environmental (TOE) framework. By evaluating these factors, the tool aims to provide a comprehensive assessment of DHVSU's readiness to facilitate technology transfer and innovation. Primary data collection methods, primarily through surveys, are employed to gather data from different stakeholders, including faculty members, administrators, and industry professionals. The collected data are then integrated into the developed multi-criteria tool, which facilitates a systematic evaluation of DHVSU's technology transfer readiness. The findings of this study will contribute to the identification of strengths and weaknesses within DHVSU's technology transfer ecosystem. The assessment outcomes will aid in the formulation of tailored strategies and recommendations to enhance the university's readiness in technology transfer initiatives. Additionally, the multi-criteria tool developed in this research can serve as a valuable resource for other HEIs seeking to evaluate and improve their technology transfer capabilities.

Key Words: — ***Technology transfer, higher educational institutions, multi-criteria assessment tool, readiness assessment.***

I. INTRODUCTION

University technology transfer is a significant component of the national innovation system, and it is highly valued by the academic community, business and industrial field, and related ministries and commissions.

Manuscript revised June 13, 2023; accepted June 14, 2023. Date of publication June 16, 2023.

This paper available online at www.ijprse.com

ISSN (Online): 2582-7898; SJIF: 5.59

Numerous relevant measures have boosted the collaboration among industry, academic, and research institutes and encouraged Research and Development (R&D) and the diffusion of critical technologies in enterprises and industries [1].

An important view in current "political" thinking is the idea that publicly funded research organizations, such as universities or higher education institutions (HEIs), have amassed significant levels of scientific and technical competence as a result of their research activities. This expertise can be applied to produce spin-off technologies (e.g., processes, materials, software) that the parent institution can commercially profit from or transfer to an industrial environment, as well as to expand their traditional training programs to include short or distance

learning courses suitable for industrial needs [2]. Universities, businesses, regional and national economies, as well as society at large, gain from technology transfer. Technology transfer may help improve academic institutions' research, as well as the reputation of the university, its researchers, and their innovations.

This paper is concerned in assessing the readiness level of Don Honorio Ventura State University (DHVSU), an academic institution in Central Luzon Philippines regarding the adaptation of technology transfer through developing a multi-criteria tool that is based in technology-organization-environment (TOE) framework. Since DHVSU is continuously producing researches in various nature and field, technology transfer could possibly be adapted, conducted, and evaluated.

Generally, this study aims to create a criteria-based assessment tool for the general conduct of technology transfer within the Don Honorio Ventura State University (DHVSU) in terms of its readiness regarding technology adaptation within its organization.

Specifically, this study aims (1) to formulate a validated assessment tool in the evaluating the readiness of universities or other institutions in the conduct of technology transfer based on the TOE framework and (2) to assess the level of readiness of Don Honorio Ventura State University (DHVSU) in terms of technology transfer.

II. Literature Review

The phenomenon of technology transfer is also recognized as an important source of the technique and technology development. However, it is often treated simplistically and unilaterally [3]. Although it appears that technology transfer between universities and businesses is occurring more often, only a small number of cooperative projects can really be carried out. On one hand, enterprises have a pressing need for high-tech advancement yet cannot seem to identify appropriate projects. On the other hand, the current science and technology (S&T) advancements do not generate enough interest to realize their economic values. There is no universally agreed benchmark for measuring a university's research accomplishments. Evaluation of technological achievements often centers on technological advancement, such as obtaining international colleague advanced standard or domestic advanced standard. Therefore, in order to enhance the management of technology transfer inside universities, it is vital to investigate the R&D route of S&T projects, assess the factors affecting transfer, and establish the grade standard of university technology transfer readiness level [1].

Literatures clearly demonstrate the significance of technology transfer, but in addition to the transfer itself, the method and management of the transfer are also very important. To have a proper technology transfer process in place is vital. (Lavoie, 2019) Magnussen and Johansson (2008) explain that, for any transfer to be successful, not only do organizations need to be aware of what is going to be transferred and when, but also how the process is being conducted.

With the said context, in order to formulate an assessment tool in assessing the readiness level of an institution or organization regarding the adaptation of technology transfer, specific aspects should be considered to yield relevant and valid results. Additionally, without deep knowledge of the subject (itself technology, processes of technology transfer) and without a well-systematized its knowledge the technology transfer may be inefficient or may be considered inefficient. Thus, establishing a framework is important because it provides a clear and coherent structure for the research and for the conduct of assessment. [3]

This action-research has adapted the technology–organization–environment (TOE) framework which is described in Tornatzky and Fleischer's The Processes of Technological Innovation (1990). The book describes the entire process of innovation–stretching from the development of innovations by engineers and entrepreneurs to the adoption and implementation of those innovations by users within the context of a firm. The TOE framework represents one segment of this process – how the firm context influences the adoption and implementation of innovations [4].

Its strength over other behavior models is the reflection of the impacts of multiple aspects (i.e., internal and external) on adoption decisions based on the following three contextual groups: technology, organization, and environment. The technological context depicts existing technologies in use and new technologies that are relevant to each firm. Organizational context reflects the characteristics of the firm in terms of its scope, size, and resources, while environmental context illustrates the arena in which firms conduct business, including industry, competitors, and government [5].

III. METHODOLOGY

This study employs an action research approach. Action research focuses on social system transformation through action that produces information about a change imposed in a system. And the imposition of a new technology in an organization—deemed as technology transfer—dictates that there is a need for action research. This research deals with the readiness of a higher educational institution (HEI) with regards to technology transfer and the target organization is the Don Honorio Ventura State University (DHVSU) located within Bacolor, Pampanga.

Phase 1: Formulation of an Assessment Tool using TOE framework

Based on the TOE framework, the factors to be considered in the assessment of the readiness of a higher educational institution (HEI) in terms of technology transfer was limited within technology, organization, and environment only. This section defines the scope and parameters that need to be complied by the said institution to determine its level of compliance in the adaptation of new technology as a result of research and development units within its organization.

Technological Factor:

Technology transfer is a complex and varied process that takes place at various levels of technological preparedness. The readiness of an institution or an organization may be assessed through the European Commission's nine (9) Technology Readiness Levels (TRLs). These could be enumerated as: (1) basic principles observed; (2) technology concept formulated; (3) experimental proof of concept; (4) technology validated in laboratory; (5) technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies); (6) technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies); (7) system prototype demonstration in operational environment; (8) system complete and qualified; (9) actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies or in space). [3]

A study which deals with the assessment of an environmentally sound technology transfer, discussed the method of technology transfer as its first dimension—the technological factor of the TOE framework. Factors under this dimension were listed: (1) Legislative Idea; (2) Property Ownership; (3) Transfer Behavior; and (4) Orderly Supervision. A legal framework for environmentally sound technology transfer should be constructed, with the environment technology transfer law serving as its foundation, in order to achieve the systematization and specialization of the legislation on the subject [6].

Organizational Factor:

In the conduct of technology transfer from a higher educational institution (HEI) can be significantly affected by criteria such as income from contract works and income from international projects, among others. However, when HEIs develop new products as a result of research and development (R&D), it is not only aimed towards the technology transfer towards outside private organizations or the government. Among the significant factors established, funding per one researcher, the number of employees within the technology transfer office (TTO), the number of researchers in the university, and the number of publications within the university are significant factors but with descending weights, based on their utilization of the factor relationship method (FARE). Since this study focuses on a government-funded HEI, it is of utmost priority to ensure funding on various R&D activities [7]. The challenges faced by firms that have received government support, funding has a significant effect on the survival of a firm in the long run [8].

The same study discussed Intellectual Property Law as its third dimension—the organizational factor of the TOE framework. Factors under this dimension were listed: (1) Patent Ownership System; (2) Environmentally Sound Technology Standards; and (3) Compulsory Patent Licensing System. Organizations and institutions can profit from the flexibility of international intellectual property agreements as well as the development of a robust intellectual property protection system, which can foster an atmosphere that is beneficial for technological innovation and transfer. Moreover, it also discussed Investment Law as its fourth dimension, which also falls under the organizational factor of the TOE framework [6].

Environmental Factor:

One study focused on analyzing situations of various organizations in the conduct of technology transfer once environmental regulations have been introduced. Particularly in developing countries, there have been negative notions towards the inclusion of environmental regulations as they were deemed to lower an organization's output [9]. In the model developed

by Asano and Matsushima (2014), pollutants damaging the environment of the community, or country, adapting a particular technology are to be considered in the production process. In addition, once pollutants to the receiving community have been recognized, there may be a consequent environmental tax that needs to be charged to the entity that introduces said technology.

The use of technology may cause a number of ecological and environmental issues, but it is also one of the most crucial ways to achieve sustainable development. It was also mentioned that environmental sound technology refers to environmental technology with less pollution, more sustainable utilization of all resources, more recycling of waste, and more acceptable disposal of surplus wastes, as referenced from the Division of Sustainable Development within the United Nation Department of Economic and Social Affairs. This study mentions Environmental Law as its second dimension—the environmental factor of the TOE framework. This includes factors such as Unifying Related Content of Technology Transfer, Expanding the Scope of Technology Transfer, and Actively Promoting International Cooperation on the Transfer of Environmentally Sound Technologies [6].

After determining the indicators under each of the required factors within the framework, a comprehensive assessment tool, which includes all the identified indicators, was formulated. These indications will act as a guide to help grasp each parameter accurately. To properly assess the level of readiness of Don Honorio Ventura State University (DHVSU) as a higher educational institution (HEI) in the conduct of technology transfer, specific data needs to be collected.

Once collected, each indicator will be rated in terms of the university's compliance, with one (1) being the lowest—indicating noncompliance—and five (5) being the highest—indicating that the university has provided evidences of compliance way beyond what's necessary. A table indicating the respective descriptive rating corresponding to each point in the rating scale is presented below.

Table.1. Criteria in Utilizing the Assessment Tool

Rating	Interpretation	Description
5	Very High Compliance	The gathered data or document provided all the required information for that indicator and included additional data or documents after exceeding the requirement.
4	High Compliance	The gathered data or document provided all the required information for that indicator and exceeding the requirement.
3	Compliant	The gathered data or document provided all the required information for that indicator.
2	Low Compliance	The gathered data or document provided is not sufficient but is nearly there to prove compliance for that indicator.
1	Very Low Compliance	The gathered data or document does not provide any evidence of compliance for that indicator

The generated assessment tool is presented below.

Table.2. Developed Assessment Tool

Para Meter	Indicator	Data Collection
Technological Factor	1.1 The technology or innovation was developed as a result of a research conducted by a R&D (research and development) staff of the university.	Proof of publication of said research in at least the university level up to international publication.
	1.2 The technology or innovation has been proven to be useful as reviewed by experts within	Proof that the research was presented at a local or international

	the field of the said invention.	research colloquium.
	1.3 The technology or innovation must be readily available for use with a complete and qualified system.	Proof that the developed technology is a complete and qualified system with all its components from the planning, maintenance, and upgrading.
Organizational Factor	2.1 There is a recognized Intellectual Property Office (IPO) or unit in the university with sufficient number of permanent IP officers.	An established Intellectual Property Office (IPO) with an organizational chart indicating all the members of said unit.
	2.2 There is a recognized R&D (Research and Development) Unit or Department within the university with sufficient number of permanent R&D staff.	An established Research and Development (R&D) Unit with an organizational chart indicating all the members of said unit.
	2.3 There is sufficient funding for the various R&D units within the university.	Statement of account indicating the amount of budget allocated for respective R&D units within the university.
	2.4 The quantity and quality of research publications that are being generated by the R&D staff within the university.	Total count and list of all locally or internationally published research outputs by the R&D staff within the university.
Environmental Factor	3.1 The developed technology or innovation does not yield pollutants that may affect the environment.	Certification that the prototype or any product developed is environment-friendly.
	3.2 There is a unified related content of technology transfer in line with an eco-environmental code.	The university must have a memorandum order which enforces environmentally sound technology transfer.
	3.3 There is an expanded scope of technology transfer including energy conservation and clean technology.	The university must have a memorandum order which encourages development of clean technology, leading towards energy conservation.

After generating the assessment tool, it was subjected to validity and reliability tests. A technology transfer expert, an intellectual property (IP) officer, and an environmental engineer were validators for this study to ensure that all three major components of the TOE framework were verified. Modifications on the initially prepared tool, as suggested by the validators, were reflected for the improvement of the assessment tool. After a series of repetitive consultations with these experts, the final version of the tool was created and was subjected to a reliability test.

In order to determine the internal consistency and reliability of the assessment tool, its Cronbach's alpha must be obtained. Cronbach's alpha assesses how closely connected and comparable the answers provided by a questionnaire's items are to one another. Alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of factors extracted from dichotomous and/or multi-point formatted questionnaires or scales [10]. Obtaining an alpha coefficient of 0.70 or higher indicates internal consistency and reliability for the instrument.

Engineer managers that are involved with adaptation of new technologies within their organization are the expected users of this assessment tool. Thus, the level of readiness of Don Honorio Ventura State University (DHVSU) was subjected to the assessment of four (4) engineer managers using the assessment tool. A purposive sampling technique was utilized to select the respondents for this initial assessment.

Using the Statistical Package for Social Sciences (SPSS), the internal consistency and reliability of the assessment tool, as utilized by this initial group to assess the level of readiness of DHVSU in receiving a technology that was developed through research by the engineering department of the university, was measured.

To ensure as well that the responses of this initial group show consistency, the sets of responses were compared using One-Way ANOVA. One-way ANOVA (Analysis of Variance) is a statistical method used to compare the means of three or more groups. Whether the differences in the means of the responses of each member of the initial group is statistically significant or not was determined using One-Way ANOVA. The F-statistic is calculated by dividing the between-group variance by the within-group variance. If the F-value is greater than the critical F-value, it suggests that there is at least one statistically significant difference between the means of the groups [11].

Phase 2: Data Collection

The next stage of the methodology deals with the collection of necessary documents that needs to be used in the evaluation of the level of readiness of an HEI in terms of technology transfer. To provide actual evidences on each indicator, the following documents needs to be collected:

- *Proof of Publication and Presentation* – An innovation is developed as an output of a research; thus, there is a need that particular research be published, locally or internationally, and presented to various colloquiums. This may evaluate Items 1.1, 1.2, and 1.3 of the assessment tools.
- *Official Website of the Higher Educational Institution (HEI)* – An official website contains the hierarchy of the organizational structure of the institution. From here, Items 2.1 and 2.2 from the assessment tool may be evaluated.
- *Documentation of Internal Budget and Resources Allocation* – The annual budget of an institution or university needs to be allocated to various purposes and research is one of the many units that requires funding. Based on this document, a breakdown of the budget allotted for research and development (R&D) may evaluate Item 2.3 of the assessment tool.
- *List of Published Research Outputs* – After knowing the particular unit responsible for research and development in the institution or university, the number of outputs can be identified. The total count and list of all locally or internationally published research outputs by the R&D staff within the university can be established; thus, evaluating Item 2.4 of the assessment tool.
- *Certification of Environmental Compliance* – A certificate indicating that the output produced is compliant to environmental laws must be presented to ensure that the said innovation is environment-friendly. This may evaluate Item 3.1 of the assessment tool.
- *List of Memorandum Orders* – Memorandum Orders dictate new provisions or guidelines to be implemented within an institution or a university. A memorandum order may be drafted by various directors, unit heads, or college deans. Depending on the existing memos, Items 3.2 and 3.3 from the assessment tool may be evaluated.

Each item in the abovementioned list may be used to complete the assessment tool. Based on the quality of the document provided, corresponding scores may be provided to respective items or indicators in the tool. A different group, comprised of ten (10) engineer managers, utilized the tool to assess the level of readiness of DHVSU in terms of technology transfer. Then, the average score of all items may be obtained to identify the level of readiness of the institution of university being assessed.

Table.3. Criteria in Utilizing the Assessment Tool

Range	Interpretation	Description
4.00–5.00	High Compliance	The institution or university is ready for adapting said innovation or technology. Evidences of better-quality documents can indicate readiness to a wide range of technologies to be adapted.

3.00–3.99	Compliant	The institution or university is ready for adapting said innovation or technology. Many other types of technologies can be adapted if items with a score below 3.0 can be improved.
1.00–2.99	Noncompliant	The institution or university is not ready for adapting said innovation or technology. All documents in each item must be improved, especially those with a score below 3.0

Based on the results of the analysis, the potential for successful conduct of technology transfer may be identified. If the overall compliance score is above 3.00, it could be said that the institution or university is ready for adapting said innovation or technology. Conversely, if the score is below 3.00, it suggests that more work needs to be done to improve the institution or university's readiness for technology transfer. In such cases, recommendations could be made to address the identified weaknesses in order to improve its readiness.

IV. Results and Discussion

The assessment tool that was developed was subjected to the evaluation of the engineer managers. The four (4) sets of responses are presented as follows:

Table.4. Summary of Responses of the Initial Group

Parameter	Indicator	R1	R2	R3	R4
Technological Factors	T1 (1.1)	4	4	4	4
	T2 (1.2)	4	4	3	3
	T3 (1.3)	4	3	4	3
Organizational Factors	O1 (2.1)	4	4	4	4
	O2 (2.2)	5	4	4	5
	O3 (2.3)	4	3	4	3
	O4 (2.4)	4	4	4	3
Environmental Factors	E1 (3.1)	4	4	4	4
	E2 (3.2)	4	3	3	3
	E3 (3.3)	4	3	3	3
Overall Rating		4.1	3.6	3.7	3.5

The table below shows the results of the reliability test.

Table.5. Reliability Statistics using Cronbach's Alpha

Reliability Statistics	
Cronbach's Alpha	Number of Items
.776	10

The statistical analysis produced a result .776 for the Cronbach's alpha coefficient, indicating that all 10 items were within the acceptable range of internal consistency. This result suggests that the assessment tool is reliable and could be used to properly assess the level of readiness of a higher educational institution or a university in terms of technology transfer.

Using One-Way ANOVA, the difference between the means of the four (4) responses were compared.

Table.6. Comparison of Means using One-Way ANOVA

Comparison of Means					
Scores	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.075	3	.692	2.515	.074
Within Groups	9.900	36	.275		
Total	11.975	39			

At 95% level of significance (α=0.05), the value for F-critical is 2.866. There were no statistically significant differences between means of the responses of the four (4) engineer managers as determined by one-way ANOVA ($F(3,39) = 2.515$, $p = .074$). This shows that even though there is an obvious difference between the means of each respondent's scores, this difference is not statistically significant, which leads to the idea that the assessment tool could actually be used by engineer managers.

After assessing the reliability and validity of the tool, it was subjected to the use of a different set of engineer managers. The summary of responses for each engineer manager is presented in the succeeding tables below. First, the assessments of the respondents of the readiness of DHVSU as an institution regarding technology transfer in terms of Technological Factors.

Table.7. Assessment of Technology Transfer Readiness in terms of Technological Factors (TF)

Respondents	Technological Factors (TF)		
	T1 (1.1)	T2 (1.2)	T3 (1.3)
R1	3	3	3
R2	4	4	3
R3	4	3	3
R4	4	3	3
R5	4	4	4
R6	4	4	3
R7	4	3	4
R8	3	3	3
R9	4	3	3
R10	3	3	3
Average	3.70	3.30	3.20

Next, the assessments of the respondents of the readiness of DHVSU as an institution regarding technology transfer in terms of Organizational Factors.

Table.8. Assessment of Technology Transfer Readiness in terms of Organizational Factors (OF)

Respondents	Organizational Factors (OF)			
	O1 (2.1)	O2 (2.2)	O3 (2.3)	O4 (2.4)
R1	3	3	3	3
R2	4	4	3	4
R3	4	4	3	3
R4	4	5	3	3
R5	4	5	4	4
R6	4	5	3	3
R7	4	4	4	4
R8	4	4	3	3
R9	4	5	3	3
R10	4	5	4	3
Average	3.90	4.40	3.30	3.30

Then, the assessments of the respondents of the readiness of DHVSU as an institution regarding technology transfer in terms of Environmental Factors.

Table.8. Assessment of Technology Transfer Readiness in terms of Environmental Factors (EF)

Respondents	Environmental Factors (EF)		
	E1 (3.1)	E2 (3.2)	E3 (3.3)
R1	3	3	3
R2	4	3	3
R3	3	3	3
R4	3	3	3
R5	4	4	4
R6	3	3	3
R7	4	3	3
R8	3	3	3
R9	4	3	3
R10	3	3	3
Average	3.40	3.10	3.10

Finally, the average responses per factor and per respondent are summarized below. Consequently, the overall assessment for DHVSU in terms of its readiness in technology transfer is also presented in the table below.

Table.9. Assessment of Technology Transfer Readiness

Respondents	Average Rating			
	TF	OF	EF	Overall
R1	3.00	3.00	3.00	3.00
R2	3.67	3.75	3.33	3.60
R3	3.33	3.50	3.00	3.30
R4	3.33	3.75	3.00	3.40
R5	4.00	4.25	4.00	4.10
R6	3.67	3.75	3.00	3.50
R7	3.67	4.00	3.33	3.70
R8	3.00	3.50	3.00	3.20
R9	3.33	3.75	3.33	3.50
R10	3.00	4.00	3.00	3.40
Average	3.400	3.725	3.200	3.470

Based on the calculated results, the average rating for the level of readiness of DHVSU as an institution regarding technology transfer are all above 3.00. The average scores obtained for technological factor, organizational factor, and environmental factor are 3.400, 3.725, and 3.200, respectively. With an overall average of 3.470, DHVSU is said to be compliant and is ready for the adaptation of new technology. Based on Table 3, the said institution is merely compliant but have not gone beyond what is expected of it to be more ready regarding technology transfer.

V. CONCLUSION

This action research has successfully developed a comprehensive tool to assess the readiness of higher educational institutions in the context of technology transfer.

The study focused specifically on Don Honorio Ventura State University (DHVSU) in Bacolor, Pampanga, providing valuable insights into the institution's preparedness to engage in technology transfer activities.

Through an extensive review of relevant literature and the application of a multi-criteria evaluation framework, the study identified key factors that contribute to the readiness of HEIs for technology transfer. These factors encompassed various dimensions, including human resources, research and development capabilities, industry collaboration, and intellectual property management. The assessment tool, having been subjected to validity and reliability tests, received a Cronbach's Alpha coefficient of .776, which indicates internal consistency within its items. The tool was then used to assess the level of readiness of Don Honorio Ventura State University (DHVSU) in terms of technology transfer. It was found out that the said institution is said to be compliant, with a corresponding level of readiness of 3.470.

By employing this newly developed tool, DHVSU and other HEIs can now assess their current state of readiness for technology transfer initiatives. The tool serves as a valuable resource for institutional decision-makers, enabling them to identify strengths, weaknesses, and areas for improvement. By addressing these gaps, HEIs can enhance their capacity to effectively transfer technology and foster meaningful collaborations with industry partners.

The findings of this study contribute to the broader field of technology transfer in higher education by providing a systematic and practical approach to assessing readiness. The multi-criteria tool offers a structured framework that can be adapted and applied to other institutions, facilitating comparative assessments and benchmarking exercises. This contributes to the advancement of technology transfer practices and enhances the overall innovation ecosystem within higher education.

It is worth noting that while this study focused on DHVSU, the developed tool has the potential to be customized and implemented in other HEIs across different geographic locations. Further research and validation studies are encouraged to refine and enhance the tool's effectiveness and applicability to various contexts.

In conclusion, the development of this multi-criteria tool represents a significant step forward in assessing the readiness of HEIs for technology transfer. By empowering institutions to evaluate their capabilities and make informed decisions, the tool contributes to the overall goal of fostering innovation, knowledge dissemination, and industry collaboration within higher education institutions.

To further improve the level of readiness of the institution with regards to technology transfer, it is recommended that an improvement on items under the Environmental Factors (EF) within the TOE framework be executed. Since the university is working towards achieving a higher level of accreditation, it should have a wider scope of technology—including energy conservation and clean technology—that it will adapt within its organization. Similarly, the organization should have an improved memorandum which enforces environmentally sound technology transfer. TOE (technology-organizational-environmental) framework is already suited for the actual assessment since it resulted into an internally consistent tool, though an improved assessment tool could be made by increasing the number of sub-factors to be considered in the assessment.

REFERENCES

[1]. Z. Juan, L. Wei and P. Xiamei, "Research on Technology Transfer Readiness Level and Its Application in University Technology Innovation Management," 2010 International Conference on E-Business and E-Government, Guangzhou, China, 2010, pp. 1904-1907.

[2]. E. R.J. Bell, "Some current issues in technology transfer and academic-industrial relations: a review," Technology Analysis & Strategic Management, vol. 5, no. 3, pp. 307-322, 1993.

[3]. A. Toca*, V. Iațchevici, T. Nițulenco, and N. Rusu, "Some aspects of technology transfer," in MATEC Web of Conferences, January 2018, vol. 178, no. 2, p. 08006.

[4]. J. Baker, "The Technology–Organization–Environment Framework," in Information Systems Theory, pp. 231-245, University of Hamburg, Hamburg, Germany, September 2011.

[5]. Nguyen, T. H., Le, X. C., and Vu, T. H. L., "An Extended Technology-Organization-Environment (TOE) Framework for Online Retailing Utilization in Digital Transformation: Empirical Evidence from Vietnam," Journal of Open Innovation: Technology, Market, and Complexity, vol. 8, no. 4, p. 200, 2022.

[6]. Z. Zhang and X. Ren, "Multidimensional Legal Research on the Transfer of Environmentally Sound Technologies in China," Sustainability, vol. 15, no. 3, p. 2151, 2023.

[7]. J. Stankevičienė, L. Kraujalienė, and A. Vaiciukevičiūtė, "Assessment of technology transfer office performance for value creation in higher education institutions," Pages 1063-1081, Received 28 Mar 2017, Accepted 13 Nov 2017, Published online: 20 Dec 2017.

[8]. D. Smith, M. Feldman, and G. Anderson, "The longer-term effects of federal subsidies on firm survival: evidence from the advanced technology program," J Technol Transf, vol. 43, pp. 593-614, 2018.

[9]. T. Asano and N. Matsushima, "Environmental Regulation and Technology Transfers," ISER Discussion Paper, no. 862, Dec. 17, 2012.

[10]. J. R. A. Santos, "Cronbach's Alpha: A Tool for Assessing the Reliability of Scales," Journal of Extension, vol. 37, no. 2, April 1999.

[11]. F. J. Gravetter and L. B. Wallnau, "Essentials of Statistics for the Behavioral Sciences," 8th ed., Jon-David Hague, Publisher, Wadsworth, Cengage Learning, 2014.