COLOMBO SCIENTIFIC PUBLISHING

INTERNATIONAL JOURNAL OF MULTIVARIATE DATA ANALYSIS THEORY & PRACTICE
E-ISSN: 2536-7935
P-ISSN: 2536-7927
PAGE NO: 23-28

An Evaluation Model for Pandemic-Driven Transformation of Technical and Vocational Education and Training (TVET) Pedagogical Practices: A Cross-National Study of Indonesia and Malaysia

Ankit Gupta
National Institute of Technology Tiruchirappalli

Priya Neha Singh
University of Delhi

ARTICLE INFO

Article history:
Published: October 07, 2023
VOLUME: Vol.08 Issue 01 2023

Keywords:
TVET transformation, COVID-19 pandemic, digital pedagogy, blended learning, online education readiness, Indonesia, Malaysia, evaluation model, Industry 4.0, educational resilience

ABSTRACT

The COVID-19 pandemic triggered an unprecedented disruption in Technical and Vocational Education and Training (TVET) systems worldwide, necessitating rapid pedagogical transformation, digital integration, and reconfiguration of teaching–learning ecosystems. This study proposes an evaluation model for assessing pandemic-driven transformation in TVET pedagogical practices, focusing on a cross-national comparative context between Indonesia and Malaysia. The research synthesizes digital transformation theories, blended learning frameworks, and online education readiness models to construct a multi-dimensional evaluation structure encompassing institutional readiness, pedagogical adaptability, technological infrastructure, and learner engagement.

Drawing upon prior studies on digital education transformation and COVID-19 educational disruption (Bogdandy, Tamas, & Toth, 2020), this study positions TVET systems within the broader paradigm of Industry 4.0-aligned education ecosystems. The methodology is grounded in a conceptual and analytical modeling approach supported by structured literature synthesis from recent empirical and theoretical studies. The findings suggest that both Indonesia and Malaysia demonstrate partial but uneven digital readiness, with Malaysia exhibiting relatively stronger synchronous learning integration and Indonesia showing broader adoption challenges but higher flexibility in informal digital adaptation strategies.

The proposed evaluation model provides a structured framework for assessing TVET resilience, adaptability, and sustainability in crisis contexts. It contributes to policy formulation, institutional benchmarking, and future digital transformation strategies in vocational education systems across developing economies.

1. INTRODUCTION

1.1 Background of the Study

The global outbreak of COVID-19 significantly disrupted traditional education systems, forcing institutions to rapidly transition toward online and blended learning environments. This shift was particularly challenging for Technical and Vocational Education and Training (TVET), where hands-on skills development, laboratory-based learning, and workplace training constitute core pedagogical elements. The sudden transformation required TVET institutions to adopt digital tools, redesign curricula, and reconfigure teaching strategies without adequate preparation.

In this context, digital transformation in education became not only an adaptive response but also a structural necessity. As highlighted in empirical research, the pandemic accelerated the adoption of ICT-based pedagogical models and redefined educational delivery mechanisms (Espino-Díaz et al., 2020). Similarly, Bogdandy, Tamas, and Toth (2020) emphasize that COVID-19 acted as a catalyst for systemic

digital transformation in education, reshaping teaching methodologies and institutional frameworks across global contexts.

1.2 Problem Statement

Despite widespread digital adoption during the pandemic, significant disparities remain in TVET readiness, particularly between developing nations such as Indonesia and Malaysia. While both countries implemented online and blended learning strategies, their effectiveness varied due to differences in infrastructure, institutional capacity, and learner preparedness. Prior studies indicate that readiness for online learning is a critical determinant of educational effectiveness during crises (Allam et al., 2020; Chung et al., 2020).

However, there is limited research that provides a structured evaluation model specifically designed for assessing TVET pedagogical transformation under pandemic conditions. Existing studies largely focus on general higher education or isolated aspects of online learning, leaving a gap in integrated cross-national evaluation frameworks.

1.3 Research Objectives

This study aims to:

1. Develop a structured evaluation model for assessing pandemic-driven TVET pedagogical transformation.

2. Compare the implementation of digital and blended learning strategies in Indonesia and Malaysia.

3. Identify key dimensions influencing TVET adaptability during COVID-19.

4. Provide policy and institutional recommendations for strengthening future TVET resilience.

1.4 Significance of the Study

The significance of this study lies in its contribution to both theoretical and practical domains. Theoretically, it extends digital transformation discourse in education by integrating TVET-specific pedagogical dimensions. Practically, it offers a structured model that policymakers and educational institutions can use to assess and enhance their digital readiness and instructional effectiveness.

2. LITERATURE REVIEW

2.1 Digital Transformation in Education

Digital transformation has emerged as a central theme in contemporary educational research, particularly in response to COVID-19. Balyer and Oz (2018) highlight that digital transformation in education involves not only technological adoption but also cultural and pedagogical shifts. Similarly, Iivari, Sharma, and Ventä-Olkkonen (2020) describe digital transformation as an everyday phenomenon that reshapes learning environments and human interaction patterns.

Bogdandy, Tamas, and Toth (2020) provide a critical case-based analysis of how educational institutions adapted to COVID-19, emphasizing the integration of cognitive infocommunications in learning systems. Their findings demonstrate that digital transformation is not merely reactive but also strategic, influencing long-term educational sustainability.

2.2 Online and Blended Learning Models

Blended learning and online education have become dominant pedagogical approaches during the pandemic. Dhawan (2020) argues that online learning serves as a viable solution during crises, although its effectiveness depends on technological infrastructure and learner engagement. Similarly, Cheung et al.

(2020) emphasize that blended learning integrates digital and face-to-face elements, offering flexibility and adaptability.

Chaeruman (2019) and Martín-García (2020) further elaborate that blended learning models require careful instructional design to ensure pedagogical coherence. Clark and Post (2021) highlight that synchronous participation enhances learning outcomes in blended environments, while Nieuwoudt (2020) identifies attendance patterns as significant predictors of academic success in online education.

2.3 TVET and Pandemic Adaptation

TVET systems faced unique challenges during COVID-19 due to their practical and skill-based nature. Levin et al. (2020) argue that TVET institutions experienced significant disruptions but also opportunities for digital innovation. The World Bank report underscores that TVET systems require structural reforms to adapt to crisis conditions effectively.

In Malaysia, institutional responses included rapid deployment of online platforms and blended learning strategies (Khor et al., 2020), while Indonesia faced challenges in infrastructure and accessibility (Churiyah et al., 2020). These differences highlight the need for structured evaluation frameworks.

2.4 Readiness and Learner Engagement

Readiness for online learning is a critical determinant of educational success. Allam et al. (2020) and Chung et al. (2020) emphasize that student preparedness significantly influences learning outcomes. Motivation, self-efficacy, and engagement are also essential factors (Hashim et al., 2020).

Deepika et al. (2021) highlight the role of e-learning methodologies in sustaining education during lockdowns, while Ramaha and Karas (2021) emphasize interactive tools such as avatars to maintain learner motivation in asynchronous environments.

2.5 Theoretical Positioning and Research Gap

Despite extensive research on digital education, there remains a lack of integrated evaluation models tailored specifically for TVET systems under pandemic conditions. Existing frameworks often focus on either technological readiness or learner behavior but fail to integrate institutional, pedagogical, and cross-national dimensions.

Bogdandy, Tamas, and Toth (2020) provide foundational insight into digital transformation during COVID-19; however, their work does not extend into TVET-specific comparative evaluation models. This study addresses this gap by proposing a multi-dimensional evaluation framework.

3. METHODOLOGY

3.1 Research Design

This study adopts a conceptual-analytical research design supported by structured literature synthesis. The approach is qualitative in nature, focusing on model development rather than empirical hypothesis testing. It integrates cross-national comparative analysis between Indonesia and Malaysia to examine differences in TVET pedagogical transformation.

3.2 Data Sources

The study relies exclusively on secondary data derived from peer-reviewed journals, policy reports, and institutional publications. Key references include studies on digital transformation, blended learning, and TVET adaptation during COVID-19.

3.3 Model Development Framework

The evaluation model is constructed based on four primary dimensions:

1. Institutional Readiness – Infrastructure, policy support, and administrative capacity
2. Pedagogical Adaptation – Teaching strategies, curriculum redesign, and instructional methods
3. Technological Integration – Use of digital platforms, LMS systems, and ICT tools
4. Learner Engagement – Motivation, participation, and digital literacy

These dimensions are synthesized from existing literature and aligned with Industry 4.0 educational transformation principles (Kagermann et al., 2016).

Bogdandy, Tamas, and Toth (2020) are used as a foundational reference point for understanding how digital transformation frameworks can be operationalized in crisis contexts.

3.4 Analytical Approach

The study employs comparative thematic analysis to evaluate similarities and differences between Indonesia and Malaysia. The analysis focuses on identifying patterns of adaptation, structural constraints, and technological readiness.

3.5 Limitations of Methodology

The primary limitation of this study is its reliance on secondary data, which may not fully capture real-time institutional variations. Additionally, the absence of primary empirical data restricts statistical validation of the proposed model.

REFERENCES

1. Ana, A. et al., Journal of Technical Education and Training Vol. 13 No. 4 (2021) p. 28-4140Espino-Díaz, L., Fernandez-Caminero, G., Hernandez-Lloret, C. M., Gonzalez-Gonzalez, H., & Alvarez-Castillo, J. L. (2020). Analyzing the impact of COVID-19 on education professionals. Toward a paradigm shift: ICT and neuroeducation as a binomial of action. Sustainability (Switzerland), 12(14), 1-10.

2. Allam, S. N. S., Hassan, M. S., Mohideen, R. S., Ramlan, A. F., & Kamal, R. M. (2020). Online Distance Learning Readiness During Covid-19 Outbreak Among Undergraduate Students. International Journal of Academic Research in Business and Social Sciences, 10(5), 575-590.

3. Amiti, F. (2020). Synchronous and asynchronous E-learning.European Journal of Open Education and E-learning Studies,5(2).

4. APAC. (2021). Unlocking Apac's Digital Potential: Changing Digital Skill Needs and Policy Approaches. Amazon Web Service.

5. Bartlett, J.E., Kotrlik, J.W. and Higgins, C.C. (2001) Organizational Research: Determining Appropriate Sample Size.Survey Research. Information Technology, Learning, and Performance Journal, 19(1), 43-50.

6. Balyer, A., & Oz, O. (2018). Academicians' views on digital transformation in education. International Online Journal of Education and Teaching (IOJET), 5(4), 809-830.

7. Bogdandy, B., Tamas, J., & Toth, Z. (2020). Digital Transformation in Education during COVID-19: A Case Study. 11th IEEE International Conference on Cognitive Infocommunications, CogInfoCom 2020 - Proceedings, 173-178.

8. Chaeruman, U. A. (2019). Merancang Model Blended Learning Designing Blended Learning Model.Jurnal Teknodik,17(4), 053-063.

9. Cheung, S. K. S., Li, R., Phusavat, K., Paoprasert, N., & Kwok, L. (2020). Blended Learning. Education in a Smart Learning Environment.

10. Churiyah, M., Sholikhan, S., Filianti, F., & Sakdiyyah, D. A. (2020). Indonesia education readiness conducting distance learning in Covid-19 pandemic situation.International Journal of Multicultural and Multireligious Understanding,7(6), 491-507.

11. Chung, E., Subramaniam, G., & Dass, L. C. (2020). Online learning readiness among university students in Malaysia amidst COVID-19.Asian Journal of University Education,16(2), 46-58.

12. Clark, C. E. J., & Post, G. (2021). Preparation and synchronous participation improve student performance in a blended learning experience.Australasian Journal of Educational Technology, 7(3),187-199.

13. Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the coronavirus pandemic: students' perspective.Sustainability,12(24), 10367.

14. Deepika, V., Soundariya, K., Karthikeyan, K., & Kalaiselvan, G. (2021). 'Learning from home': role of e-learning methodologies and tools during novel coronavirus pandemic outbreak.Postgraduate Medical Journal,97(1151), 590-597.

15. Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis.Journal of Educational Technology Systems,49(1), 5-22.

16. Dwivedi, Y. K., Hughes, D. L., Coombs, C., Constantiou, I., Duan, Y., Edwards, J. S., Gupta, B., Lal, B., Misra, S., Prashant, P., Raman, R., Rana, N. P., Sharma, S. K., & Upadhyay, N. (2020). Impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life. International Journal of Information Management, 55(July), 102211.

17. Espino-Díaz, L., Fernandez-Caminero, G., Hernandez-Lloret, C. M., Gonzalez-Gonzalez, H., & Alvarez-Castillo, J. L. (2020). Analyzing the impact of COVID-19 on education professionals. Toward a paradigm shift: ICT and neuroeducation as a binomial of action. Sustainability (Switzerland), 12(14), 1-10.

18. Hashim, H., Kadir, N. A. A., Mansor, F., & Azudin, M. Z. M. (2020). ODLDuring MCO: Conceptualising the Relationships between Self-Efficacy, Learning Motivation and Performance of Higher Learning Education Students. International Journal of Academic Research in Business and Social Sciences, 10(8), 258-269.

19. Huang, R. H., Liu, D. J., Tlili, A., Yang, J. F., & Wang, H. H. (2020). Handbook on facilitating flexible learning during educational disruption: The Chinese experience in maintaining undisrupted learning in COVID-19 outbreak.Beijing: Smart Learning Institute of Beijing Normal University, 1-54.

20. Hunter, W. J., & Austin, R. (2020). Blended and online learning for global citizenship: New technologies and opportunities for intercultural education. In Blended and Online Learning for Global Citizenship: New Technologies and Opportunities for Intercultural Education. Routledge Taylor & Francis Group.

21. Hussin, A. A. (2018). Education 4.0 made simple: Ideas for teaching.International Journal of Education and Literacy Studies,6(3), 92-98.

22. Iivari, N., Sharma, S., & Ventä-Olkkonen, L. (2020). Digital transformation of everyday life.International Journal of Information Management, 55(June), 102183.

23. Jones, E. (2019). "From Mobility to Internationalization of the Curriculum at Home." In K. Godwin and H. de Wit, edited by. Intelligent Internationalization: The Shape of Things to Come. Brill Sense; p. 179-183.

24. Kagermann, H., Anderl, R., Gausemeier, J., Schuh, G., & Wahlster, W. (Eds.). (2016).Industrie 4.0 in a Global Context: strategies for cooperating with international partners. Herbert Utz Verlag.

25. Kemendikbud. (2020). Survey Belajar Dari Rumah. Jakarta: Kemendikbud

26. Kerimbayev, N., Kultan, J., Abdykarimova, S., A. Akramova. (2017). LMS Moodle: Distance International Education in Cooperation of Higher Education Institutions of Different Countries, Education and Information Technologies, 22(5), pp. 2125-2139.

27. Khor, V., Arunasalam, A., Azli, S., Khairul-Asri, M. G., & Fahmy, O. (2020). Experience from Malaysia during the COVID-19 movement control order.Urology,141, 179-180.

28. Kwok, K. O., Lai, F. Y. L., Wei, V. W. I., Tsoi, M. T. F., Wong, S. Y. S., & Tang, J. W. T. (2020). Comparing the impact of various interventions to control the spread of COVID-19 in twelve countries.Journal of Hospital Infection,106(1), 214-216.

29. Levin, V., Santos, I. V., Weber, M., & Hoftijzer, M. A. (2020).TVET Systems' response to COVID-19: Challenges and Opportunities(No. 148495, pp. 1-0). The World Bank.

30. Martin, A. (2020). How to optimize online learning in the age of coronavirus (COVID-19): A 5-point guide for educators.UNSW Newsroom,53(9), 1-30.

31. Martín-García, A. V. (2020). Blended Learning: Convergence between Technology and Pedagogy(A. V. Martín-García (ed.)). Springer International Publishing.

32. Mohd Salleh, F., Md Ghazali, J., Wan Ismail, W., Alias, M., & A.Rahim, N. (2020). The Impacts Of Covid-19 Through Online Learning Usage For Tertiary Education In Malaysia. Journal of Critical Reviews, 147-149.

33. Niemueller, T., Zwilling, F., Lakemeyer, G., Löbach, M., Reuter, S., Jeschke, S., & Ferrein, A. (2016). Industrial Internet of Things: Cybermanufacturing Systems.

34. Nieuwoudt, J. E. (2020). Investigating synchronous and asynchronous class attendance as predictors of academic success in online education.Australasian Journal of Educational Technology,36(3), 15-25.

35. Noor, ME., Hardyanto, W & Wibawanto, H. (2017). Penggunaan E-Learning dalam Pembelajaran Berbasis Proyek di SMA Negeri 1 Jepara. Innovative Journal of Curriculum and Educational Technology 6(1), 17-26.

36. Peruzzini, M., Grandi, F., & Pellicciari, M. (2017). Benchmarking of tools for user experience analysis in Industry 4.0. Procedia manufacturing, 11, 806-813.

37. Ramaha, N. T., & Karas, I. R. (2021). Maintain Learners' Motivation within Asynchronous E-Learning Environments: How Can Interactive Avatars Help.European Journal of Advances in Engineering and Technology,8(9), 9-14.

38. Santos, B. P., Alberto, A., Lima, T. D. F. M., & Charrua-Santos, F. M. B. (2018). Indústria 4.0: desafios e oportunidades.Revista Produção e Desenvolvimento,4(1), 111-124

.