

Transformational Leadership as a Driver of Sustainable Practices in Tvet Institutions

Amir Aris, Nurhayati Kamarudin*, Wirda Syaheera Mohd Sulaiman

University Technical Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

*Corresponding Author

DOI: <https://dx.doi.org/10.47772/IJRISS.2025.910000650>

Received: 26 October 2025; Accepted: 04 November 2025; Published: 20 November 2025

ABSTRACT

Transformational leadership has emerged as a pivotal approach in guiding Technical and Vocational Education and Training (TVET) institutions toward sustainable practices. This study examines the influence of transformational leadership on the implementation of sustainability-focused policies and practices within Malaysian TVET institutions. The research highlights how leadership behaviours such as inspirational motivation, intellectual stimulation, idealized influence, and individualized consideration contribute to the development of environmental awareness, resource efficiency, and social responsibility. Data were gathered from 120 respondents across five TVET colleges using a structured questionnaire and analyzed using descriptive and regression analyses. Findings reveal that transformational leadership significantly predicts the integration of sustainable practices in teaching, campus operations, and institutional governance. The study underscores the importance of leadership development and organizational culture in realizing sustainability goals across TVET ecosystems.

Keywords: Transformational Leadership, Sustainable Practices, TVET, Leadership Development, Environmental Sustainability.

INTRODUCTION

Leadership plays a fundamental role in shaping institutional direction, culture, and long-term performance, particularly within Technical and Vocational Education and Training (TVET) institutions that serve as engines of workforce development and industrial transformation. In today's rapidly evolving world, leadership is not only about administrative efficiency or academic governance but also about the ability to envision, influence, and mobilize others toward sustainable futures. Transformational leadership, characterized by inspiration, intellectual stimulation, individualized consideration, and idealized influence, is therefore considered a vital approach for aligning institutional strategies with sustainability imperatives. It empowers individuals to exceed expectations and fosters a sense of collective responsibility toward social, economic, and environmental goals.

Within the context of Malaysia's National TVET Policy and the 2030 Agenda for Sustainable Development, the integration of sustainability principles into TVET institutions has become a national priority. The Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 12 (Responsible Consumption and Production), emphasize the need for education systems to cultivate sustainability-oriented mindsets and competencies. This transformation requires leaders who can steer institutions beyond traditional technical training models toward comprehensive frameworks that incorporate green skills, digital readiness, inclusivity, and ethical stewardship. As Malaysia transitions toward an innovation-driven and low-carbon economy, TVET leaders are expected to promote green technologies, renewable energy awareness, waste minimization, and sustainable production practices through both curriculum and institutional management.

However, despite strong policy direction, many TVET institutions continue to face challenges in translating sustainability goals into practical actions. Studies have shown that while policy documents frequently highlight

sustainability, implementation remains fragmented due to limited leadership capacity, resource constraints, and lack of institutional coherence (Aziz et al., 2022; Goh & Rahman, 2023). In some cases, sustainability is perceived as an additional burden rather than an integrated institutional value. Leadership gaps such as limited strategic vision, resistance to change, or insufficient empowerment of middle managers and educators hinder the ability to embed sustainability into daily operations and teaching practices. Consequently, there is a pressing need to understand how transformational leadership behaviours can drive sustainable transitions across TVET ecosystems.

Transformational leadership offers a powerful lens to address these challenges. Through the articulation of a clear and inspiring vision, leaders can motivate staff and students to embrace sustainability as part of the institution's identity and mission. Intellectual stimulation encourages innovation and creative problem solving in implementing green initiatives, while individualized consideration nurtures the professional growth of educators and administrators who become change agents within their contexts. Such leaders cultivate a shared sense of purpose, aligning institutional objectives with broader environmental and societal needs. In doing so, transformational leadership acts as both a catalyst and an anchor for sustainability in TVET bridging the gap between policy intent and operational reality.

Moreover, the contemporary TVET landscape is influenced by globalization, digitalization, and environmental pressures that demand adaptive and visionary leadership. The Fourth Industrial Revolution (IR4.0) introduces opportunities for technological innovation but also challenges institutions to ensure that technology adoption supports, rather than undermines, sustainable development. Transformational leaders are uniquely positioned to balance these priorities leveraging technology to reduce carbon footprints, enhance learning efficiency, and foster green innovation among students and industry partners. They facilitate partnerships between academia, industry, and government to co-develop sustainable solutions that extend beyond institutional boundaries, contributing to national and regional sustainability goals.

Another crucial dimension is the development of an institutional culture that values sustainability. Leadership plays an integral role in shaping this culture through policy framing, communication, and role modelling. Transformational leaders create an environment of trust, participation, and continuous learning where sustainability is embedded in every decision-making process from procurement and waste management to curriculum design and community engagement. This systemic approach ensures that sustainability becomes not an isolated project but a sustained organizational ethos.

In the Malaysian context, the integration of sustainability within TVET institutions aligns with the aspirations of the Twelfth Malaysia Plan (2021–2025) and the National Energy Transition Roadmap (2023), which emphasize human capital development for a green economy. Transformational leadership, therefore, is not merely an internal management strategy but a strategic national lever to prepare a skilled, responsible, and future-oriented workforce. Leaders in TVET must demonstrate strategic foresight and ethical integrity while ensuring that sustainability initiatives translate into measurable outcomes such as reduced environmental impact, improved employability, and enhanced community well-being.

Given this backdrop, the present study aims to explore how transformational leadership drives sustainable practices in TVET institutions by examining its influence across three dimensions—environmental, economic, and social sustainability. Specifically, it seeks to determine the extent to which leadership behaviours and institutional culture predict the adoption of sustainable campus operations, green curriculum integration, and inclusive governance mechanisms. By doing so, this research contributes to the growing discourse on leadership and sustainability in vocational education, offering insights that may guide policymakers, educators, and institutional leaders in designing leadership development programs that advance sustainability transformation in Malaysia's TVET ecosystem.

LITERATURE REVIEW

Concept of Transformational Leadership

Transformational leadership was first introduced by Burns (1978) as a leadership approach that elevates followers' motivation, morality, and performance by appealing to higher ideals and values. Later, Bass and Avolio (1994) expanded the concept into a multidimensional framework comprising idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Together, these dimensions encourage followers to transcend personal interests for the collective good of the organization. Transformational leaders emphasize vision, purpose, and change, encouraging creativity, innovation, and commitment toward long-term goals.

In educational institutions, transformational leadership plays a central role in developing institutional culture, influencing pedagogical innovation, and shaping the moral and social dimensions of learning. Unlike transactional leadership, which focuses on rewards and compliance, transformational leaders seek to inspire intrinsic motivation and nurture a shared commitment to continuous improvement. According to Bass (1998), such leaders cultivate trust, model ethical behaviour, and align institutional objectives with the broader societal mission of education.

Transformational Leadership in Education

Leadership in education has evolved beyond administrative oversight to encompass visionary and change-oriented roles. In higher and technical education, transformational leadership has been linked to improved institutional performance, teacher commitment, and student engagement (Nguyen et al., 2021; Ahmad et al., 2021). Research by Leithwood and Jantzi (2005) identified transformational leadership as one of the most effective models in educational reform due to its focus on developing shared vision and professional collaboration.

Within TVET settings, transformational leaders play a pivotal role in facilitating innovation and adaptability. TVET institutions operate at the intersection of education and industry, requiring dynamic leadership capable of responding to technological change, labour market demands, and sustainability imperatives. Goh and Rahman (2023) highlight that transformational leaders in TVET promote “curriculum greening” integrating sustainability concepts such as circular economy, renewable energy, and responsible consumption into training programs. By embedding environmental awareness into technical education, such leaders contribute to producing graduates with competencies relevant to the green economy.

Dimensions of Transformational Leadership and Their Impact

Each dimension of transformational leadership uniquely contributes to organizational sustainability:

Idealized Influence Transformational leaders act as role models, demonstrating integrity and ethical standards that inspire followers to emulate them. In TVET institutions, leaders who consistently practice sustainable habits such as promoting energy conservation and responsible waste management encourage similar behaviors among staff and students (Rahman & Hashim, 2022).

Inspirational Motivation through a compelling vision, transformational leaders inspire enthusiasm and optimism toward sustainability goals. For example, principals who frame sustainability as a shared mission instill a sense of collective responsibility that mobilizes staff participation in green campus initiatives (Nguyen et al., 2021).

Intellectual Stimulation, this dimension encourages creativity and critical thinking. In TVET contexts, intellectual stimulation is vital for fostering innovation in curriculum design and teaching methodologies, such as the use of problem-based learning to address environmental issues or the integration of green technologies in workshops and laboratories (Aziz et al., 2022).

Individualized Consideration, transformational leaders mentor and support individual staff development, recognizing unique strengths and encouraging professional growth. Leaders who invest in training and capacity-building for sustainability cultivate a motivated and skilled workforce capable of driving institutional change (Pham et al., 2024).

Collectively, these dimensions create a leadership ecosystem conducive to sustainability integration. Studies show that employees and educators under transformational leadership demonstrate higher job satisfaction, stronger commitment to institutional goals, and greater participation in sustainability initiatives (Nguyen et al., 2021; Pham et al., 2024).

Leadership and Sustainable Development in TVET

Sustainability in TVET refers to the systematic integration of environmental stewardship, social equity, and economic viability within institutional governance, teaching, and learning processes (UNESCO-UNEVOC, 2023). As TVET institutions prepare the workforce for green industries, leadership becomes the cornerstone of this transformation. Effective leaders translate sustainability policies into actionable strategies, ensuring alignment with national frameworks such as Malaysia's Greening TVET Initiative and the National Policy on Industry 4.0 (Industry4WRD).

Transformational leadership provides the foundation for this process by aligning institutional purpose with sustainability objectives. According to Aziz et al. (2022), leaders with transformational qualities are more likely to support eco-innovation, encourage sustainable procurement, and foster collaborative partnerships with industries engaged in green technology. Furthermore, they create learning environments where students and staff internalize sustainability as a professional and personal value.

Recent studies affirm the positive relationship between transformational leadership and sustainability outcomes. For example, Pham et al. (2024) found that transformational leadership behaviours significantly predict the successful integration of sustainability education in Vietnamese technical institutions. Similarly, Ahmad et al. (2021) identified a strong correlation between leadership vision and sustainable campus operations in Malaysian polytechnics. These findings support the argument that leadership commitment and institutional culture jointly determine the success of sustainability initiatives in TVET.

Ethical and Cultural Dimensions of Leadership in Sustainability

Ethics and cultural values play an essential role in shaping leadership effectiveness. Transformational leaders emphasize integrity, fairness, and empathy qualities necessary for fostering trust and engagement in sustainability transitions. In the multicultural context of Malaysia, cultural intelligence and inclusivity are additional competencies that leaders must possess to mobilize diverse stakeholders. As noted by Goh and Rahman (2023), sustainability initiatives are most effective when aligned with local cultural practices and community values.

Moreover, leadership ethics directly influence the credibility of sustainability efforts. Leaders who practice transparency and accountability reinforce institutional legitimacy and inspire stakeholders to participate actively in sustainability programs. Nguyen et al. (2021) argue that ethical transformational leadership not only drives policy compliance but also nurtures moral commitment among followers to act responsibly toward society and the environment.

Theoretical Underpinnings

This study is grounded in transformational leadership theory and sustainability leadership theory. The former provides the behavioural framework explaining how leaders influence followers through vision, motivation, and support (Bass & Riggio, 2006). The latter, proposed by Avery and Bergsteiner (2011), emphasizes long-term orientation, stakeholder engagement, and systems thinking as integral to sustainable leadership. Integrating these theories allows for a comprehensive understanding of how leadership behaviours translate into sustainable outcomes within educational institutions.

From a systems perspective, TVET institutions can be viewed as learning organizations where leadership acts as the central mechanism driving adaptation and innovation. Transformational leadership, through its focus on empowerment and shared vision, aligns well with the concept of sustainable learning organizations (Senge, 2000). Such alignment ensures that sustainability is institutionalized through continuous learning, reflective practice, and knowledge sharing.

Research Gap and Conceptual Linkage

Despite growing evidence linking leadership and sustainability, research focusing specifically on transformational leadership in TVET institutions remains limited, particularly in developing countries such as Malaysia. Much of the existing literature concentrates on higher education or corporate sustainability, overlooking the unique challenges faced by TVET institutions such as balancing technical competency training with environmental responsibility. Furthermore, few empirical studies have examined how leadership dimensions directly influence the adoption of sustainability practices across environmental, social, and economic domains within TVET.

Therefore, this study seeks to bridge this gap by empirically examining how transformational leadership contributes to sustainable practices in Malaysian TVET institutions. By synthesizing theories of leadership and sustainability, it proposes a conceptual model linking leadership behaviours to institutional sustainability performance. Understanding these dynamics will provide valuable insights for policymakers and practitioners aiming to strengthen leadership development frameworks that support Malaysia's transition to a green and inclusive economy).

Problem Statement

The increasing urgency for sustainability within education systems has placed significant responsibility on leadership, particularly in Technical and Vocational Education and Training (TVET) institutions. While numerous policy frameworks including Malaysia's National TVET Policy and Education for Sustainable Development (ESD) initiatives emphasize the importance of sustainability, many institutions struggle to translate these policies into actionable and measurable practices. One critical factor influencing this gap is leadership effectiveness. Specifically, the ability of institutional leaders to inspire, motivate, and guide their teams toward sustainable transformation remains inconsistent across TVET ecosystems.

Transformational leadership has been identified as one of the most effective leadership paradigms for driving innovation, empowerment, and long-term organizational change (Bass & Riggio, 2006). However, despite its proven impact in higher education and corporate contexts, there is still limited empirical understanding of how transformational leadership operates as a catalyst for sustainability in TVET settings. In many cases, leaders in TVET institutions continue to adopt transactional or bureaucratic styles that emphasize compliance and short-term performance rather than visionary and participatory leadership. This often results in fragmented sustainability initiatives that fail to integrate into institutional culture, curriculum design, and operational management (Nguyen et al., 2021; Aziz et al., 2022).

Furthermore, while sustainability has become a global educational imperative aligned with the United Nations Sustainable Development Goals (SDGs), the alignment between leadership practices and sustainability outcomes in TVET institutions remains unclear. Research suggests that transformational leaders through attributes such as inspirational motivation and intellectual stimulation can foster innovation and environmental responsibility. Yet, the extent to which these leadership dimensions influence the adoption of green campus practices, sustainable curriculum frameworks, and community engagement initiatives has not been adequately explored (Goh & Rahman, 2023).

There is also a notable research gap in understanding how transformational leadership contributes to the three pillars of sustainability: environmental, social, and economic within vocational education systems. Most existing studies focus on general leadership effectiveness or student outcomes without examining how leadership behaviours shape institutional strategies for sustainability. As TVET institutions are expected to

produce a workforce capable of supporting Malaysia's transition to a low-carbon and circular economy, the absence of strong transformational leadership poses a barrier to achieving this vision.

Therefore, this study seeks to address the gap by examining the role of transformational leadership as a driver of sustainable practices in Malaysian TVET institutions. It aims to determine how leadership behaviours influence the implementation of sustainability initiatives and how these leadership dynamics contribute to institutional capacity, stakeholder engagement, and long-term environmental stewardship.

METHOD

Research Design

This study employed a quantitative research design to examine the relationship between transformational leadership and sustainable practices within Malaysian TVET institutions. A structured questionnaire was developed based on established theoretical frameworks and distributed to both academic and administrative leaders. The quantitative approach was chosen to enable statistical analysis of the predictive influence of transformational leadership on sustainability outcomes, allowing for generalization across different TVET settings.

The study adopted a cross-sectional design, capturing data from participants at a single point in time to assess current leadership behaviours and sustainability practices. This approach aligns with prior educational leadership studies (Bass & Avolio, 1994; Nguyen et al., 2021) and provides a comprehensive snapshot of leadership dynamics influencing environmental, social, and economic sustainability in TVET contexts.

Sampling Methods

The target population for this study comprised leaders, department heads, and senior lecturers from selected public and private TVET institutions across Malaysia. These individuals were chosen because they play direct roles in institutional management, curriculum development, and sustainability-related decision-making.

A systematic random sampling technique was employed to ensure equal representation from different institutional categories (polytechnics, community colleges, and skills training institutes). The sampling frame included 150 personnel, out of which 120 valid responses were obtained, representing an 80% response rate. This sample size was considered sufficient based on Krejcie and Morgan's (1970) sample size determination table, ensuring statistical validity and reliability.

The inclusion criteria were:

Minimum of two years of experience in a leadership or management position.

Direct involvement in sustainability or curriculum management activities.

Employment in a recognized Malaysian TVET institution registered under the Department of Skills Development (DSD) or Ministry of Higher Education (MOHE).

Methods for Data Collection

Data was collected using an online structured questionnaire distributed via institutional email networks and professional TVET associations. The instrument was designed using Google Forms for accessibility and anonymity, encouraging honest responses.

Prior to the full-scale survey, a pilot test was conducted with 15 participants to evaluate clarity, reliability, and time efficiency. Minor revisions were made based on feedback, particularly in the wording of sustainability-related items to reflect Malaysian TVET terminology.

Respondents were given two weeks to complete the questionnaire, with follow-up reminders sent to maximize participation. Ethical considerations such as voluntary participation, confidentiality, and data protection were strictly observed in accordance with Universiti Teknikal Malaysia Melaka (UTeM) ethical research guidelines.

Research Instrument

The research instrument comprised four main sections, each measuring distinct variables relevant to the study:

Table 1: Variables

Secti on	Variable	Number of Items	Source of Scale
A	Demographic Information	6	Self-developed
B	Transformational Leadership Dimensions	20	Bass & Avolio (1994) – Multifactor Leadership Questionnaire (MLQ)
C	Sustainable Practices	15	Adapted from UNESCO-UNEVOC (2023), Greening TVET Framework
D	Institutional Culture and Support	10	Adapted from Ahmad et al. (2021) and Nguyen et al. (2021)

A five-point Likert scale was used across all sections, ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

Examples of items include:

“My institution’s leadership inspires staff to contribute to environmental initiatives.”

“Sustainability practices are embedded in our curriculum and campus operations.”

The dependent variable in this study is Sustainable Practices, while Transformational Leadership serves as the main independent variable, and Institutional Culture as the moderating variable.

Validity and Reliability

Content validity was established through expert review involving three academic specialists in leadership and sustainability from Universiti Teknikal Malaysia Melaka (UTeM) and Universiti Pendidikan Sultan Idris (UPSI). Their feedback ensured that the questionnaire items accurately reflected constructs relevant to transformational leadership and sustainability within the Malaysian TVET context.

Construct validity was verified using Exploratory Factor Analysis (EFA) with Varimax rotation to confirm factor loadings and ensure alignment with theoretical constructs. Items with factor loadings below 0.5 were removed to maintain dimensional clarity.

Reliability testing was conducted using Cronbach’s Alpha to assess internal consistency of the constructs. The results showed satisfactory reliability levels as follows:

Transformational Leadership = 0.92

Sustainable Practices = 0.88

Institutional Culture = 0.86

All values exceeded the 0.70 threshold, indicating high reliability (Nunnally, 1978).

To ensure statistical robustness, the data were analyzed using SPSS version 26. Descriptive statistics were used to summarize respondent profiles, while Pearson's correlation and multiple regression analyses were employed to test the hypotheses and examine the predictive power of transformational leadership on sustainability outcomes.

RESULTS AND DISCUSSION

Exploratory Factor Analysis for Transformational Leadership

An exploratory factor analysis (EFA) was conducted to validate the underlying structure of the Transformational Leadership construct. Using Varimax rotation, four distinct factors were extracted corresponding to Bass and Avolio's (1994) model Idealized Influence, Inspirational Motivation, Intellectual Stimulation, and Individualized Consideration. The Kaiser-Meyer-Olkin (KMO) value was 0.812, indicating sampling adequacy, while Bartlett's Test of Sphericity was significant ($\chi^2 = 1254.63$, $p < 0.001$), confirming data suitability for factor analysis. The four extracted factors explained 76.45% of the total variance, indicating a robust construct structure consistent with transformational leadership theory within TVET institutions.

The factor loadings of each leadership dimension, where all retained items exceeded the 0.50 loading threshold, demonstrating acceptable construct validity and alignment with theoretical expectations.

Exploratory Factor Analysis for Sustainable Practices

An EFA was also carried out to identify the latent structure of Sustainable Practices in TVET institutions. Three components emerged: Environmental Sustainability, Economic Sustainability, and Social Sustainability. The KMO statistic was 0.789 and Bartlett's Test was significant ($\chi^2 = 978.27$, $p < 0.001$), confirming factorability. The three factors accounted for 72.31% of the total variance, indicating that sustainability within TVET institutions encompasses multiple, interrelated dimensions of practice and policy implementation.

Table 6 presents the factor loadings for sustainable practices, all of which exceeded the 0.50 threshold, validating their reliability for further analysis.

Reliability Analysis

The reliability of the constructs was examined using Cronbach's alpha to assess internal consistency. All constructs achieved alpha values above 0.70, indicating acceptable reliability (Nunnally, 1978). Transformational Leadership dimensions recorded $\alpha = 0.93$, Sustainable Practices $\alpha = 0.89$, and Institutional Culture $\alpha = 0.87$. These results confirm that the scales were reliable and suitable for regression analysis.

Regression Analysis and Hypothesis Testing

Multiple regression analysis was employed to assess the predictive power of Transformational Leadership dimensions on Sustainable Practices within TVET institutions. The overall model was significant ($F = 48.321$, $p < 0.001$) and explained 68.4% of the variance in sustainability outcomes ($R^2 = 0.684$). Among the leadership dimensions, Inspirational Motivation and Intellectual Stimulation were the strongest predictors ($\beta = 0.46$, $p < 0.001$; $\beta = 0.38$, $p < 0.001$), followed by Idealized Influence ($\beta = 0.29$, $p < 0.05$) and Individualized Consideration ($\beta = 0.24$, $p < 0.05$).

These findings demonstrate that transformational leadership behaviours significantly enhance the adoption of sustainable practices in TVET institutions. When Institutional Culture was introduced as a moderating variable, the model's explanatory power increased slightly ($\Delta R^2 = 0.05$), suggesting that a positive and collaborative culture amplifies the leadership sustainability relationship. Regression analysis confirmed that transformational leadership accounted for 64% of the variance in institutional sustainability outcomes. These findings are consistent with prior studies by Ahmad et al. (2021) and Pham et al. (2024), who found that leadership commitment and vision alignment are significant predictors of sustainable transformation. The

study reinforces the idea that transformational leadership acts as a catalyst for developing institutional resilience and environmental responsibility in TVET settings.

DISCUSSION OF FINDINGS

The findings of this study reaffirm the pivotal role of Transformational Leadership in promoting sustainability within TVET institutions. Consistent with previous studies (Nguyen et al., 2021; Goh & Rahman, 2023; Pham et al., 2024), the results show that leaders who inspire, empower, and intellectually stimulate their subordinates foster an institutional culture conducive to sustainable transformation. The strong predictive relationship between leadership dimensions and sustainability outcomes underscores the importance of visionary and ethical leadership.

Inspirational Motivation emerged as the most influential dimension, highlighting the importance of articulating a clear sustainability vision that resonates with institutional stakeholders. Intellectual Stimulation also played a key role, reflecting leaders' ability to encourage innovation, critical thinking, and creative problem-solving, essential traits for implementing green technologies and sustainable practices in TVET environments.

Moreover, the moderating effect of Institutional Culture indicates that sustainability initiatives are more successful when supported by a culture that values participation, trust, and shared learning. Leaders who engage staff members through mentorship and collaborative decision-making not only strengthen organizational commitment but also drive behavioural change toward sustainability. These findings support UNESCO-UNEVOC's (2023) assertion that leadership capacity building is essential for greening TVET systems globally.

In conclusion, the analysis validates Transformational Leadership as a critical driver for embedding sustainable practices within Malaysian TVET institutions. Leadership behaviours such as inspiration, intellectual stimulation, and individualized support empower institutions to align with the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 12 (Responsible Consumption and Production). Future research could explore longitudinal impacts of leadership development programs on sustainability performance and examine qualitative perspectives on how leadership behaviours evolve in diverse TVET contexts.

CONCLUSION

This study concludes that transformational leadership plays a crucial and strategic role in advancing sustainable practices within Malaysian TVET institutions. The findings affirm that when leaders demonstrate vision, inspiration, intellectual stimulation, and individualized consideration, they effectively embed sustainability principles into institutional governance, curriculum design, and operational systems. Transformational leaders act as catalysts for cultural change, shaping organizational mindsets to embrace environmental responsibility, social inclusion, and ethical innovation.

The research provides strong empirical evidence that transformational leadership significantly influences sustainability outcomes, explaining a substantial portion of the variance in environmental, social, and economic performance indicators within TVET institutions. Among the leadership dimensions, inspirational motivation and intellectual stimulation emerged as the most influential, highlighting the need for leaders who can articulate a clear sustainability vision and foster innovative problem-solving. When educators and administrators are encouraged to think creatively and critically about sustainable solutions, they become active contributors to institutional transformation rather than passive implementers of policy.

Furthermore, the study emphasizes that institutional culture acts as an important enabler in the leadership-sustainability relationship. Transformational leadership is most effective when supported by a collaborative, inclusive, and trust-based culture that values shared decision-making and continuous learning. Leaders who nurture such a culture empower staff and students to take ownership of sustainability initiatives, from energy conservation and waste reduction to community engagement and industry partnerships. This finding reinforces

the assertion by UNESCO-UNEVOC (2023) that greening TVET requires strong leadership commitment combined with a supportive institutional environment.

In the Malaysian context, these insights are highly relevant to the national agenda for sustainable education outlined in the Malaysia Education Blueprint (2015–2025) and the National TVET Policy. Both frameworks emphasize the integration of sustainability and green skills into education systems as part of the nation's transition toward a low-carbon and knowledge-based economy. Therefore, TVET leaders must go beyond administrative management to become transformational agents of change championing sustainability not only through policy but through everyday institutional practices and interactions.

From a practical standpoint, the study suggests that leadership development programs within the TVET sector should incorporate sustainability competencies, ethical reasoning, and systems thinking. Such training can equip current and future leaders with the skills and mindsets required to navigate the complexities of sustainability transitions. Additionally, performance assessment mechanisms for TVET institutions should include sustainability metrics to ensure that leadership effectiveness is evaluated holistically, encompassing social and environmental contributions alongside traditional performance indicators.

Future research should expand this work by examining the longitudinal effects of leadership development initiatives on institutional sustainability performance. Qualitative studies exploring the lived experiences of TVET leaders and educators could provide richer insights into how transformational leadership manifests in different institutional settings and cultural contexts. Through such research, policymakers and practitioners can develop more nuanced strategies to strengthen leadership capacity and accelerate Malaysia's progress toward achieving Sustainable Development Goal 4 (Quality Education) and other sustainability targets.

In conclusion, transformational leadership is not merely a leadership style but a strategic imperative for embedding sustainability within TVET institutions. By cultivating visionary, ethical, and collaborative leaders, Malaysia's TVET system can serve as a powerful engine for sustainable human capital development and national resilience.

Suggestions: While the study is theoretically and empirically strong, a few areas could be improved for greater impact. The discussion section could include more critical reflection on possible causality limitations inherent in the cross-sectional design. The reliance on self-reported data introduces potential response bias that could affect the robustness of the findings. Moreover, the literature review, though extensive, relies heavily on Malaysian and ASEAN references; adding more global comparative perspectives (e.g., from European or African TVET systems) could enhance generalizability. Visual elements such as conceptual models, regression diagrams, or summary tables could also improve accessibility and presentation clarity for readers. Future research should adopt longitudinal or mixed-method approaches to capture evolving leadership behaviours and sustainability outcomes over time. Expanding the sample to include private TVET institutions and different regions would increase external validity. Introducing Structural Equation Modelling (SEM) could better explore mediating and moderating effects between leadership dimensions, institutional culture, and sustainability indicators. The paper could benefit from integrating qualitative insights, such as interviews or case studies, to illustrate leadership practices in action. Additionally, the authors may consider developing a practical framework or toolkit for implementing transformational leadership in sustainability programs, enhancing the study's applied value for institutional leaders and policymakers.

ACKNOWLEDGEMENT

The study is funded by Universiti Teknikal Malaysia Melaka, Malaysia (UTEM), through a publication incentive from Grant FRGS-EC with project number FRGS-EC/1/2024/FPTT/F00605. The authors would also like to thank the Research and Innovation Management Center (CRIM) for their support. The authors also would like thanks to Centre of Technopreneurship Development (C-TeD) for the support.

REFERENCES

1. Ahmad, N., Ismail, R., & Lee, S. H. (2021). Leadership and sustainability practices in Malaysian

- higher education institutions. *Journal of Educational Management*, 35(2), 145–162.
2. Alam, G. M., & Hoque, K. E. (2022). Greening technical and vocational education and training for sustainable futures: A policy analysis. *International Journal of TVET Studies*, 9(1), 1–15.
3. Ali, A., & Zulkifli, N. (2020). Transformational leadership and employee engagement: A pathway to organizational sustainability. *Asian Journal of Business and Management*, 12(4), 33–42
4. Annan-Diab, F., & Molinari, C. (2017). Interdisciplinarity: Practical approach to advancing education for sustainability. *International Journal of Sustainability in Higher Education*, 18(3), 376–391
5. Avery, G. C., & Bergsteiner, H. (2011). *Sustainable leadership: Honeybee and locust approaches*. Routledge.
6. Aziz, A., Rahman, M. F., & Omar, R. (2022). The role of transformational leadership in advancing green TVET practices. *International Journal of Vocational Education and Training Research*, 8(3), 22–30
7. Bass, B. M., & Riggio, R. E. (2006). *Transformational leadership* (2nd ed.). Lawrence Erlbaum Associates.
8. Boon, C. Y., & Talib, A. A. (2023). Leadership innovation and sustainability outcomes in Malaysian higher learning institutions. *Journal of Leadership and Organizational Studies*, 30(1), 64–80.
9. Burns, J. M. (1978). *Leadership*. Harper & Row.
10. Chen, H., & Lim, S. (2023). Green human capital and sustainable leadership practices in vocational education. *International Review of Education*, 69(4), 561–578.
11. Goh, S. K., & Rahman, A. A. (2023). Sustainability leadership and curriculum greening in Malaysian TVET colleges. *Asian Journal of Sustainability Studies*, 5(1), 44–58.
12. Ismail, S., & Wahid, A. (2022). Institutional transformation through sustainability leadership in TVET colleges. *Journal of Technical Education and Training*, 14(2), 55–68.
13. Leitsao, J., Pereira, D., & Gonçalves, A. (2019). Quality of Work Life and Organizational Performance: Workers' Feelings of Contributing, or Not, to the Organization's Productivity. *International journal of environmental research and public health*, 16(20), 3803. <https://doi.org/10.3390/ijerph16203803>
14. Leithwood, K., & Jantzi, D. (2005). A review of transformational school leadership research: 1996–2005. *Educational Administration Quarterly*, 41(4), 529–545.
15. Pham, M. T., Tan, C. L., & Abdullah, A. (2024). Leadership influence on sustainability integration in technical education institutions. *Journal of Sustainable Education Research*, 8(2), 112–130.
16. Sharma, R., & Jain, P. (2021). The role of leadership in embedding sustainability in higher education institutions. *International Journal of Educational Development*, 84, 102418.
17. Singh, K., & Ahmad, N. (2020). The mediating role of organizational culture in the relationship between leadership and sustainability. *Management Science Letters*, 10(12), 2789–2800.
18. UNESCO. (2020). *Education for Sustainable Development: A roadmap (2020–2030)*. UNESCO Publishing.
19. UNESCO-UNEVOC. (2023). *Greening TVET institutions: A practical guide for sustainable transformation*. UNESCO Publishing.
20. Zhu, C., & Zhang, L. (2022). Sustainable leadership and digital transformation in vocational education. *Sustainability*, 14(7), 4315.