


Chapter 8


From Data to Action: Optimizing Resources in TVET Through AI and Big Data Insights

Gowtham Kumar Reddy Mittoor

 <https://orcid.org/0009-0002-3257-8571>

The Wendy's Company, Bentonville, USA

Suresh Putteti

 <https://orcid.org/0009-0001-3814-2886>

Zoominfo, Bentonville, USA

ABSTRACT

Technical and Vocational Education and Training (TVET) institutions are increasingly leveraging Artificial Intelligence (AI) and Big Data to enhance resource allocation, optimize decision-making, and improve educational outcomes. This chapter explores how AI-driven analytics and Big Data insights can be utilized to streamline curriculum design, personalize learning experiences, and enhance operational efficiency in TVET systems. By examining real-world case studies and data-driven strategies, this chapter highlights how predictive modeling, intelligent automation, and advanced analytics can drive cost-effective and high-impact resource utilization. Furthermore, it discusses challenges, ethical considerations, and future directions for integrating AI and Big Data into TVET, ensuring sustainable and inclusive growth in skill development and workforce readiness.

INTRODUCTION

Technical and Vocational Education and Training (TVET) plays a crucial role in equipping individuals with industry-relevant skills, fostering workforce readiness, and driving economic development. As industries undergo rapid technological transformations, TVET institutions must adapt to evolving demands by integrating innovative approaches to education and training. Traditional methods of resource management in TVET often struggle to keep pace with dynamic labor market needs, leading to inefficiencies in curriculum development, training delivery, and workforce alignment. The adoption of AI and

DOI: 10.4018/979-8-3373-1142-5.ch008

Big Data has emerged as a game-changer, enabling data-driven decision-making, enhancing operational efficiency, and optimizing resource allocation to ensure effective skill development.

AI and Big Data are revolutionizing modern education by providing predictive insights, automating processes, and personalizing learning experiences. In the context of TVET, these technologies enable institutions to analyze vast datasets, forecast industry trends, and tailor training programs to meet current and future workforce demands. AI-driven tools, such as intelligent tutoring systems, adaptive learning platforms, and predictive analytics, empower educators and administrators to make informed decisions, maximize resource utilization, and improve student outcomes. By harnessing AI and Big Data, TVET institutions can bridge the skills gap, enhance employability, and contribute to a more efficient and responsive education system.

This chapter aims to explore the transformative impact of AI and Big Data in TVET, highlighting their role in optimizing resources, streamlining training methodologies, and improving institutional decision-making. It examines key applications, benefits, and challenges associated with the adoption of these technologies in TVET. Additionally, the chapter provides insights into best practices, case studies, and future trends, offering a comprehensive understanding of how AI and Big Data can drive sustainable and inclusive growth in technical and vocational education.

LITERATURE REVIEW

Alenezi (2022) explores how AI is revolutionizing vocational education and training (TVET), emphasizing the role of automation and intelligent analytics in improving institutional efficiency. Chen & Zhao (2021) discuss the role of Big Data in education, highlighting its impact on enhancing learning outcomes and optimizing resource allocation. Similarly, Davis & Smith (2020) demonstrate how predictive analytics can be applied in curriculum development to ensure alignment with industry trends.

Gupta & Kumar (2023) focus on the implementation of AI-driven smart scheduling in higher education, which improves efficiency in classroom allocation and faculty workload management. Turner & Evans (2019) highlight the use of AI for budget optimization in TVET, showcasing cost reductions through automated financial planning. Zhang & Li (2023) present case studies demonstrating the success of Big Data in workforce development, reinforcing its value in decision-making for resource allocation.

Lee & Wong (2019) investigate AI-based personalized learning models in vocational training, emphasizing their ability to adapt to individual student needs. Miller & Thompson (2021) address ethical considerations in AI-driven education, particularly in personalized learning environments. Their research underscores the necessity of balancing efficiency with fairness in AI implementation.

Patel & Singh (2020) examine blockchain applications in credential verification for TVET systems, ensuring authenticity and reducing fraud. Rahman & Ahmed (2022) explore the role of IoT and edge computing in vocational training, illustrating how real-time data processing enhances hands-on learning experiences.

Whig et al. (2025) present multiple studies on AI applications, including gender-specific healthcare solutions (2025), AI-driven secure federated learning (2025), and network security in 6G communications (2025). Their work highlights how AI can optimize various domains, from healthcare to cybersecurity, demonstrating parallels with its applications in TVET. Additionally, Malik & Gupta (2022) discuss the significance of text mining in service management, further emphasizing AI's role in extracting actionable insights from data.

10 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/from-data-to-action/377117

Related Content

Developing the Students' Thinking and Learning Skills in the Instrumental Lesson

Rossella Marisi (2022). *Research Anthology on Vocational Education and Preparing Future Workers* (pp. 517-541).

www.irma-international.org/chapter/developing-the-students-thinking-and-learning-skills-in-the-instrumental-lesson/304504

A Global Comparative Study in Disability Inclusion Legislation and Policies in the TVET Education

Precious Muzite (2022). *Research Anthology on Vocational Education and Preparing Future Workers* (pp. 747-761).

www.irma-international.org/chapter/a-global-comparative-study-in-disability-inclusion-legislation-and-policies-in-the-tvet-education/304517

Key Processes for the Performance of Work-Integrated Learning in HE: Focusing on Talents With a Winning-Foursome

Walter Nuningerand Jean-Marie Châtelet (2022). *Research Anthology on Vocational Education and Preparing Future Workers* (pp. 355-385).

www.irma-international.org/chapter/key-processes-for-the-performance-of-work-integrated-learning-in-he/304494

Student Reflections and Self-Assessments in Vocational Training Supported by a Mobile Learning Hub

Lisbeth Amhag (2022). *Research Anthology on Vocational Education and Preparing Future Workers* (pp. 593-609).

www.irma-international.org/chapter/student-reflections-and-self-assessments-in-vocational-training-supported-by-a-mobile-learning-hub/304508

Employability Skills for Civil Engineering: The Complexities of Equipping Students With 4th Industrial Revolution Skills

Thokozani Isaac Mtshaliand Sylvia Manto Ramaligela (2022). *Research Anthology on Vocational Education and Preparing Future Workers* (pp. 203-218).

www.irma-international.org/chapter/employability-skills-for-civil-engineering/304485