

FOSTERING SUSTAINABILITY IN VOCATIONAL TRAINING INSTITUTES: THE INTERSECTION OF GREEN HUMAN RESOURCE MANAGEMENT (GHRM) AND GREEN TECHNICAL VOCATIONAL EDUCATION AND TRAINING (GTVET) SKILLS

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ABSTRACT

This study examines the role of Green Human Resource Management (GHRM) and Green Technical Vocational Education and Training (GTVET) in advancing the sustainable development of vocational training institutes. Focusing on Punjab, Pakistan, the study explores the impact of GHRM practices and GTVET skills on organizational sustainability. Adopting a quantitative research approach, the study investigates how GHRM practices and GTVET skills contribute to creating sustainable organizations. The conceptual model positions GHRM practices and GTVET skills as independent variables, sustainable development as the dependent variable. Data were collected from 353 participants using structured questionnaires and analyzed through PLS-SEM techniques. The findings reveal significant positive relationships between GHRM, GTVET, and sustainable development. Moreover, the green environment mediates these relationships, amplifying their impact on organizational sustainability. This study provides empirical evidence supporting the integration of GHRM practices and GTVET to address the growing demands of the green economy. It offers several valuable suggestions for policymakers and practitioners to improve vocational training and human resource strategies. Additionally, the study outlines important implications and proposes directions for future research.

Keywords: Green HRM, Sustainability, Green Environment, Environmental Management.

1.0 Introduction

It is widely recognized that Green Technical and Vocational Education and Training (GTVET) plays a significant role in fostering economic sustainability and social development, both at the individual and national levels (Yafi, Tehseen, & Haider, 2021). Policymakers face the challenge of creating an environment conducive to generating green employment opportunities by harmonizing GHRM and GTVET. Research indicates that imparting high-quality green vocational and technical training in Pakistan's GTVET sector can effectively alleviate poverty and contribute to economic growth at both national and international levels. Green Human Resource Management (GHRM) fosters economic growth,

global harmony, and productivity through the integration of Green Technical and Vocational Education and Training (GTVET) (Bangwal, Tiwari, & Chamola, 2017). This integration leads to financial freedom, social flexibility, and political stability. The green skills imparted through GTVET play a pivotal role in enhancing individuals' creative capacity and are an integral component of GHRM (Munawar, Yousaf, Ahmed, & Rehman, 2022).

A green culture embodies a lifestyle and set of beliefs that prioritize environmental protection and sustainability in business practices. It reflects a collective commitment to identifying and eliminating actions that harm or degrade the environment. Globally, variations of green culture include concepts like environmentalism, eco-culture, ecological consciousness, naturalism, and agro-ecology (Wyckhuys et al., 2022). Rapid economic growth demands a skilled workforce proficient in green practices, including technicians, technologists, engineers, researchers, and innovative scientists. Countries such as China, Japan, Malaysia, and Australia serve as examples of how integrating green skills into national sustainable development strategies can safeguard the environment while fostering progress (Husain, Wahab, & Husain). GTVET plays a crucial role in transitioning to a low-carbon economy and a climate-resilient society. Its implementation involves preparing learners for diverse occupational fields, enhancing workforce participation, and adapting to evolving expectations. GTVET now encompasses educating and training individuals to support the shift toward a sustainable society, recognizing the necessity of conducting human activities and workplace operations in an environmentally friendly and sustainable manner (Hossain, Asaduzzaman Chowdhury, & Kchaou, 2021).

GTVET also provides an opportunity to promote entrepreneurial learning, potentially leading to the establishment of sustainable enterprises and social ventures that benefit society. To maintain GTVET's relevance in the current labor market, it is crucial to align its practices with contemporary regulations. Many TVET graduates work in sectors governed by standards that define operational requirements and skills for specific jobs. However, these regulations and standards are often outdated and fail to adequately address sustainability needs, necessitating updates to enable a smooth transition to a green economy (Ali, Anufriev, & Amfo, 2021). Out-dated regulations can inadvertently reinforce a "business-as-usual" approach in operations, work procedures, and systems, which is not sustainable. This can lead to excessive use of raw materials, waste generation, and harmful emissions, causing unnecessary damage to the environment. Therefore, it is imperative to update and align regulations with sustainability principles, ensuring that GTVET contributes effectively to a greener and more sustainable future. Given the historical insufficiency of many human activities in achieving sustainability, there is an urgent need to overhaul processes related to personal consumption and occupational practices. Furthermore, new sectors must be developed to replace environmentally unfriendly alternatives (Xiao et al., 2022). Green Technical and Vocational Education and Training (GTVET) plays a pivotal role in fostering a more sustainable society by promoting skills and technologies that reduce reliance on non-renewable raw materials, encourage waste recycling, minimize energy consumption, and prevent environmental pollution.

1.1 Rationale of the study and Research Gaps

Given that past human activities often failed to meet sustainability goals, there is an urgent need to adapt personal consumption patterns and revamp out-dated occupational practices to align with sustainability principles (Amjad, Rao, Rahman, Mohsin, & Sarfraz, 2024). Developing new sectors of activity to replace environmentally unsustainable practices is crucial for creating a more sustainable society. This process involves acquiring skills and promoting the study of technologies designed to minimize the use of scarce raw materials,

recycle waste, reduce energy consumption, and prevents environmental pollution. Additionally, incorporating entrepreneurial learning into vocational education and training provides opportunities to establish sustainable enterprises and social projects that contribute to the collective good of society. To maintain the relevance of Green Technical and Vocational Education and Training (GTVET) in the context of evolving labor market regulations and Green Human Resource Management (GHRM), it is essential to account for the significant number of TVET graduates employed across various sectors. Many of these sectors operate under established standards that define procedures and outline the skill requirements for specific roles (Amjad et al., 2024). The employability and productivity of the workforce are closely tied to their competencies in GTVET. As industrialization and modernization of production processes advance, the demand for a trained and skilled workforce managed through GHRM becomes increasingly significant. In the context of rapid technological changes and growing global competition in the evolving world of work, a knowledgeable, skilled, and adaptable green workforce is vital for any nation aspiring to compete globally and secure prosperity for its citizens. However, many existing regulations were established before the concept of sustainability was fully appreciated, highlighting the need for updates to align with the transition to a green economy. Out-dated regulations may inadvertently sustain a "business-as-usual" approach, leading to the excessive use of raw materials, waste generation, and harmful emissions—practices that are no longer viable in the pursuit of sustainability (Kapil, 2015).

Transforming Green Technical and Vocational Education and Training (GTVET) and Green Human Resource Management (GHRM) has become essential for steering the economy and society toward a sustainable, greener future (Amjad et al., 2024). The on-going transition to greener economies is driving significant changes in the demand for Green skills (Zubir et al., 2021). These changes involve modifications in job execution methods, necessitating the retraining and up skilling of displaced workers for redeployment in alternative sectors. They also include the emergence of new skilled occupations requiring training and qualification, as well as the integration of green practices into existing jobs, which demands up skilling for the current workforce (Strietska-Ilina & Strietska-Ilina, 2011). A successful transition to a green economy requires the comprehensive integration of Green skills (GTVET) and employment development (GHRM) policies into the core green economic agenda (Montanari, Agostini, & Francesconi, 2023). While the transition to a green economy promises access to new job opportunities, it simultaneously alters the nature and scope of existing jobs. Without a well-trained GTVET workforce, this transformation could lead to skill shortages in some sectors, even as job opportunities arise in others. Strategies for Green Skills Development (GTVET) must adapt to the evolving employment landscape by equipping teachers and trainers with effective knowledge transfer capabilities, expanding the scope of TVET, and enabling the workforce to adjust to technological shifts. To tackle the complex challenges posed by the greening of the economy, a comprehensive approach involves deconstructing the entire product value chain into distinct levels. This facilitates the identification of skill and capacity requirements, targeted training, and the alignment of GTVET graduates with abundant and decent employment opportunities. The anticipated greening of the economy is expected to exacerbate the intricacies of multi-level skill shortages and surpluses (Montanari et al., 2023). The transition to a low-carbon economy presents two key challenges related to skill requirements: the insufficient availability of skilled (GTVET) professionals for green jobs and the need to retrain workers affected by changing skill demands. Providing targeted training (GHRM) for employees across various skill levels can effectively address these challenges, fostering a stronger sense of purpose for institutions transitioning to greener TVET practices.

A critical component of achieving the global vision for sustainability is the establishment of more sustainable production and consumption patterns. An essential element in this paradigm shift is transforming Technical and Vocational Education and Training (TVET) institutions to align with sustainability goals Strietska-Ilina and Strietska-Ilina (2011). These SDGs are universally applicable and require widespread awareness-building, public and worker understanding, educational programs, and various forms of training for successful implementation. In particular, certain SDGs set ambitious targets for skills development and education. By 2030, the goals aim to significantly increase the number of youth and adults equipped with relevant skills, including technical and vocational expertise, to foster employment, decent jobs, and entrepreneurship. Additionally, the SDGs aspire to ensure that all learners acquire the knowledge and skills essential for promoting sustainable development. This includes education for sustainable development and sustainable lifestyles, understanding human rights, promoting gender equality, fostering a culture of harmony and non-violence, inspiring a sense of global citizenship, and cultivating an appreciation for cultural diversity and its contribution to sustainable development (Connor, 2015).

Quality education is pursued through equal access to affordable and high-quality Technical and Vocational Education and Training (TVET), including at the university level. The objectives include increasing the number of individuals, particularly youth and adults, equipped with relevant technical and vocational skills for employment, decent jobs, and entrepreneurship. The goals also aim to eliminate gender disparities in education and ensure equal access to education and vocational training for vulnerable groups, such as individuals with disabilities, indigenous peoples, and children in vulnerable situations (Piwowar-Sulej, 2021). In the context of greening communities and workplaces, there is a need to equip students with sustainability fundamentals that are applicable in their workplaces and local communities." This revision improves clarity and readability (Duvnjak & Kohont, 2021). While greening the curriculum focuses on imparting sustainability skills for the workplace, the 'greening of the workplace' emphasizes the role of TVET education in fostering environmentally conscious work environments. TVET institutions can strategically promote practices that reduce the environmental impact of business activities, actively engaging in sustainability programs and projects that address local issues. Pakistan, a resource-rich country, faces a growing Green skills gap (Green Human Resource Management - GHRM & Green Technical and Vocational Education and Training - GTVET), despite significant growth in the TVET sector. This gap contributes to rising unemployment, which is attributed to a mismatch between the demand for GTVET and the supply of GHRM in the industry sector. The negative perception of TVET as inferior to general academic education has led to a decline in the supply of skilled labor, affecting the sector's overall quality and the returns on investment in skill development.

2.0 Literature Review

2.1 Sustainable Development

The global agenda now includes environmental sustainability, which has led to a growing interest in sustainable development in Technical and Vocational Education Training (TVET) institutions' strive to contribute to the international environmental, economic and social sustainability agenda.

2.1.1 The Relevance of TVET for Sustainable Development

TVET institutions bear the responsibility of advancing sustainability as they prepare their students with skills, knowledge and attitudes relevant to sustainable practices in various

sectors. The United Nations Sustainable Development Goals (SDGs) call on the need for education, which includes TVET systems, to promote sustainable development, particularly Goal 4 (Quality Education) and Goal 8 (Decent Work and Economic Growth). Mainly, Vocational institutes are well placed to adopt green skill sets to their curricular to meet the green industry workforce needs and equip the students for future sustainable industries (UNESCO, 2014; UNEVOC).

2.1.2 Greening TVET: Whole-institution Approach

Embedding sustainability in technical vocational educational training institutions is beset with various challenges; the whole institution approach is one of them. This framework refers to integrating sustainability in all policies and actions taken with respect to the institute. Some of the steps include:

1. A clear understanding of greening purpose and scope
2. Developing strategic plans on how to embed sustainability in curriculum design,
3. Sustainability practices, such as energy-efficient technologies and sustainable resource use.
4. Monitoring and evaluation of sustainability initiatives (UNESCO, 2014).

This holistic approach makes sustainability a core value of the institution, influencing teaching methods, organizational culture, and student behavior.

2.1.3 Challenges and Opportunities

One of the major challenges facing sustainability integration in TVET is a lack of funding and resources for green initiatives. Institutional infrastructure and financial problems have deterred many institutions from embracing sustainability mainstreaming. Cooperative efforts with industries and governmental organizations can offer financial and technical support to vocational institutes in successfully addressing these challenges (ILO, 2011). In addition, the integration of sustainability in TVET is related to the development of green jobs, which demand new skills. As industries move towards greener practices, vocational training needs to be adjusted to provide relevant competencies, such as waste management, renewable energy, and eco-friendly production methods (CEDEFOP, 2008).

2.1.4 Institutional and Societal Benefits

Greening TVET enhances not only the effectiveness of institutions but also contributes to wider social objectives. In embedding sustainability in their training programs, vocational institutes build environmentally responsible citizens and professionals who will lead sustainable practices in the workplace and community. It also helps in making the graduates more employable in green innovation-oriented industries. The implementation of corporate environmental management initiatives introduces new job positions and necessitates a precise set of skills. This reflects the evolving landscape of employment needs driven by the authoritative to integrate sustainable and environmentally conscious practices within corporate frameworks (Rehman, Elrehail, Alshwayat, Ibrahim, & Alami, 2023). As companies increasingly recognize the importance of environmental responsibility, these forecasting practices demonstrate a proactive stance in aligning human resources with the demands and complexities of modern environmental management initiatives (Afsar, Bibi, & Umrani, 2023).

2.2 Greening TVET: Aligning with Key Sustainable Development Goals (SDGs)

Two key issues include the lack of skilled professionals for green jobs and the need to retrain those affected by changing skill requirements. Addressing these challenges requires providing targeted training for workers of varying skill levels—low, medium, and high. The establishment of more sustainable production and consumption patterns is a crucial component in realizing the global vision of sustainability.

Greening Technical and Vocational Education and Training (TVET) institutions is crucial to achieving specific Sustainable Development Goals (SDGs), particularly 4.4 and 4.7:

- SDG 4.4 aims to significantly increase the number of youth and adults with related skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship by 2030.
- SDG 4.7 targets ensuring that all learners obtain knowledge and skills endorsing sustainable development, including education for sustainable development, sustainable lifestyles, human rights, gender equality, peace culture, non-violence, global citizenship, gratitude of cultural diversity, and recognizing culture's influence to sustainable development (Agreement, 2015).

These goals are outlined in the practical guide "Greening Technical and Vocational Education and Training" as part of the UN Sustainable Development Goals, aligned with the 2030 agenda for sustainable development, which includes clean water and hygiene targets, such as refining water quality (Target 6.3) and increasing water-use efficiency across all sectors (Target 6.4).

SDG 4 - Quality Education aims to ensure equivalent access to reasonable and quality Technical and Vocational Education and Training (TVET), including university, for both women and men (Target 4.3). It also seeks to increase the number of individuals with relevant skills for employment, decent jobs, and entrepreneurship (Target 4.4). Additionally, SDG 4 aims to eliminate gender discrepancies in education and guarantee equal access for vulnerable groups, including persons with disabilities, native peoples, and children in vulnerable situations (Target 4.5).

Greening the curriculum emphasizes sustainability skills and content applicable in workplace settings. Conversely, the 'greening of the workplace' emphasizes on the contribution of TVET education to influencing environmentally friendly work environments, including places where business activities are predominantly conducted using processes, technologies, and tasks. In practice, Technical and Vocational Education and Training (TVET) institutions hold a strategic role in fostering practices that mitigate the environmental impact of business activities. They can actively engage in developing sustainability programs and projects, leveraging skills and training to address local issues collaboratively. Institutions that contribute to capacity development and offer professional training services to community stakeholders play a crucial role in demonstrating and promoting sustainable approaches in their respective domains.

2.3 Sustainable Performance:

Sustainable performance has recently attracted considerable focus within academic and business realms as organisations have started incorporating sustainable strategies within their procedures (Sharma et al., 2021). This idea also captures an organization's attempt to reduce its impact on the environment as it strives to work more efficiently. Synonyms of green performance are sustainable or corporate social responsibility performance as it focuses on minimising harms to the environment and proper use of resources (Lerman, Benitez, Müller, de Sousa, & Frank, 2022). Deliberate pressure from stakeholders, regulatory authorities and consumers has made green performance an essential measure of organizational performance. The understanding of green performance can be traced back to the aspects of sustainable environment and CSR. It is a set of measures that are focused on mitigating negative effects of organisational processes and actions, including energy saving, waste and emissions control and environmentally friendly products (Marco-Lajara, Zaragoza-Sáez, Martínez-Falcó, & Ruiz-Fernández, 2022). Such practices are evidence of intentions of an organisation to deal with issues affecting the environment as it pains operational and financial concern. Hart, (1995) noted that there is merit in incorporating the green performance into the strategic

management saying it is a way of developing competitive edge since it leads to instatement of innovations that will enhance stakeholder relations. Environmental management can be captured in three ways, namely; the minimisation of environmental liabilities, the optimisation of resource usage, and the creation of sustainable products (Bresciani, Rehman, Alam, Ashfaq, & Usman, 2022). Environmental cost reduction comes in the form of pollution and wastes' control and such areas as carbon management and compliance with environmental laws. Resource efficiency deals with improving the use of energy, water and raw materials in order to reduce cost and improve sustainability (Mansoor, Farrukh, Jahan, Lee, & Abd Wahab, 2022). While, sustainable product development refers to the systematic process or conceptualization and creation of products with less negative effect on the surrounding environment, especially in every phase of their lifecycle (Muisyo & Qin, 2021). These dimensions make a huge contribution in ensuring organization attain sustainable goals within the longest run.

Empirical studies have categorically pointed green performance showing that it can help organizations to achieve their objectives. Execution of the green practices is associated with benefits including better operational performance, better organizational image, and better customer response (Muisyo & Qin, 2021). In the fourth place, green initiatives also create innovation since organizations will come up with new technologies or ways of doing things in order to be sustainable. Nonetheless, green performance is a difficult nut to crack, hampered by expensive green solutions, organisational barriers to change, and lack of green savvy among organisational elites. Still, as a result of the increasingly global focus on sustainability, green performance will continue to be high on the agenda of organizations in the future years (Soegiri & Yuniarsa, 2020). Green performance is achieved by contributing environmentally friendly practices in HRM, from hiring eco-conscious employees to rewarding staff. This approach enhances overall organizational green performance (Lampthey, 2021). Researchers highlight the significance of Green HRM, emphasizing that HR executives' decisions and behaviors effect organizational sustainability (S. E. Jackson, Renwick, Jabbour, & Muller-Camen, 2011). Adoption of an Environmental Management System (EMS) is crucial for businesses in designing and implementing corporate environmental strategies to meet environmental goals (Haden et al., 2009).

The efficacy of human resource management (HRM) structures is improved when they are united with other parts of the business. Research constantly displays that HRM structures are more effective (Negt & Haunschild, 2024), especially when affiliated with the organization's culture (T. Jackson, 2014). Human resource management practices play an important role in understanding green organizational objectives and ensuring sustainable performance (Jamil, Zaman, Kayikci, & Khan, 2023). HRM practices, including education, choice, staffing, and payment, align with green practices (Cherian & Jacob, 2012). Ensuring green HRM methods, from selecting eco-friendly employees to compensation, contributes to organizational green performance (Yousefi et al., 2023). Scholars in the field focus on Green HRM and practices. Human resource executives' decisions reflect GHRM practices and organizational sustainability (S. E. Jackson et al., 2011). Environmental Management Systems (EMS) are crucial for designing corporate environmental strategies (Jiang, Rosati, Chai, & Feng, 2020). The integration of HRM structures with green practices enhances overall organizational performance. Organizational behaviour studies how people's actions in a company impact its performance, including decision-making, leadership, motivation, personality, productivity, and management. It involves a managerial process to organize green initiatives by hiring environmentally conscious individuals. Employee commitment is categorized into affective, continuance, and normative dimensions (Bankins, Ocampo, Marrone, Restubog, & Woo, 2024). Various researchers, including Aydoğın and Arslan (2020), have examined the links

between HRM practices and organizational commitment. Ababneh (2021) explored the perception of green practices among IT industry employees.

2.4 Green Human Resource Management (GHRM)

Green Human Resource Management (GHRM) is the central component in achieving sustainability within organizational frameworks. Broadly defined, Green HRM involves the implementation of HRM policies, philosophies, and practices strategically designed to promote the sustainable use of business resources. Additionally, it aims to proactively prevent and mitigate any negative consequences arising from environmental issues within organizational settings. The primary focus of this exploration is to understand and highlight the critical role GHRM plays in guiding organizations toward eco-friendly practices and contributing significantly to the broader goal of sustainability (Zoogah, 2011). Currently, some companies are adopting forward-thinking strategies by proactively forecasting the number and types of employees needed for the successful implementation of corporate environmental management initiatives, programs, and activities. Examples include adhering to standards like ISO 14001, adopting cleaner production practices, and embracing responsible care protocols. These proactive approaches are exemplary practices adopted by leading companies to effectively address and manage their environmental concerns. GHRM encompasses activities dedicated to creating, implementing, and sustaining a system that transforms employees into environmentally conscious individuals, aligning with organizational environmental goals (Correia, Farrukh Shahzad, Moleiro Martins, & Baheer, 2024). It involves policies, practices, and systems to benefit individuals, society, the natural environment, and the overall business, contributing significantly to environmental sustainability (Paulet, Holland, & Morgan, 2021). Employee performance plays a crucial role in addressing environmental pollution caused by organizations, necessitating Green Human Resource Requirements (GHRM). To realize administrative environmental goals, identifying four key categories is essential: Green aptitudes, Green attitudes, Green behaviours, and Green results (Aboramadan, 2022).

For an employee to be considered "Green," possessing adequate knowledge and skills in Greening is essential. Alongside competence, the right attitude towards environmental sustainability is crucial (Tabrizi, Karatepe, Rezapouraghdam, Rescalvo-Martin, & Enea, 2023). A pivotal Green human resource requirement is Green behaviour, including Green organizational citizenship behaviour, involving positive actions like using natural light to reduce electricity, encouraging others to adopt green practices, and sharing knowledge about environmental sustainability. An Empirical Analysis of Green HRM As an Emerging Trend in HRM Practices (Darvishmotevali & Altinay, 2022). Green HRM (GHRM) is an evolving management field that offers sustainable solutions for cost reduction and effective HRM strategies. This study explores the relationship between GHRM and organizational commitment, drawing insights from various Human Resource Management books, emphasizing the importance of aligning green HR practices with different organizational functions for overall sustainability (Al-Alawneh, Othman, & Zaid, 2024). Existing literature indicates a transformation in Human Resource Management (HRM) systems, evolving from traditional labor approaches with minimal employee participation to more participative and helpful strategies. These contemporary approaches allow workers to enhance their skills, knowledge, and mindset (Lengnick-Hall, Lengnick-Hall, Neely, & Bonner, 2021). Green performance is achieved through eco-friendly HRM practices, across employee selection to compensation (Lamprey, 2021). Scholars focus on Green HRM and its impact on organizational sustainability (Obereder, Müller-Camen, & Renwick, 2022). Human resource executives' choices reflect Green HRM practices and organizational sustainability (green signatures). An Environmental Management System (EMS) is crucial for designing and

implementing corporate environmental strategies (Haden, Oyler, & Humphreys, 2009). Aligning HRM structures with business elements enhances their effectiveness, particularly when aligned with organizational culture (S. E. Jackson, Schuler, & Jiang, 2014). Human resource management practices are pivotal for achieving green organizational goals and sustainable performance.

In the context of growth consciousness in environmental management and sustainable asset improvement (Aftab, Abid, Cucari, & Savastano, 2023), Green Human Resource Management (GHRM) involves HRM practices focused on the environmental impact of corporations. It is closely linked to the firm's environmental strategy and the environmentally responsible behaviours of employees (Renwick, Redman, & Maguire, 2013). Essentially, GHRM integrates the organization's ecological management goals into HR processes, including recruitment and selection, training and development, performance management and evaluation, as well as rewards and recognition (Muller-Carmem, Jackson, Jabbour, & Renwick, 2010; Rathore, 2023; Renwick et al., 2013). Green Human Resource Management (GHRM) involves three main aspects: building environmentally friendly skills among employees, motivating their engagement in green practices, and providing opportunities for them to contribute to sustainability. Developing employees' green skills includes eco-friendly recruitment, training, and development (Miah, Szabó-Szentgróti, & Walter, 2024). Motivating green passion involves activities like performance management and reward systems, while providing green opportunities encompasses employee involvement and leadership for environmental initiatives. The overall goal is to enhance a firm's green performance, moderated by a culture of green innovation (Muisyo & Qin, 2021). Based on the above discussion, this is affirmed that topics like green development, sustainable development, green communities, urbanization, and education are prevalent. Starting from a young age, it's crucial to install green skills in learners to promote environmental awareness and responsibility (Tandon, Dhir, Madan, Srivastava, & Nicolau, 2023).

2.5 Green (GTVET) Training Skills:

There is need to build various skills which will facilitate the shift towards a green economy and ensure that those participating in the economy employ sustainable measures. Green Technical Vocational Education and Training (GTVET) skills pertain to skills needed to bring about such change by incorporating sustainability in different sectors. Of these skills includes vocation knowledge and proficiencies, self of personal and procedural behaviors towards minimum adverse environmental effects, optimum energy use, and promoting sustainability by Buntat, Othman, Saud, Mustafa, and Mansor (2013); (Tegar). These skills, also known as soft green skills, are essential across various industries and job levels, including education, construction, and business. The Australian government has outlined a framework for cultivating green skills in the TVET sector, aligning with the Green Skills Agreement's goals. The development of green talents is crucial for transitioning from a traditional to a green development. According to the OECD (2016), "green skills" encompass technical skills, values, attitudes, and other components needed in the workplace.

From GTVET perspective, green skills refers to the competency that is needed by a person in order to carry out his or her assignments in as sustainable a manner as possible (Tegar). These skills cover a broad area of specialization that may include power production from renewable sources, environmental disposal and recycling, environmentally conscious production, environmentally friendly farming, and green architecture. As observed by Asukwo, Moses, Ibang, and Yusuf (2020), green skills relate not only to specific content of the work but also to problem-solving, innovative approach, and flexibility needed to adjust work practices to sustainability objectives. It is therefore essential for green skills

development through GVT through education as it seeks to entrepreneurial skills require in industries charging to the low carbon economy. GTVET systems incorporate environmental perspectives in technology and vocational sector to provide learners with relevant skills and techniques to enable them work in developing sectors of environmental technology (Tongshuwal, Fittoka, & Dung, 2024). Thus, Chepkoech Sr (2021) asserts that this approach help to develop the workers to be fit for green jobs which are jobs that contribute to the sustaining or creation of environmental quality (Cedefop, 2013). It is also noticed that the cultivation of green skills through GTVET is important not only for the conservation of the environment, but also for the economic stability. Employees trained in green skills are more likely to find jobs in the sectors which are set to expand in the next decades including renewable electricity, waste management, construction of green buildings among others. Furthermore, GTVET can facilitate the achievement of another social objective, namely that of creating equal opportunities for green jobs in countries of the developing world where such deficits are most markedly felt (UNESCO-UNEVOC, 2019).

Integrating green skills into school curricula is crucial (Kamis, Alwi, & Yunus, 2017). These skills, vital for a green development and environmental awareness, are essential for sustainable national development (James, Batumalay, & Paramasivam). Teachers play a key role in fostering green skills among students through intelligent teaching tactics. Government efforts to deploy green technology should consider the design and advancement processes. Extensive training for a green development is necessary (Jahonga, Ngore, & Muramba, 2015; Majumdar, 2011). Investigating connections between government policies, education, and the green development, Lethoko (2014) explores South America's educational response to green initiatives. The green economy affects employee competency through revitalizing green development, advancing green technology, and fostering green skills. Technical and vocational education plays a vital role in transmitting green technology and skills to cultivate environmental passion.

2.5.1 Implications of Green Skills in Broader Contexts

All industries and workforce levels, including education, construction, and business, require workers with green skills. The Australian government has outlined a framework for green skills development in the TVET sector, aligning with the Green Skills Agreement. The conversion to a green economy necessitates developing both hard and soft green competencies. Gavurova, Megyesiova, and Hudak (2021) identifies technical skills, values, and attitudes as "green skills" crucial in the workplace. Green skills should be integrated into school curricula, introducing green technology and skills to primary school pupils. Teachers play a crucial role in fostering green skills by employing intelligent teaching tactics. Analyzing government attempts to deploy green technology should consider the design process and advancement. Extensive training is necessary to create a green development (Jahonga et al., 2015; Majumdar, 2011). Advocates suggest incorporating green skills into every subject or topic for comprehensive education (Kaliappan & Hamid, 2021).

(Lethoko, 2014) explored the relationship between government policies, education, and the green development in South America. The impact of the green economy on employee competency includes reviving green development, advancing green technology, and cultivating green skills. In Pakistan, educators emphasize incorporating green skills into vocational education and training. Mukoni (2013) and Sola (2014) found that environmental education in institute curricula minimally affects community, students, and instructors. Technical and vocational education plays a crucial role in fostering environmental passion. Brown (2013) examined the influence of different cohort types on the development of green skills in Australia's TAFE institutions. Growing market sectors, including recycling, green building, water system sustainability, renewable energy, and energy-saving industries, were

considered. The research objectives include exploring the likelihood of adopting green practices in vocational institutes concerned with resource efficiency, featuring diverse students, committed to environmental sustainability, with an initial understanding of greening benefits, updated curricula, and a focus on material reuse. Based on the above literature review of notable past and contemporary studies, the following hypotheses have been proposed.

H1: GHRM has significant effect on sustainable development.

H2: GTVET Training skills have significance effects on sustainable development.

2.6 Conceptual Model and Underpinning Theory

The Resource-Based View (RBV) offers a robust theoretical framework for this model, especially in analysing how internal resources including GHRM practices and GTVET skills affect organisational/social beneficiaries including sustainable development.

Theory of RBV holds the view that the organisations succeed at gaining a competitive advantage when they efficiently deploy valuable, rare, inimitable, and non-substitutable resources (Barney 1991). As can be appreciated, GHRM practices and GTVET skills constitute such resources as implement and reinstate, respectively, the workforce capabilities and encouragement of environmentally sustainable behaviours within a green environment. A conceptual model is presented (refer to figure 2.1) in which Green Environments mediates the relationship between the independent variables of GHRM Practices and GTVET Skills while Sustainable Development is the dependent variable.

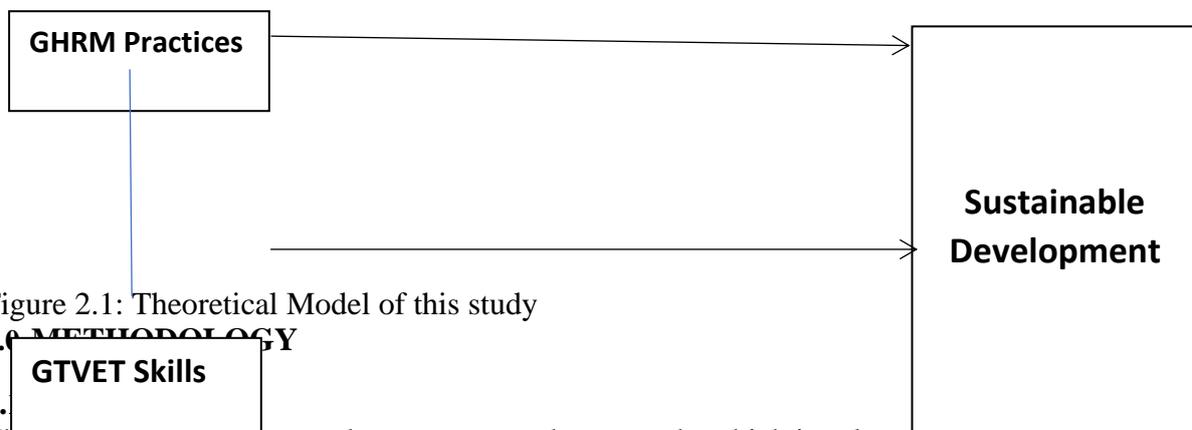


Figure 2.1: Theoretical Model of this study

3. METHODOLOGY

3.1. INTRODUCTION

This study employed an explanatory research approach, which involves exploring aspects that have received limited attention to date (Cooper et al., 2006). The correlational research method was utilized to emphasize the identification and examination of theoretical and conceptual relationships between variables. The primary objective of this study was to identify the key factors influencing sustainable development through Green HRM and Green TVET. The population for this study comprised staff members from TVET institutes across Punjab (refer to Table No.3.1). The sample size consisted of 353 staff members from these institutes. A 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), was used in the questionnaire to survey the participants. Specifically, the Green HRM Practices scale, adapted from Roscoe, Subramanian, Jabbour, and Chong (2019), consisted of 13 items measured on a five-point Likert scale ranging from 1 (Strongly Satisfied) to 5 (Strongly Dissatisfied). Similarly, sustainable development was measured using the Sustainable Performance scale, comprising 18 items adapted from Wijethilake (2017), and a five-point Likert scale with the same response format. The Green TVET Skills construct

included 20 items adapted from (Majumdar, 2011; OECD, 2016), following the same Likert scale design. In the social sciences, convenience sampling a form of non-probability sampling is commonly employed. Using convenience sampling, researchers collect data from members of the target population who are readily accessible. For this study, convenience sampling was adopted due to time constraints, which precluded the strategic selection of a sample for this investigation (Saunders et al., 2018). Data collection proved to be one of the most challenging aspects of this study, as many staff members were engaged in various official assignments in remote areas. To address this challenge and meet the research objectives, at least one enumerator was appointed in each city. Survey questionnaires were chosen as the data collection method for their efficiency, ease of administration, and reliability in yielding consistent results.

Table 3.1: List of TVET Institutions of southern Punjab

List of TVET Institutes
Dera Ghazi Khan
1- Bhakkar
2- Darya Khan
3- Kallurkot,
4- Mana Ahmadani (Satellite)
5- Taunsa Sharif
Layyah
1- Chowk Azam
2- Fathepur
3- Kot Sutlan
4- Layyah
5- Basti Jhakar (Satellite)
Muzafargurh
1- Jatoai
2- Mehmood kot
3- Dr Muzaffar Saeed VTI
4- Shah Garh (Satellite)
5- Basira (Satellite)
6- Kot Addu
7- Rang Pur
8- Shah Jamal
9- Khan Garh (Satellite)
Rajanpur
1- Dajal
2- Fazilpur
3- Jampur
4- Kamal Fareed VTI
Vehari
1- Vehari
2- Sardarpur Jahandir (Satellite)

3- Ludden
Khanewal
1- Khanewal
2- Abdul hakeem
Bahawalnagar
1- Bahawalnagar
2- Chishtian
3- Fortabbas
4- Minchinabad
5- Mandi Sadiq Gunj (Sattelite)
Lodhran
1- Lodhran
2- Chak 12 MPR (Satellite)
3- Dunyapur
4- Kehror Pakka
5- Makhdoom Aali
6- Qutabpur
Rahim Yar Khan
1- Khan Pur
2- Liaqat Pur
3- Rhaim Yar Khan
4- Rajan Pur Kalan
5- Sadiq Abad
6- Khan Bela
7- Zahir Per
8- Jamal Din Wali
9- H. H. Sheikh Khalifa
Bahawalpur
1- Bahawal Pur (Male)
2- Bahawal Pur (Female)
3- Yazman
4- Ahmed Pur East
Multan
1- Multan (Male)
2- Multan (Female)
3- Shuja Abad
4- MTEC Multan

4.1 Response rate

The target population for this study was limited to staff members, including senior instructors, principal officers, and administrative staff, from the 58 vocational training institutes in South Punjab. Attempts have been made to increase the response rate by using various methods. Only 305 valid questionnaires were returned due to these efforts. The response rate is 67.77%.

4.2 Measurement Model

The measuring model is assessed to look at the construct's quality. The outer loadings are investigated first in examining the quality requirements, then perhaps the validity structure and reliability are examined.

4.2.1 Loadings, CA, AVE, and Reliability

In this study, no item was found to be less than 0.50, as suggested by (Hult et al., 2018). As a consequence, no item has been deleted from this study. Results are shown in Table 4. CR and CA are commonplace techniques used for determining the reliability of the. The findings of CR and CA are shown in the fifth table. The range of CA is from 0.892 to 0.956, while the range of CR is from 0.926 to 0.960. CR and CA indicate good reliability over the advised values of 0.70 (Hair, Ringle, & Sarstedt, 2011). When the value of AVE is greater or equal to 0.50, the underlying construct is assessed using converge items. (Fornell & Larcker, 1981). Convergent validity results are entirely reliant on AVE statistics. Table 4.1 shows that all variables are more than the recommended values. So, convergent validity is established.

Table 4.1 Convergent Validity

Construct	Items	Loadings	CA	CR	AVE
Green HRM Practices	GHRMP1	0.847	0.957	0.962	0.661
	GHRMP2	0.837			
	GHRMP3	0.806			
	GHRMP4	0.764			
	GHRMP5	0.732			
	GHRMP6	0.834			
	GHRMP7	0.861			
	GHRMP8	0.894			
	GHRMP9	0.795			
	GHRMP10	0.791			
	GHRMP11	0.741			
	GHRMP12	0.856			
	GHRMP13	0.796			
GTEVT Skills	GTEVT-A1	0.760	0.973	0.975	0.662
	GTEVT-A2	0.821			
	GTEVT-A3	0.868			
	GTEVT-A4	0.853			
	GTEVT-A5	0.800			
	GTEVT-OC1	0.763			
	GTEVT-OC2	0.743			
	GTEVT-OC3	0.834			
	GTEVT-OC4	0.856			
	GTEVT-OC5	0.800			
	GTEVT-TS1	0.795			
	GTEVT-TS2	0.800			
	GTEVT-TS3	0.854			
	GTEVT-TS4	0.772			
	GTEVT-TS5	0.811			
	GTEVT-V1	0.787			
	GTEVT-V2	0.860			

	GTEVT-V3	0.825			
	GTEVT-V4	0.826			
	GTEVT-V5	0.832			
Sustainable Performance	SP-EP1	0.822	0.970	0.973	0.663
	SP-EP2	0.849			
	SP-EP3	0.858			
	SP-EP4	0.731			
	SP-EP5	0.802			
	SP-EP6	0.770			
	SP-EP7	0.836			
	SP-EP8	0.802			
	SP-EcoP1	0.809			
	SP-EcoP2	0.843			
	SP-EcoP3	0.840			
	SP-EcoP4	0.852			
	SP-SP1	0.766			
	SP-SP2	0.856			
	SP-SP3	0.853			
	SP-SP4	0.822			
	SP-SP5	0.779			
SP-SP6	0.750				

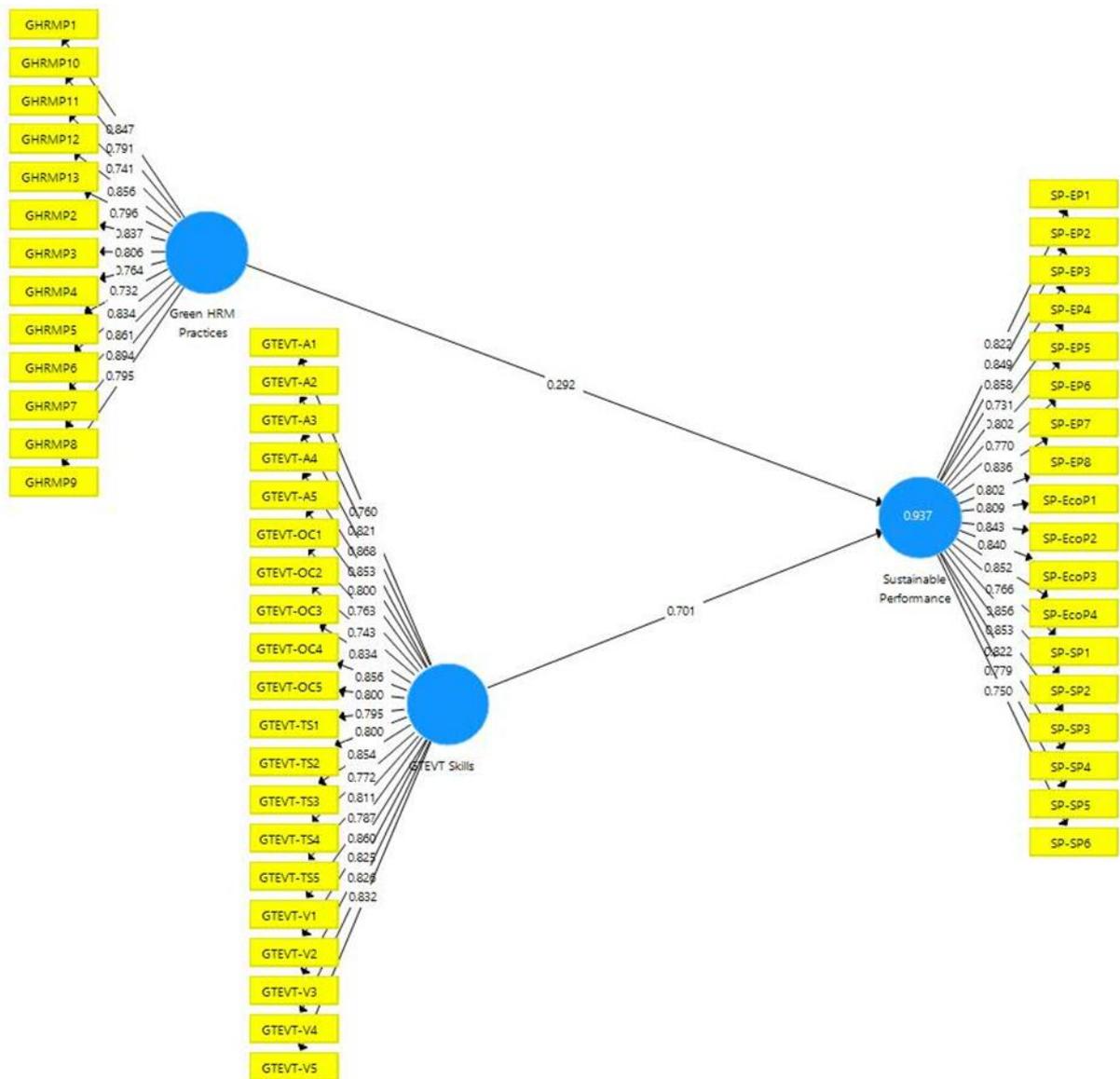


Fig 4.1
4.2.2 Discriminant Validity

Discriminant validity was analysed to assess the model’s external consistency. This assessment is based on the associations among the variables, with the values of the variables compared to the square root of the AVE. As shown in Table 4.2, all correlations among the variables are lower than the square root of the AVEs, except for those highlighted in bold across the table.

Table 4.2 Discriminant Validity (Fornell and Larcker Criterion)

	GTEVT Skills	Green HRM Practices	Sustainable Performance
GTEVT Skills	0.814		
Green HRM Practices	0.801	0.813	
Sustainable Performance	0.788	0.803	0.814

4.2.3 Collinearity Statistics (VIF)

The “Variance Inflation Factor (VIF)” is examined to determine the degree of collinearity in PLS-SEM analysis. There are two commonly recognized generalizations: “If VIF 5 or higher, it indicates a potential issue with collinearity problem” (Hair et al., 2011). “If VIF 3.3 or higher, it indicates a potential issue with collinearity problem” (Diamantopoulos & Siguaw, 2006).

Table 4.3 Collinearity Statistics (VIF)

Items	VIF
GHRMP1	4.352
GHRMP2	4.277
GHRMP3	4.975
GHRMP4	4.428
GHRMP5	2.317
GHRMP6	3.335
GHRMP7	4.482
GHRMP8	4.213
GHRMP9	3.073
GHRMP10	3.072
GHRMP11	2.405
GHRMP12	3.679
GHRMP13	2.728
GTEVT-A1	4.075
GTEVT-A2	3.897
GTEVT-A3	4.301
GTEVT-A4	4.624
GTEVT-A5	4.687
GTEVT-OC1	3.003
GTEVT-OC2	3.631
GTEVT-OC3	4.481
GTEVT-OC4	4.253
GTEVT-OC5	3.710
GTEVT-TS1	4.114
GTEVT-TS2	4.049
GTEVT-TS3	4.116
GTEVT-TS4	4.023
GTEVT-TS5	3.755
GTEVT-V1	3.002
GTEVT-V2	4.719
GTEVT-V3	3.828
GTEVT-V4	3.668
GTEVT-V5	4.466
SP-EP1	3.912
SP-EP2	4.303
SP-EP3	4.307
SP-EP4	2.787
SP-EP5	3.401

SP-EP6	2.591
SP-EP7	3.777
SP-EP8	2.986
SP-EcoP1	3.179
SP-EcoP2	4.049
SP-EcoP3	4.278
SP-EcoP4	3.878
SP-SP1	2.771
SP-SP2	4.850
SP-SP3	4.285
SP-SP4	4.633
SP-SP5	4.030
SP-SP6	2.942

4.3 Structural Model Assessment

The structural model was measured using SmartPLS . The required tests conducted within the structural model included hypothesis testing with path coefficients and T-values, as well as an examination of the effect size and predictive relevance of the model.

4.3.1 Direct Effect and Hypotheses Testing

Using SmartPLS, the structural model provided an analysis of the inner model, examining the direct linkages among the study's factors, including t-values and path coefficients.(Henseler, Ringle, & Sinkovics, 2009) stated that path coefficients are analogous to regression analysis and standardized beta coefficients. Beta values represent the regression coefficients, and t-values are analyzed to determine the significance level of the constructs. Furthermore, following the 'rule of thumb' outlined by Hair Jr et al. (2014) , the bootstrapping method was employed, using 500 sampling iterations for 300 cases/observations, to determine the beta values of the regression coefficients. The t-values were also considered; for a hypothesis to be accepted, the t-value must approximately equal or exceed 1.64. If the t-value falls below this threshold, the hypothesis or relationship is deemed unsupported. The structural model primarily focuses on testing the hypotheses or relationships developed in the research framework. The main goal is to evaluate the model by analyzing both direct and indirect relationships, as well as to test and decide on the acceptance or rejection of hypotheses using the structural model. This process involves predicted correlations between factors, assessed through PLS bootstrapping. In this study, only two direct hypotheses were tested and analyzed, both of which were supported.

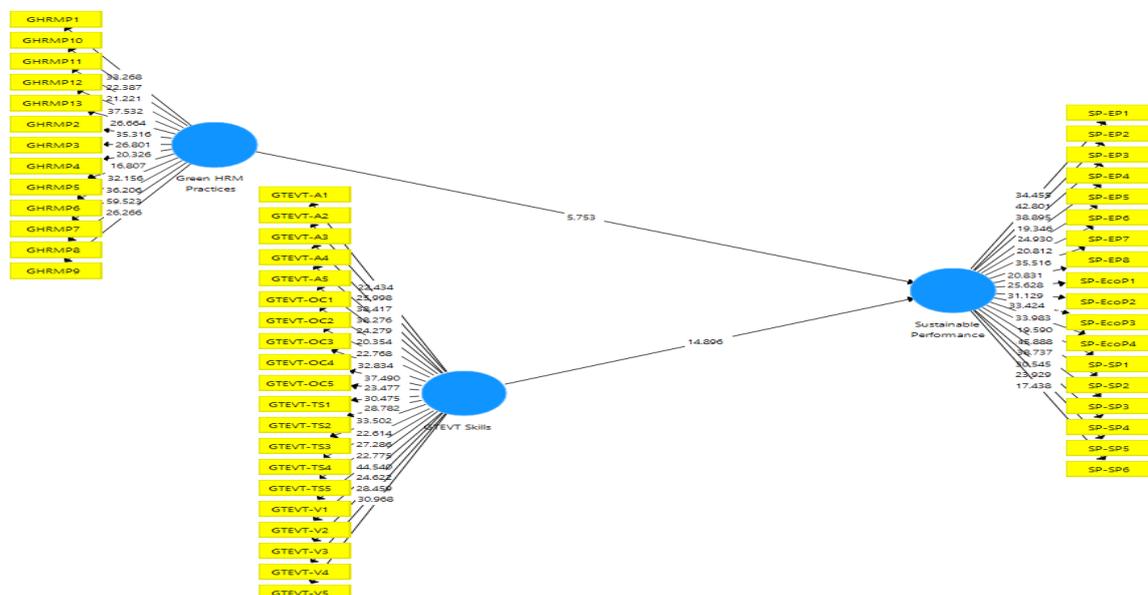
H1 examines whether Green HRM Practices (GHRMP) have a significant and positive relationship with Sustainable Performance (SP). The results indicate that GHRMP has a substantial impact on SP ($\beta = 0.701$, $t = 14.896$, $p = 0.000$). Therefore, H1 is supported.

H2 examines whether GTVET Skills have a significant and positive relationship with Sustainable Performance. The results show that GTVET significantly impacts SP ($\beta = 0.292$, $t = 5.753$, $p = 0.000$). Therefore, H2 is supported. The results for both hypotheses are presented in Table 4.4

Table 4.4

Path	Beta Coefficient	S.D	T Values	P Values	Decision
GHRMP -> SP	0.701	0.047	14.896	0.000	Supported
GTEVT -> SP	0.292	0.051	5.573	0.000	Supported

Fig 4.2



5.0 Discussion and Conclusion

The analysis conducted and presented in Chapter 4 also supports the hypothesis stating the relevance of Green HRM Practices and GTEVT Skills for Sustainable Performance. The findings, therefore, support the hypothesized relationship between organizations implementing green HRM and developing GTEVTs for sustaining organizational goals in economic performance, environmental stewardship, and organizational social responsibility. The study provides a positive correlation between Green HRM Practices and Sustainable Performance by emphasizing sustainable HRM practices. This is in line with previous studies like Renwick et al. (2013), where it is agreed that green recruitment, training, and appraisal practices are vital for sustainability integration within the practice systems of organizations. Similarly, Jabbour and Santos (2008) pointed out that organizations that use green HRM initiatives gain better environmental and social performance. This finding is in line with this study. Further, the study reveals that green HRM strategies affect both environmental and social aspects of Sustainable Performance. For instance, training or performance appraisals that promote environmental awareness encourage workplace use of environmentally friendly practices. Further, findings presented by other researchers, including Dumont, Shen, and Deng (2017), reinforce these findings by associating green HRM with enhanced organizational sustainability performance.

The findings also showed a highly significant positive correlation between GTEVT Skills and Sustainable Performance. Technical and operational vocational competencies of GTEVT were established to help enhance workforce productivity and, thus, economic efficiency, as well as promote the conservation and sustainable use of resources. These results are consistent with Rasool, Wang, Zhang, and Samma (2020) assertion that vocational and technical skills improve company sustainability and performance. Also, the current research supports the idea that organizations where employees possess advanced GTEVT skills for green practices can be more effective at utilizing green practices that, in turn, improve Sustainable Performance. This is supported by another author Fang, Shi, Gao, and Li (2022), who showed that the skilled workforce has a positive relationship with sustainable performance, especially in industries that seek to adopt sustainability practices.

The findings have indicated that while measuring three dimensions of Sustainable Performance, Green HRM Practices and GTEVT Skills significantly affect the outcome. Green HRM was identified to positively influence environmental and social performance, which aligns with the study by Bagale (2015). On the other hand, the GTEVT skills played a more significant role in enhancing the firm's economic performance, supporting other researchers, such as Muhsina (2024), who posited that technical skills would significantly impact operational performance.

The findings of this study support but also add to the existing body of knowledge regarding the enhancement of sustainable development through Green HRM Practices and GTEVT Skills. However, this study advances the literature by offering a more holistic perspective while furthering our understanding of how these factors collectively improve every aspect of Sustainable Performance. For instance, while previous research was based on a single aspect of sustainability, this study introduces a comprehensive framework. Therefore, it can be concluded that the outcome reinforces that if organizations want to increase their Sustainable Performance, they must devote resources to Green HRM Practices and the nurturing of GTEVT aptitude. The results support previous work and enrich the literature on sustainability drivers, providing a solid ground for further examination.

5.1 Theoretical Implications

This study provides considerable theoretical implications for understanding the association between Green HRM Practices, GTEVT Skills, and Sustainable Performance. Thus, extending prior literature with these variables incorporated into a single model, this research supports the moderation effects of HRM on sustainability and the interconnected roles of skill development. First, the results extend the studies in the RBV literature, supporting Green HRM Practices and GTEVT Skills as valuable, rare, and inimitable resources through which organizations may establish sustainable competitive advantages (Barney, 1991). Indeed, this research proves that going green through the reforms of environmentally sustainable HRM practices has the potential to reduce the organizational impact on the environment and increase workforce involvement and organizational innovation performance, which are essential for sustainability. Second, this research contributes to human capital theory by explaining how GTEVT Skills vocational and technical education is used for economic, social, and environmental objectives. The results support Becker's theory that stakeholder investment in developing skills in human capital provides organizational flexibility and productivity in addressing sustainability issues (Becker, 1964). Furthermore, the study responds to the research questions by presenting a conclusion on sustainable performance, including economic, environmental, and social aspects. This broad view is a theoretical advance from previous studies, which often examined only which aspect of sustainability, for instance, the environmental one (Dumont et al., 2017).

5.3 Managerial Implications

The implications of this study are suggestive for managers interested in improving Sustainable Performance in the organizations they are managing. First, it is recommended that managers integrate Green HRM practices within their organizations through green recruitment, training, performance management systems, and others. These practices make the employees change their behaviors to green behavior and make the organization's human resource management reflect on environmental policies and measures. Furthermore, GTEVT skills enhancement is the other crucial factor that needs to be funded. Here, the following practices can be adopted by managers in relation to appeals to employees: Conduct vocational and technical training on green technologies; green products and services; sustainable production processes and procedures for innovation; appropriate solutions, processes, and tools for sustainability. Finally, using technology to enhance the evaluation of

green HRM and training programs for effectiveness will also serve a great purpose. Managers can fulfill stakeholder demands for sustainable practices by advancing the company's sustainable management practices.

5.4 Conclusion

This thesis has discussed Green HRM practices, GTEVT skills, and sustainable performance to determine the impact of the different factors on sustainable economic, environmental, and social performance. Therefore, the findings of this current study confirmed that not only Green HRM practices but GTEVT skills also positively impact Sustainable Performance, which indicates that these factors are the key drivers in the context of organizational sustainability. The study outcome proves that Green HRM activities such as environmentally complex recruitment and selection, training on environmental issues, and appraisals that encourage an organizational culture of the environment lead to the creation of permission to address issues of the environment. Likewise, GTEVT skills development provides the workforce with technical and vocational skills essential for an organization's efficiency in adopting sustainability. The study supported the theoretical framework of sustainability and resource-based theory and gave managers guidelines regarding implementing these practices. Through the use of green initiatives and skills development, organizations can expand their stakeholder demands while achieving environmental conservation goals in developing sustainable operations. Therefore, the research contributes to the previous knowledge focusing on the integrated nature of the sustainability concept by considering its economic, environmental, and social aspects.

5.5 Limitations and Future Suggestions

This study concerned vocational training institutes in south Punjab, Pakistan; hence, the findings may not be generalized to other regions or industries. Second, due to the cross-sectional research design, the study investigates the current associations between given variables, not the changes in these associations with time. Thirdly, response bias is possible since respondents may give socially desirable answers to questions related to sustainability practices and achievements. Finally, this study did not involve moderating or mediating variables regarding the strength of Green HRM practices, the GTEVT skill relationship, and its impact.

To strengthen and advance the findings of this investigation of Green HRM Practice, GTEVT skill, and Sustainable Performance, several areas of improvement should be explored in future research. Extending the geographical and sectoral coverage is crucial to replicate the findings to other locations and industries and produce more generalizable results. The longitudinal study setting is optimal for capturing the dynamic nature of these relationships and describing how Green HRM practices and GTEVT skills can support sustainable results in changing environments. Moreover, it can enhance understanding of the processes that underpin sustainability by including mediators like green organizational culture and moderators like regulatory support. Future research should also seek to employ stratified data sources through surveys with subjective data from the respondents and objective data from performance and environmental indices to reduce response bias and increase the validity of the data collected. Last, examining how implementing the increasing technologies like AI and IoT may provide insights into how the emerging technological solutions improve the Green HRM practice and skills development towards attaining sustainability. Developing these fields will help to create a better understanding of the concept and prerequisites for sustainable performance.

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