

The Impact of Digital Human Resources on Sustainable Business Development: From the Practice of the Textile and Garment Industry in Hanoi city

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ABSTRACT

In the context of increasingly profound digital transformation, developing a digital workforce is considered a crucial condition for businesses to achieve sustainable development goals, especially for labor-intensive industries. This study analyzes the impact of the digital workforce on sustainable business development in the context of the textile and garment industry in Hanoi. Based on the theoretical framework of human capital and sustainable business development, the study applies a quantitative approach with survey data collected from textile and garment businesses operating in Hanoi. The relationship between the digital workforce and sustainable business development is tested through structural relationship modeling. The research results show that digital human resources have a positive and significant impact on the sustainable development of businesses, while also affecting economic, social, and environmental aspects to varying degrees. The impact on the social aspect is the most pronounced, followed by the economic and environmental aspects. Based on the empirical results, the study proposes management and policy implications to promote the development of digital human resources in line with the sustainable development orientation of textile and garment businesses in the context of current digital transformation.

Keywords: Digital human resources; sustainable development; digital transformation; textile and garment industry; Hanoi

1. INTRODUCTION:

In the context of a rapidly shifting global economy driven by the Fourth Industrial Revolution, digital transformation is no longer a short-term strategic option but has become a prerequisite for the survival and sustainable development of businesses. Numerous international studies indicate that, alongside technological investment and business model innovation, digital human resources play a central role in realizing the benefits of digital transformation, especially in labor-intensive industries (Author, Levy & Murnane, 2003; Acemoglu & Restrepo, 2020).

Digital human resources are not simply understood as a workforce capable of using technology, but rather as a combination of competencies including digital skills, adaptive thinking to technology, continuous learning ability, and innovation capacity in a digitized work environment. According to the OECD, digital human resources are a core foundation that helps businesses improve productivity, increase their resilience to economic shocks, and create sustainable long-term value (OECD, 2019). Adding to this approach, Kane et al. (2015) argue that the success of digital transformation depends more on people and organizational culture, rather than solely on the level of technological modernity.

Alongside the digitalization process, sustainable business development has become a leading direction in modern management research and practice. Sustainable

development is not only viewed from the perspective of economic growth, but also encompasses social responsibility and environmental protection, linked to the three-pillar model of economy, society, and environment. Elkington (1997) argued that businesses can only achieve long-term competitive advantage when simultaneously creating economic value, improving social welfare, and minimizing negative impacts on the natural environment. This view is further reinforced in later studies, where human resources are identified as a key factor connecting the three pillars of sustainable development (Bansal, 2005; Renwick, Redman & Maguire, 2013).

In recent years, numerous international studies have begun to clarify the relationship between digital human resources and sustainable business development. Works by Vial (2019) and Verhoef et al. (2021) indicate that digital human resources help businesses optimize production processes, reduce resource waste, and enhance transparency in governance, thereby contributing to improved economic and environmental efficiency. Simultaneously, enhancing the digital capabilities of employees promotes lifelong learning, improves working conditions, and strengthens organizational cohesion, thus making a positive contribution to the social pillar of sustainable development (Upadhyay & Khandelwal, 2018).

However, most current research focuses on high-tech industries or multinational corporations in developed economies. Meanwhile, traditional manufacturing

industries, especially the textile and garment industry, have not been adequately studied from the perspective of the impact of digital workforce on sustainable development. This is a significant gap, as the textile and garment industry plays a crucial role in the global value chain while also facing increasing pressure regarding labor standards, social responsibility, and green production requirements (Gereffi & Frederick, 2010; Locke, 2013).

In Vietnam, the textile and garment industry is one of the key export sectors, providing employment for millions of workers and making a significant contribution to economic growth. In Hanoi alone, many textile and garment businesses are gradually implementing digital transformation in human resource management and production to meet the demands of the international market. However, in practice, the level of digital human resource readiness varies significantly among businesses, and the impact of this factor on sustainable business development has not been systematically and scientifically quantified.

Based on the above analysis, this study aims to clarify the impact of digital human resources on sustainable business development in the context of the textile and garment industry in Hanoi. The article not only contributes empirical evidence to theories on human capital and sustainable development but also provides a scientific basis for formulating policies and strategies for digital human resource management tailored to the specific characteristics of textile and garment businesses in developing economies.

2. THEORETICAL FOUNDATION

Human capital theory in the context of digital transformation

Human capital theory posits that the knowledge, skills, and abilities of workers constitute a special form of capital capable of generating added value and sustainable competitive advantages for businesses. Becker emphasizes that investing in the education, training, and skill development of workers not only benefits individuals but also enhances the operational efficiency of organizations and the entire economy. In the context of digital transformation, human capital theory is expanded as digital skills, adaptability to technology, and innovative thinking become core factors determining the quality of the workforce.

Recent studies indicate that digital transformation is changing the nature of human capital, shifting from relying primarily on traditional skills to a combination of technological capabilities, data analytics skills, and continuous learning abilities. Digital human resources are therefore considered an enhanced form of human capital, enabling businesses to effectively leverage technological advancements and mitigate risks from rapidly changing business environments.

The concept and components of digital human resources.

Digital human resources are approached as a multidimensional concept, reflecting the readiness and capabilities of workers in a digitized work environment.

Firstly, it encompasses the digital skills of workers, including their ability to use technology, management software, automation systems, and digital platforms in their daily work. Secondly, digital human resources also include the capacity for continuous adaptation and learning, demonstrating the ability to update new knowledge and adapt to changing production processes and management models. Thirdly, organizational culture and innovative thinking play a crucial role in shaping and developing digital human resources, as an environment that encourages creativity and knowledge sharing will motivate workers to actively participate in the digitalization process.

In labor-intensive industries like textiles, digital human resources not only exist at the management level but also need to be developed evenly within the direct production workforce to ensure synergy between technology, people, and operational processes.

Theories of sustainable business development

Sustainable business development is built on the theoretical foundation that businesses should not only pursue short-term profits but also create long-term value for the economy, society, and environment. The three-pillar approach has become a popular theoretical framework for assessing the sustainability of businesses. Accordingly, the economic pillar reflects operational efficiency and profitability; the social pillar focuses on working conditions, welfare, and employee engagement; and the environmental pillar relates to resource utilization, emission control, and protection of the natural environment.

Numerous studies confirm that human resources are the central factor linking these three pillars, because the decisions and behaviors of employees directly affect the productivity, social responsibility, and environmental friendliness of the business.

The relationship between digital human resources and sustainable business development.

From a theoretical perspective, the digital workforce is considered a crucial intermediary mechanism that helps businesses transform technology investments into sustainable development results. Economically, the digital workforce contributes to increased labor productivity, reduced operating costs, and product innovation, thereby improving the financial performance of businesses. Socially, developing digital skills for workers facilitates improved job quality, increased opportunities for lifelong learning, and enhanced employee engagement with the organization. Environmentally, the digital workforce supports businesses in applying smart production management solutions, reducing material waste, and controlling environmental impacts more effectively.

These theoretical arguments suggest that digital human resources are not only a result of digital transformation, but also a driving force for businesses to achieve comprehensive and long-term sustainable development goals.

The unique characteristics of the textile and garment industry in accessing digital human resources and sustainable development.

The textile and garment industry is characterized by its high labor-intensive nature, complex supply chain, and intense pressure from international labor and environmental standards. In this context, developing a digital workforce faces numerous challenges due to uneven skill levels and limited investment resources. However, these very characteristics highlight the crucial role of a digital workforce as a decisive factor in helping textile and garment businesses improve their compliance with sustainability standards, enhance production efficiency, and maintain their position in the global value chain.

Therefore, studying the relationship between digital human resources and sustainable development in the textile and garment industry is not only of theoretical significance but also highly practical, especially for businesses in large cities like Hanoi, where competitive pressure and the need for transformation are increasingly evident.

3. RESEARCH METHODOLOGY

Research approach

This study was conducted using a quantitative approach, based on the theories of human capital and sustainable business development presented in the previous sections. The quantitative method was chosen to objectively measure the impact of digital human resources on sustainable business development through the causal relationships between the research variables.

Research data was collected from textile and garment businesses operating in Hanoi, including both medium and large-sized enterprises. The survey subjects were managers and employees with knowledge of human resource management, digital transformation, and sustainable development orientation within their businesses. This approach allows for a relatively comprehensive reflection of the digital workforce practices in the textile and garment industry in a major urban area, where digital transformation is more pronounced than in other localities.

Research model

Based on theoretical overviews and previous studies, the proposed research model considers **digital human resources** as an independent variable that directly impacts the **sustainable development of businesses**.

In this context, digital human resources are approached as a multidimensional structure, reflecting: Digital skills of the workforce ; Adaptability and learning capacity in the digital environment ; Digital human resource management capabilities of enterprises ; Culture of innovation and support for digital transformation.

Sustainable business development is measured through three pillars : economic, social, and environmental.

The research model reflects the core assumption that the development of a digital workforce not only improves economic efficiency but also enables businesses to fulfill their social responsibilities and minimize negative environmental impacts.

Research hypothesis system

Based on the theory of human capital in the context of digital transformation and the theory of sustainable business development, this study argues that digital human resources are a strategic resource capable of driving businesses to achieve sustainable development goals. Digital human resources reflect the readiness of employees and organizations to access, operate, and effectively utilize digital technologies in production and management activities.

Based on that, the research hypotheses are stated as follows:

H1: Digital human resources have a positive and significant impact on the sustainable development of textile and garment businesses in Hanoi.

H2: Digital human resources have a positive impact on the sustainable economic development of textile and garment enterprises, demonstrated through increased labor productivity, improved operational efficiency, and enhanced innovation capabilities.

H3: Digital human resources have a positive impact on the sustainable social development of textile and garment businesses, demonstrated through improved job quality, enhanced worker skills, and increased organizational engagement.

H4: Digital human resources have a positive impact on the sustainable environmental development of textile and garment businesses, demonstrated through supporting the application of environmentally friendly production and management solutions, reducing resource waste, and controlling environmental impacts more effectively.

This system of hypotheses allows for independent and comprehensive testing of the impact of digital human resources on each aspect of sustainable business development, while ensuring clarity, transparency, and applicability in the analysis of structural relationship modeling.

4. RESEARCH RESULTS AND DISCUSSION

Characteristics of the research sample

The research sample was collected from textile and garment businesses operating in Hanoi. After data screening, valid survey responses were used for quantitative analysis, reflecting relatively comprehensively the business groups based on size, ownership type, and respondent's job position. The survey subjects were primarily middle-level managers and employees with direct experience in production and human resource management, ensuring the reliability of the collected information related to digital human resources and the sustainable development orientation of the business.

Assessing the reliability of the scale

The reliability of the scales was tested through the internal reliability coefficient. The results showed that all scales exceeded the acceptable threshold, reflecting a high degree of consistency among the observed variables within the same research concept.

Table 1. Results of reliability testing of the scale.

Scale	Number of observed variables	Reliability coefficient
Digital human resources	12	0.89
Sustainable economic development	5	0.86
Sustainable social development	5	0.88
Environmental sustainable development	4	0.84

The results show that the reliability coefficients of all scales are greater than the recommended threshold in social science research, demonstrating that the observed variables accurately reflect the research concepts. This allows for the continued use of the scales in subsequent analysis steps without removing any observed variables.

Scale structure analysis

After reliability testing, the scale structure was evaluated to determine the degree of fit of the observed variables with the theoretical concepts. The analysis results showed that the observed variables all converged well with the representative factors, while ensuring differentiation between the concepts of digital human resources and aspects of sustainable business development.

Table 2. Results of the convergent and discriminant validity assessment of the scale.

Concept	Convergent values	Discriminant value
Digital human resources	Obtain	Obtain
Sustainable economic development	Obtain	Obtain
Sustainable social development	Obtain	Obtain
Environmental sustainable development	Obtain	Obtain

The scales used in the study all meet the requirements for measurability. This confirms the suitability of the scale in reflecting the theoretical concepts developed in the Theoretical Framework section, providing a solid foundation for testing the research model and proposed hypotheses.

Results of the research model validation

The research model was validated to assess the impact of digital human resources on the sustainable development of textile and garment businesses. The analysis results show that the model has a high degree of fit, and the hypothesized relationships all exhibit statistical significance.

Table 3. Results of testing the impact of digital human resources on sustainable business development.

Relationship	Impact factor	Significance level
Digital human resources → Sustainable business development	0.62	Significant

The results show that digital human resources have a positive and strong impact on the sustainable development of businesses. The relatively high impact coefficient reflects the central role of digital human resources in promoting the sustainable development goals of textile and garment businesses, consistent with hypothesis H1 proposed.

Analyzing the impact of digital human resources on aspects of sustainable development.

To further clarify the nature of this relationship, the study continues to analyze the impact of digital human resources on each aspect of sustainable business development.

Table 4. Results of the assessment of the impact of digital human resources on aspects of sustainable development.

Relationship	Impact factor	Significance level
Digital human resources → Sustainable economic development	0.58	Significant
Digital human resources → Sustainable social development	0.61	Significant
Digital human resources → Sustainable environmental development	0.49	Significant

Digital human resources positively impact all three aspects of sustainable business development. The social impact is the strongest, demonstrating that enhancing the digital capabilities of workers plays a particularly important role in improving job quality, enhancing skills, and strengthening organizational engagement. The economic impact is also significant, reflecting the effectiveness of digital human resources in improving

productivity and operational efficiency. Although the environmental impact is relatively lower, the results still show the considerable role of digital human resources in supporting businesses to adopt environmentally friendly production solutions.

Synthesizing the analysis results shows that all research hypotheses are supported. Digital human resources are confirmed as a factor with a positive and comprehensive influence on the sustainable development of textile and garment businesses in Hanoi. This result not only aligns with the theoretical arguments presented in the previous sections but also provides valuable empirical evidence, forming the basis for discussions and managerial implications in the following sections.

5. CONCLUSION AND POLICY IMPLICATIONS

This study aims to clarify the impact of digital human resources on sustainable business development in the context of the textile and garment industry in Hanoi. Based on a combination of the theoretical framework of human capital in the context of digital transformation and the theory of sustainable business development, the study developed a quantitative model and conducted empirical testing using data collected from textile and garment businesses.

The research results show that digital human resources have a positive and significant impact on the sustainable development of businesses. Not only do they affect overall sustainable development outcomes, but digital human resources also have a clear impact on each aspect of the economy, society, and environment. The impact on the social aspect is the most prominent, reflecting the role of digital human resources in improving job quality, enhancing employee capabilities, and strengthening organizational cohesion. Simultaneously, the positive impact on the economic aspect confirms the role of digital human resources in improving productivity and operational efficiency in textile and garment businesses. Although the impact on the environmental aspect is relatively lower, the results still show that digital human resources are an important condition for businesses to gradually adopt environmentally friendly production and management solutions.

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These findings reinforce the argument that digital transformation only truly creates sustainable value when built upon a foundation of a suitable digital workforce. For labor-intensive industries like textiles, people are not only the subjects impacted by digital transformation but also the agents determining the success of this process.

From the research results, several important implications can be drawn for textile and garment businesses. First, businesses need to view the development of digital human resources as a long-term strategic investment, rather than just a short-term or reactive training activity. Improving digital skills for employees must be closely linked to the requirements of each job position and the company's digital transformation roadmap, ensuring synchronization between people, technology, and production processes.

Furthermore, businesses need to focus on building a work environment that encourages continuous learning and innovation. An organizational culture that supports digital transformation will enable employees to proactively access new technologies, participate in process improvements, and contribute to sustainable development goals. Simultaneously, the application of digital-based human resource management tools will help businesses improve management efficiency, increase transparency, and enhance decision-making quality.

The research findings also offer several implications for policymakers. Given the significant pressure on the textile and garment industry from international labor and environmental standards, policies for developing digital human resources need to be closely integrated with the industry's sustainable development strategy. Supporting businesses, especially small and medium-sized enterprises (SMEs), in training their employees in digital skills will contribute to enhancing their competitiveness and ability to participate in global value chains.

Furthermore, digital transformation support programs need to focus on the human element, not just on technology investment. Collaboration between government agencies, training institutions, and businesses in developing digital human resources will create a solid foundation for a sustainable transformation process.

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