Applied Data Science for Exploring Human Resource Management Affecting the Competitiveness of Commercial Banks in Vietnam

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Abstract

Human resource management is crucial in banking operations and is fundamental for maintaining sustainable development and enhancing the competitiveness of commercial banks. The current challenges in human resource management within banking operations provide notable limits that adversely impact competitiveness. This study seeks to identify the elements impacting human resource management in commercial banks in Vietnam and assess their degree of impact. Considering these issues and their influence on human resource management, the authors suggested strategies to enhance human resource management and bolster the competitiveness of banks. This research employs a blend of qualitative and quantitative methodologies. The study included qualitative approaches, utilizing expert techniques and in-depth interviews with 10 bank directors, supplemented by primary data gathered via 350 questionnaires distributed to staff across 10 commercial banks in 10 regions in Vietnam. SPSS 20.0 and Amos software were utilized to measure the extent of influence of the components. The research found six factors: leadership support, training and development of human resources, workplace environment, employee perks and policies, incentive strategies, monitoring, and assessment. The study finds that control and evaluation have the strongest impact on human resource management. Ultimately, the tool assists banks in maintaining adequate human resource management and enhancing competitive positioning. The novelty of this study showed that human resource management affects the competitiveness of commercial banks with a significance of 0.05. Finally, commercial banks should improve digital human resource development software to provide comprehensive management solutions such as AI-driven recruitment platforms, automated performance evaluations, and human resource analytics tools to enhance efficiency, reducing costs and time to perform tasks. Especially helping bank leaders quickly make the right decisions about human resources. Furthermore, human resources management also contributes to the crystallization of corporate cultural values, building and preserving the bank's brand and identity, and is the driving force and goal for the bank's sustainable development.

Keywords: Human Resource Management, Competitiveness, Workplace Environment, Employee Perks and Policies, Commercial Banks

1. Introduction

Human resources are essential for the success of an organization. In banking operations, human resources play a pivotal role in strategic planning; formulating strategies, programs, and initiatives, as well as developing corporate procedures and standards of conduct, is the foundational framework for all banking activities. This resource is integral to system operation and technological infrastructure management, executing plans per established protocols; collaborating with state agencies, partners, and clients; engaging with colleagues; and overseeing cash flows and other resources under the bank's management [1], [2]. Simultaneously, human resources will facilitate the generation of innovative concepts and initiatives, enhance business processes and system efficacy, cut expenses, and mitigate risks associated with banking operations. Additionally, the human resources team plays a pivotal role in solidifying corporate cultural values, establishing and maintaining the bank's brand and identity, and serves as the impetus and objective for sustainable bank development [3].

However, human resource management is essential for human resources to promote value and effectiveness in banking activities because it can determine a bank's success in its operations. Human resource management is a necessary area in banking management and contributes to the sustainable development of banks [4], [5]. Human resource management

activities help ensure the bank has sufficient human resources with appropriate quality and capacity to meet business goals and sustainable development, manage risks, and improve bank efficiency performance. Implementing human resource management activities can help increase labor productivity, ensure compliance with legal regulations, and create a competitive advantage for banks in an increasingly competitive business environment. Investing in and supporting human resources strategically and methodically can improve employee satisfaction and boost productivity [6], [7]. Resource management in banking activities also plays an essential role in building and promoting organizational culture, creating a competitive working environment, and encouraging creativity and innovation. Managing the quality of human resources also helps banks increase their attractiveness to potential candidates, attract and retain employees, and reduce turnover rates and recruitment costs [8].

The banking industry is rapidly changing due to increased digitalization and the development of regulatory frameworks. As financial institutions incorporate artificial intelligence (AI), blockchain, and fintech solutions into their operations, human resource management has new issues in training staff, guaranteeing digital competency, and managing technology-driven processes. Furthermore, banks must manage complicated regulatory requirements such as anti-money laundering (AML) and data protection legislation, which require ongoing employee training and compliance monitoring. These sector-specific difficulties necessitate HRM solutions that improve personnel efficiency while ensuring adaptation in an increasingly digital and regulated banking environment. Addressing these difficulties is crucial for commercial banks to retain operational resilience, regulatory compliance, and a competitive edge in Vietnam's financial system.

Consequently, human resource management is a crucial component of organizational and managerial practices, significantly contributing to the bank's development and success. Efficient human resource management enables banks to secure adequately qualified personnel and requisite competencies to achieve business objectives, foster a positive workplace atmosphere, and assist employees in their personal development while maximizing their contributions to the organization, thereby facilitating sustainable growth in the current landscape [9], [10]. Human resource management is the paramount aspect that drives enterprise success and facilitates entry into the Fourth Industrial Revolution. Experts assert that our dependence on technology is substantial; however, the critical role of humans remains indisputable. In the banking sector, human resources are pivotal to the stability and advancement of banks and the security of the banking system. Incentivizing staff is crucial for enhancing the competitiveness of banks. The article seeks to examine issues related to human resource management in commercial banks and the factors influencing it, subsequently proposing solutions to enhance work motivation and improve human resource management, thereby increasing the competitiveness of the commercial banking system amid the digitalization of Vietnam's economy.

2. Literature Empirical Review and Hypothesis Development

2.1. Human Resource Management (HRM)

Human resource management involves all activities, policies, and management decisions related to and affecting an enterprise's and its employees' relationships. Human resource management requires a strategic vision linked to a company's operating strategy [11]. Human resource management is the implementation of the organizational function of essential management, including the following primary contents: (1) job analysis, (2) recruitment, and (3) Training and improving professional capacity for employees. Improve labor efficiency by using physical and mental stimulation systems for employees [12], [13]. Therefore, human resource management is closely associated with an organization, and any business that is formed and operating must have an organizational department. Human resource management ensures that the right people have the right skills and qualifications for the right job and at the right time to accomplish a company's goals. Human resource management in the banking industry is changing due to digital transformation, workforce automation, and regulatory compliance. Commercial banks in Vietnam have particular problems, including labor market rivalry, talent retention, and the incorporation of digital banking technologies. According to studies, Vietnamese banks are progressively implementing AI-driven human resource management tools, digital recruitment platforms, and e-learning systems to improve staff skills and operational efficiency. However, there is still a vacuum in strategic HR planning, as many banks continue to use traditional performance evaluation measures and struggle with leadership development programs.

2.2. Bank Competitiveness (BC)

The competitiveness of the commercial banking system is a synthesis of all banks' abilities to meet customer needs in terms of providing high-quality, diverse banking products and services [14]. Rich, convenient, and unique compared to similar products and services on the market, creating a competitive advantage, increasing banks' annual profits, creating prestige, brand, and high position in the market, and the ability to withstand and overcome adverse fluctuations in the business environment [15], [16]. Competitiveness is a factor that shows the actual capacity and advantages of a business entity compared to other competitors. The aim is to provide the best service to satisfy customer needs and generate high profits. The commercial banking system's competitiveness is the ability of banks to create competitive advantages, have higher productivity and quality than their competitors, capture a larger market share, create high profits, and develop sustainably [17]. Competitiveness was examined in this study utilizing metrics including financial performance, market positioning, and customer happiness. Financial performance metrics included profitability ratios (e.g., return on assets, return on equity), while market share was calculated using client acquisition and retention rates. Employee service quality ratings and banking experience surveys also measured customer satisfaction levels. These indicators provided a comprehensive view of how good human resource management techniques contribute to a bank's competitive advantage.

2.3. Leader Support (LS)

Leader support for advanced learning depends on the leadership style of each leader and plans to encourage subordinates to learn and improve themselves. Thus, the leader's support concept used in the study is that leaders support employees in studying and researching to develop themselves by providing full or partial tuition for advanced learning staff members [18]. Leader support has a positive effect on human resource management. Leaders in commercial banks with appropriate support policies will motivate workers to improve their knowledge, skills, and attitudes, thereby performing their jobs well and improving the human resource management of commercial banking [19], [20]. Thus, the authors gave hypothesis H1 in Figure 1.

2.4. Training and Developing Human Resources (TD)

Human resource development refers to higher learning activities than current work to create new and better job opportunities based on a bank's strategic directions. Training and human resource development help employees perform their jobs better and apply the knowledge they have learned to real work [21], [22]. Therefore, training programs must be appropriately designed to increase employee satisfaction, and from there, they can be applied well in work to increase employee efficiency. In this study, we used the concept of "human resource training and development as a learning activity that businesses organize to improve employees' knowledge and skills to help them perform their jobs better and create new job opportunities [23], [24]. Thus, the authors gave hypothesis H2 in Figure 1.

2.5. Work Environment (WE)

This study uses the concept of the working environment, including facilities, labor safety, morale, and relationships between leaders and employees and between employees and employees in a bank. The working environment can be related to life needs, health, geographical location of the bank, family, and other personal issues [25], [26]. This is appropriate for commercial banks because when a good working environment is reflected in facilities and equipment that meet requirements, there are good relationships between colleagues, leaders, and elected officials [27]. A happy atmosphere will make employees feel satisfied, more connected to the bank, and complete their work well. Thus, the authors proposed the final hypothesis H3 in Figure 1.

2.6. Employee Benefits and Regimes (EB)

According to regulations, employees are protected, work safely and hygienically, and enjoy other benefits. When employees are guaranteed their rights and labor regime, they feel satisfied, stick with the bank for a long time, and will have higher working efficiency [28], [29]. Benefits and labor regimes have a positive impact on banks' human resource management, which is also consistent with the fact that in a bank, if employees have good benefits such as adequate wages and benefits such as medical examination, if they have regular health insurance, are covered by insurance, and have time off according to the regime, they are more attached to the bank and put more effort into their work, thus

increasing the bank's human resources management and operational efficiency [30]. Hence, the authors gave hypothesis H4 in Figure 1.

2.7. Incentive Policies (IP)

Policies encouraging employees include competition, rewards, promotions, and conditions for advanced learning to ensure long-term job stability [31], [32]. The bank has good incentive policies, such as creating conditions for advanced education, promotion opportunities, bonuses, and ensuring long-term employment, which is the motivation for employees to strive to develop themselves, thereby improving their human resource management of banks and business performance of enterprises and contributing to enhancing competitiveness [33]. Thus, the authors gave hypothesis H5 in Figure 1.

2.8. Control and Evaluation (CE)

Human resource control focuses on employee behavior and performance to develop and maintain policies and procedures to achieve organizational goals. Human resource management measures include performance appraisal, disciplinary policy, employee observation, and training [34], [35]. As a result of this control process, if the employee has good evaluation results, he or she should be rewarded, but if the employee has weaknesses that do not meet the requirements, they need to be retrained or transferred to another job placement. However, the control and evaluation must be performed sensitively, comprehensively, and relatively [36]. This positively impacts human resource quality and work efficiency and improves competitiveness. Thus, the authors gave hypothesis H6 in Figure 1.

2.9. Human Resource Management (HRM) affecting bank competitiveness (BC).

Competition requires harmonious development of the relationship between competition, human resource management, and banking supervision to stabilize the banking system. Although we cannot deny the negative aspects of unfair competition, it still plays an essential role as a driving force in promoting solid economic development and simultaneously helps allocate resources effectively [37], [38]. Studies have analyzed human resource management factors that affect the competitiveness of commercial banks by identifying the components of competitiveness and measuring the influence of this aspect on the ability of commercial banks to attract customers to conduct transactions with banks in the region [39], [40]. Based on the results of proposing a model of this factor affecting the competitiveness of commercial banks, many factors affect the competitiveness of commercial banks, including one main and significant factor: human resource management. The author proposes solutions for improving the competitiveness of commercial banks. Thus, the authors gave hypothesis H7 in Figure 1.

Banks can have quick solutions to increase the quality of human resources and operational efficiency. However, macroeconomic external issues require synchronous answers at many institutions, ministries, and departments over a long implementation period. Based on the information provided, the authors have put forth a particular study model in Figure 1.
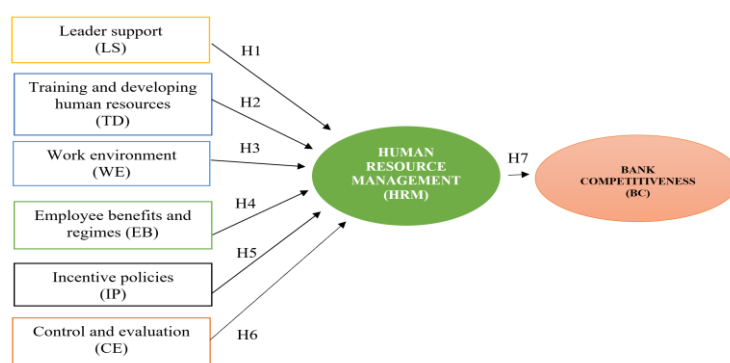
Figure 1. A research model for factors influencing human resource management and bank competitiveness

Figure 1 shows six critical factors and the impact and extent of these factors on the human resource management of commercial banks in Vietnam; it is necessary to design survey questionnaires, collect survey data, and use software to run data materials to show the research results. This topic will be researched and presented in the following sections.

3. Methodology and Data

Stage 1: Document and qualitative research on human resource management and competitiveness was cited. The literature review revealed research gaps and goals. An examination of prior studies and background theory informed the proposed research model. Qualitative analysis - the authors addressed research topics and relationships in the model with 10 experts and 10 workers to adapt the scale and model to Vietnam's market reality. Using discussion outcomes, a survey questionnaire was created. Human resource management and banking competitiveness experts reviewed the survey for understandability, clarity, design, question logic, order, grammar, and spelling. A preliminary questionnaire was created for the following study stages. Ten human resource managers and ten 10-year commercial bank employees reviewed the interview script to ensure clarity and authenticity. Interviews were conducted to learn about banking human resource management. The researcher secured meeting rooms and scheduled in-person interviews at respondents' and in-depth interview participants' offices. Respondents were interviewed in groups. Researchers and assistants (secretary and observer) conducted face-to-face interviews. Each interview lasted 90–120 minutes. From November to December 2023, 10 commercial banks in 10 provinces and towns in Vietnam used the qualitative method.

Qualitative data were carefully analyzed, and text portions were coded. Text that could not be classified was recorded. Three categories were created from the studied data, including components of the literature review that were absent from the interviews. The literature research did not include these aspects, but the interviews did. Qualitative findings changed the constructs' research model and measuring scale. A preliminary quantitative research questionnaire was created [41]. The qualitative data collected from in-depth interviews were analyzed using a thematic analysis approach. Responses were transcribed, coded, and categorized into key themes aligned with the study's research objectives. This process involved identifying patterns in leadership support, employee training, workplace environment, and incentive strategies. The findings from the thematic analysis were then used to refine the survey design for the quantitative phase, ensuring alignment between qualitative insights and the structured data analysis.

Stage 2: Quantitative research - two preliminary and official stages: An initial stage: To test the construct measurement model, 150 employees were surveyed. Confirmatory composite analysis (CCA) assessed scale reliability and validity. These values were evaluated using factor loading, AVE, CR, and Cronbach's alpha. Based on the preliminary investigation, an official questionnaire was given. This study includes sociological survey findings from 150 bank employees from the 10 most popular commercial banks in 10 provinces and cities in Vietnam: Vietcombank, Techcombank, BIDV, Vietinbank, HDBank, VPBank, VIB, SHB, ACB, MB. The authors randomly surveyed 15 employees from each bank. EFA uses a 5-point Likert scale with a minimum sample size of 50, ideally 100. The sample size of 150 met statistical standards. Vietnam has 10 provinces and cities: Can Tho, Ho Chi Minh, Da Nang, Hai Phong, Hanoi, Dong Nai, Ba Ria–Vung Tau, Binh Duong, Tien Giang, and Binh Thuan. Given the economic and infrastructure gaps across different locations, ten regions had human resource management strategies that may differ dramatically. The banks in urban areas may have more access to highly skilled workers, advanced HRM technology, and structured career development programs, whereas banks in less developed regions may rely more on on-the-job training, informal recruitment networks, and traditional HR practices. To account for these changes, the study looked at regional disparities in HRM practices and their influence on competitiveness. This technique ensures that the findings represent major financial centers and different banking settings throughout Vietnam.

After collecting data, the author performed classification, statistics, reliability analysis, group matching using exploratory factor analysis (EFA), group verification using the analytical process, confirmatory factor analysis (CFA), and influencing factor analysis using structural equation modeling. This is best for studying multivariate models and complex latent-observed variable correlations since it simultaneously permits the reliability testing of many regression models. The scale's dependability was evaluated with Cronbach's alpha. Scale reliability should exceed 0.5, and variable-total correlation should be 0.3 or higher. Cronbach's alpha sub-index for the variable type may be considered if it is high. Maintain the variable if it is insignificantly greater. Reliability tests demonstrate that all variables match statistical standards with Cronbach's alpha coefficients over 0.6 [41].

EFA results: Convergent and divergent value analysis in research is popular and effective with this strategy. This strategy is essential for decreasing estimated parameters and discovering factor groups. This study needs a factor loading coefficient of 0.5 due to its 150-person sample size. All factors met statistical requirements because the KMO

index was 0.725 > 0.5, the Bartlett test was 0.00, and the factor loading coefficients were more significant than 0.5. Factor analysis confirmation: Satisfactory convergent validity was determined by loading factors > 0.5 (p-value < 5%), composite reliability > 0.72, and average variance extracted (AVE) > 0.5. The authors' scales and indicators are valid, according to the analysis.

CMIN/df (Chi-square/df), CFI, GFI, TLI, and RMSEA are used to determine if the model fits the requirements. In particular: CMIN/df ≤ 3 is good, ≤ 5 is acceptable; CFI ≥ 0.9 is good, CFI ≥ 0.95 is excellent, CFI ≥ 0.8 is acceptable; GFI ≥ 0.9 is good, GFI ≥ 0.95 is outstanding; TLI ≥ 0.9 is good; RMSEA ≤ 0.06 is good, RMSEA < 0.08 is CFA analysis using AMOS 20 software yielded chi-square/df = 1.237, GFI, CFI > 0.9, TLI < 0.9, and RMSEA < 0.06. Therefore, the model met these conditions [41].

Official stage: Formal quantitative research methodologies examine research model factor relationships. The survey of 350 workers at the 10 banks above was conducted from November to December 2023 using quantitative research methods. Online email and phone surveys were done. An analysis examined the independent-dependent correlation and impact. The final analysis presents the content of the quantitative research method. The study's research model comprises six independent and two dependent variables and requires a minimum sample size of 98 people. The study's reliability increases as the sample size exceeds the minimum, reducing sampling biases. The study employed a purposive sampling strategy to ensure a diverse representation of banking professionals. Respondents were selected based on their job roles and experience, encompassing frontline employees, mid-level managers, and senior executives. This approach comprehensively understood human resource management practices across different hierarchical levels. Efforts were made to balance the sample across various banking departments, including customer service, risk management, and human resources, to capture diverse perspectives on HRM strategies and competitiveness.

According to the study's official research program, 350 survey questionnaires were issued, 334 valid were collected, and the rate was 95.43%. Chi-square (CMIN), CMIN/df, GFI, CFI – Comparative FitIndex, Tucker and Lewis Index (TLI), and RMSEA index (Root Mean Square Erro Approximation) < 0.08 were used to assess the research model's fit to the data. A research model is adequate for market data if the chi-square test has a P-value > 5%, CMIN/df ≤ 2, maybe ≤ 5, and GFI, TLI, CFI ≥ 0.9. The outcome measurement model was assessed for reliability, convergence, and discriminant validity. These values were validated using indicator loadings, AVE, CR, and Cronbach's alpha. Factor loading, Cronbach's alpha, and CR minimum scores of 0.50, 0.70, and 0.70 indicated scale reliability. The scale was convergent if AVE was 0.50 or greater. Partial least squares structural equation modeling with bootstrapping with 10.000 samples assessed model quality and research hypotheses. This study used bootstrapping to examine the statistical relevance of structural model routes and factors affecting human resource management and competitiveness.

4. Empirical Results

4.1. Current status of human resource management in banking operations in Vietnam

With the current level of fierce competition in the finance and banking sector, in addition to the factors of organizational model, management mechanism, technology system, and human resources apparatus, human resources apparatus is one of the factors. Commercial banks must invest methodically to improve staff capacity and increase market competitiveness. More than three years ago, bank employees were only required to be good at calculating interest rates, consulting services, and keeping accurate books to be considered good at their jobs. However, since the banking system was modernized, computers and technology have been applied to storing and processing data, followed by the birth of the Internet, blockchain, and intelligence technologies. Artificial intelligence (AI) big data requires banking industry personnel to be professionally skilled and master advanced technology. In addition, many banks' birth and vigorous growth make employees increasingly need to become more skillful, psychologically, enthusiastic, and attentive to retain customers. In general, in current reality, banks have focused on improving the quality and effectiveness of human resource management and have achieved many positive results. Despite the positive aspects of human resource management, commercial banks still have some limitations that need to be overcome to improve the effectiveness of their human resource management activities. Specifically:

Human resource planning has not yet provided a comprehensive plan for building a successor team, and the scale and number of subjects that need appropriate planning at each position, unit, and system have not been determined to ensure

the effectiveness of overall planning goals. In addition, some banks have not yet built a standard set of forecasts for human resources in general and for quality human resources in particular, leading to human resource planning that is not close to the actual situation.

Human resource recruitment in certain banks continues to face limitations, including the absence of a comprehensive and consistent recruitment strategy, failure to adhere closely to the bank's capacity framework for each position, lack of diversity and flexibility in recruitment methods, and the inability to attract experienced candidates. Recruitment planning failed to adequately address the unit's long-term human resource requirements. The staff recruitment criteria are not aligned with the specific features of each region or area, nor do they accurately reflect the actual requirements of the positions that need to be filled. While several banks may possess strengths and competitive advantages in general recruitment, they have not demonstrated a proactive approach to hiring highly skilled individuals at a significant scale, particularly specialists and mid-level executives. The present recruiting procedure is regarded as systematic and professional for the general public, but it remains rather strict and unyielding for position-specific and senior-level staff recruitment. Furthermore, while establishing recruitment requirements, banks frequently prioritize characteristics such as education, information technology proficiency, foreign language proficiency, and health status. A user's text does not provide detailed and precise information on additional factors such as communication, professionalism, creativity, and teamwork skills. This lack of specificity may limit the ability to select well-rounded and highly skilled human resources in terms of both knowledge and skills.

Some banks have not developed effective strategies regarding the arrangement and use of human resources. The arrangement and use of human resources still have gaps compared with best practices. There are no standard job title rules or professional standards for bank staff. In addition, there are still cases where the arrangement and use of human resources are not based on the needs and quality of human resources but on personal relationships. Officers are often assigned responsibility beyond placement level to positions inconsistent with capacity.

Regarding training and human resource development, banks have focused on developing human resource training, but the activities have not been linked together into a series of activities. Planned activities for training and developing each individual according to a specific roadmap. The types of training have not been linked in a comprehensive plan, and there has been no evaluation or interaction with each other to support staff in their career development process. Human resource training and development strategies are inconsistent with the banks' overall development strategies. In some banks, staff training programs are still of a mass nature without clear roadmaps, deadlines, or goals. Table 1 gives the mean value of all components, which is about 3.0. Moreover, the standard deviation approached 1.0. These data promise to improve Vietnam's human resource management and bank competitiveness.

Table 1. Testing of descriptive statistical results for human resource management and bank competitiveness

Code	N	Min	Max	Mean	Standard Deviation
1. Leader support	334	1.00	5.00	3.422	0.855
2. Training and developing human resources	334	1.00	5.00	3.053	0.908
3. Work environment	334	1.00	5.00	3.556	0.828
4. Employee benefits and regimes	334	1.00	5.00	3.113	0.935
5. Incentive policies	334	1.00	5.00	3.571	0.866
6. Control and evaluation	334	1.00	5.00	2.583	0.678
7. Human resource management	334	1.00	4.00	2.482	0.603
8. Bank competitiveness	334	1.00	5.00	2.586	0.741

Furthermore, the facts in Table 1 demonstrate that human resources are critical to an organization's performance. Human resources are directly involved in strategic planning in banking activities; formulating strategies, initiatives, and projects and developing corporate procedures and codes of conduct serve as the foundation for all banking activities. However, human resource management is critical for human resources to promote value and efficacy in banking activities since it can influence a bank's operational performance. Human resource management is essential

for banking management and contributes to sustainable development. Besides, some banks have not yet established comprehensive regulations for staff evaluation, resulting in a lack of close integration and the application of evaluation methods. Despite being the most influential element in human resource management, control and evaluation (CE) had the lowest mean score (2.583), showing difficulties in its implementation in Vietnamese commercial banks. Many banks lack standardized performance evaluation frameworks, organized feedback mechanisms, and effective monitoring systems.

Additionally, there is a lack of systematic and scientific storage and management of the evaluation results, and the assessment process still relies heavily on subjective and emotional factors. The assessment process now faces restrictions, particularly in acquiring the evaluation data. In addition, the human resource management information system is deficient and lacks strength. Furthermore, there is a lack of integration between human resource management and training. The assessment of cadres remains superficial due to the impracticality of the evaluation process. The evaluation outcomes serve as a means of maintaining cadre records and are not linked to cadre allocation and utilization. Table 2 displays the testing findings for six criteria influencing commercial banks' human resource management and competitiveness, with sig. 0.05.

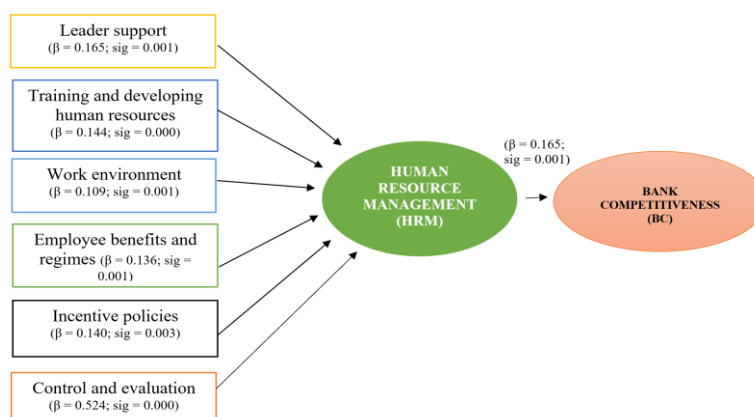**Table 2.** Factors affecting human resource management and bank competitiveness

	Relationships		Standardized Estimate	S.E	t	P	SE-Bias	C.R	Results
LS	→	HRM	0.165	0.036	3.226	0.001	0.002	1.50	Accepted H1
TD	→	HRM	0.144	0.025	3.938	***	0.001	1.00	Accepted H2
WE	→	HRM	0.109	0.026	3.029	0.002	0.001	1.00	Accepted H3
EB	→	HRM	0.136	0.027	3.241	0.001	0.003	0.67	Accepted H4
IP	→	HRM	0.140	0.033	2.936	0.003	0.001	1.00	Accepted H5
CE	→	HRM	0.524	0.034	13.948	***	0.003	1.67	Accepted H6
HRM	→	BC	0.647	0.052	14.968	***	0.002	1.50	Accepted H7

Note: *** with 1%.

Furthermore, model testing results reveal that the collection of scales in the research model fits well with the data based on convergent validity, discriminant validity, composite reliability, and variance quotation criteria. As a result, the working environment is where people spend the majority of their time at work, where they do their jobs, and where they can advance their careers. Surveying commercial banks revealed that, regarding working conditions, banks have prioritized developing a welcoming and harmonious work atmosphere. Invest in and modernize software system equipment and building infrastructure to boost employee enthusiasm and increase customer service quality. With the increasing trend of Fintech and the Industrial Revolution 4.0, banks have prioritized investment in digital infrastructure to assist authorities and employees in managing and delivering work effectively and professionally.

Figure 2 depicts the testing results for the six elements influencing human resource management and bank competitiveness, with a statistically significant result at a threshold of 0.05. Six components must be considered: (1) leader support, (2) training and development of human resources, (3) work environment, (4) employee benefits and regimes, (5) incentive programs, and (6) control and assessment. All standardized regression weights in the crucial model meet the significance level (p = 0.000, indicating statistical significance) and have tremendous values ranging from 0.450 to 0.860, all greater than 0.4. Key model fit indices Chi-square/df = 1.763, GFI = 0.992 (>0.9), TLI = 0.906 (>0.9), and CFI = 0.980 (> 0.9), and RMSEA = 0.048 (< 0.05). Thus, the model met the requirements. This study was based on the findings of a sociological survey of 350 workers from the ten most popular joint-stock commercial banks in ten Vietnamese provinces and cities to identify and evaluate the factors influencing bank human resource management and competitiveness. The findings revealed six major contributing factors with a statistical significance level of 5%.

Figure 2. Testing results for factors affecting human resource management and bank competitiveness

To enhance the management of human resources for employees in commercial banks, it is necessary for banks to persistently prioritize the implementation of the following solutions. First, establish a wage and bonus structure that is competitive and corresponds to the individual's degree of participation. Empirical evidence demonstrates that a rational and competitive compensation and incentive system that guarantees equity and impartiality is a strong motivator for workers to enhance their skills and make optimal contributions to the bank's functioning. Furthermore, it established avenues for the progression and professional growth of the workforce. In addition to the job assignment process, it is crucial to consistently examine, oversee, and evaluate the performance of management roles and provide timely assessments. Enabling competent young employees to advance, develop their careers, or rotate their positions has facilitated the dissemination of youth, creativity, and professionalism in management and business within commercial banks. This initiative has also revitalized work and allowed employees to acquire new knowledge. Furthermore, it establishes training initiatives and enhances workers' credentials. Banks can send their workers to participate in domestic and international professional courses to expand their skill sets.

Moreover, table 2 shows the bootstrap, a resampling method with replacement in which the initial sample serves as the audience. As a result, the bootstrap approach was applied with 10.000 duplicate samples in this investigation. The averaged findings from bootstrapping with N = 10.000 indicate a minor bias (refer to Table 3, C.R < 3). As a result, the research model's estimates were considered reliable. The author accepted all the assumptions, and these results demonstrated six elements affecting human resource management and the competitiveness of commercial banks with sig. 0.05.

4.2. Result Discussion

Research results analyzing data on factors affecting human resource management have shown that there are six factors: (1) leader support, (2) training and developing human resources, (3) work environment, (4) employee benefits and regimes, (5) incentive policies, and (6) control and evaluation, with the evaluation control factor having the most significant influence and the working environment having the least influence. The control and assessment using the standardized estimate was 0.524, with a significance level of 0.000 (Table 2). The findings revealed that control and assessment had a 5% effect on human resource management, which is consistent with previous research [3], [5], [9], [11]. Control and assessment are critical components of human resource management for managers and procedures. Furthermore, bank leaders should foster friendly and comfortable relationships with their employees, base decisions on employee feedback, implement policies to encourage employees, ensure long-term stable employment, prioritize training and development, and ensure employees complete their work and follow company regulations. Managers also require a control and evaluation procedure; however, the evaluation must be complete, fair, and managed. The results show that the control and evaluation factors significantly influence commercial banks' human resource management, with the impact level ranking first in the model. This indicates that, besides policy regulations and a good working environment, leaders must also pay attention to inspection and supervision.

Leader support with a standardized estimate was 0.165 with sig. 0.001 (In table 2). Research results showed that the factor of leadership support positively influences human resource management, with the second highest level of impact

in the research model with a significance of 5% and the same results of many studies [4], [7], [12], [16]. Leaders' support in personal development activities increases employee confidence and improves their professional skills and qualifications, thereby increasing the quality of human resources and business performance. This is consistent with the reality in commercial banks because the human resources in banks are currently very few, well-trained from schools, while the recruitment demand is significant, so they have to recruit trained workers from other professions. If leaders have support for officers, employees, and insurance agents in training to improve their professional qualifications, they will enhance their knowledge and vocational skills, thereby increasing their professional skills quality and work efficiency. The study concludes that leader support (LS) significantly impacts HRM, emphasizing the importance of leadership in encouraging employee growth and motivation. However, the efficacy of leadership assistance differs depending on the leadership style. Thus, transformational leaders motivate and mentor their staff, encouraging ongoing learning and skill development. Encouraging staff to learn about fintech, AI-driven banking, and digital compliance standards coincides with a transformational leadership style.

Training and developing human resources with a standardized estimate of 0.144 with sig. 0.000 (In table 2). The results show that the factor of training and development positively influences HRM but at the third level of impact with a significance of 5%, like the results of many studies [5], [8], [13], [19]. Training and developing human resources are currently of interest to banks because human resources are mainly insurance agents, many of whom have not received vocational training. Therefore, human resource training and development can improve knowledge, professional skills, and attitudes, thereby increasing banks' human resource management. Training and development need appropriate programs to meet job requirements; however, training only trains employees for a very short time. According to the study, training, and development (TD) benefit HRM, underlining the necessity of continual skill enhancement in the banking sector. However, the efficiency of training programs is determined by their format and delivery technique. Commercial banks often employ the following training forms: E-learning and digital training modules. Employees can study at their own speed based on online courses, webinars, and virtual simulations. Benefits were cost-effective, adaptable, and accessible to employees from several locations.

Incentive policies with a standardized estimate of 0.140 with a sig. 0.003 (In table 2). Incentive policy has factor shown to have a positive influence on human resource management and is the fourth highest level of impact in the research model with a significance of 5%, which is the same result as in many studies [7], [12], [18], [21]. Other studies suggest that managers need reward policies to encourage employees to make more effort at work to increase labor productivity and business performance. Managers must have appropriate policies to encourage employees to manage their human resources. Reality shows that one factor that makes workers work effectively and increases productivity is the proper incentive policy for workers. Therefore, the research results on incentive policies affecting human resources management are consistent with reality and research.

Employee benefits and regimes with the standardized estimate are 0.136 with sig. 0.001 (In table 2). Employees' working benefits and regimes include salaries, allowances, and other benefits that employees receive from bank leaders with a significance of 5%, like the results of many studies [17], [22], [28], [32]. Working benefits and regimes determine the number of employees working at banks. When employees come to work in businesses in general, and commercial banks in particular, they expect adequate salaries and allowances and enjoy benefits such as periodic health checks, vacations, and long-term stability. When employees are satisfied with the benefits and policies of the enterprise, they want to stay long-term, and they want to put more effort into their work by improving their professional skills, thereby improving human resource management for banks.

The work environment with the standardized estimate was 0.109 with sig. 0.002 (In table 2). The working environment includes facilities, labor safety, and relationships between employees and employees and leaders in the enterprise with a significance of 5%, which is the same result as that of many other studies [27], [34], [38], [40]. This result is consistent with previous research suggesting that the organizational environment impacts human resource management. The results of this research are consistent with the current reality because if the business's working environment is good, people treat each other in a friendly manner and cooperate with each other among colleagues, leaders, and employees. If employees work in good working conditions, they will be more attached to the banks, put more effort into their work, and increase human resource management, thereby increasing labor productivity and operational efficiency. According to the study, the work environment (WE) has the least impact on HRM performance while being a traditionally

significant aspect of employee motivation and job satisfaction. Cultural reasons could explain why Vietnamese commercial banks have less influence. Employees in the banking industry in Vietnam frequently value job security, career advancement, and financial stability over office conditions and aesthetics.

Human resource management affects the competitiveness of commercial banks with sig. 0.05 (In table 2). Improving the competitiveness of joint-stock commercial banks is a critical task of the banking industry, contributing to promoting socioeconomic development [29], [34], [35], [40]. Using the results of a sociological survey of 350 employees of the 10 most popular commercial banks and a structural equation model (SEM), this study identifies and evaluates human resource management factors affecting the competitiveness of commercial banks. Commercial banks must be proactive in improving competitiveness by strengthening management capacity, continuously conducting training to improve the quality of human resources, improving financial capacity, investing in physical and technical facilities, modernizing the bank, and actively promoting domestic and international cooperation. Human resource management (HRM) substantially impacts bank competitiveness as it shapes staff efficiency and service quality. However, Vietnamese banks fall behind their international counterparts regarding digital HRM adoption, systematic training, and staff retention plans. While global banks use AI-driven analytics and flexible work practices, Vietnamese banks rely on traditional HR procedures. To increase competitiveness, banks should integrate digital HR tools, develop e-learning programs, and introduce individualized incentives. Aligning with global HRM trends would boost personnel productivity and assure long-term success in Vietnam's banking industry.

5. Conclusions and Policy Recommendations

5.1. Conclusions

Throughout its history, the Vietnamese banking system has developed standards for human resource quality to fulfill the needs of the economy and banking sector. Commercial banking has recently become one of the most critical parts of the financial system, with a growing range of high-tech products and services. To satisfy the growth of the digital economy, these variables necessitate enhancing human resource quality according to the development strategy. Given the complicated and unforeseen dynamics of the COVID-19 pandemic, leaders, administrators, and executives are focusing on digitization and developing top-notch human resources to react to it. In the context of the pandemic-accelerated digital transformation of economies, advanced technologically skilled workers are increasingly important. Commercial banks value such resources and prioritize them. As Vietnam becomes more integrated internationally, participating in global financial institutions and markets, cooperating with foreign enterprises, and reaching out to developed economies are becoming more vital. Professional and high-tech development requires firms in general and commercial banks, in particular, to be carefully prepared, especially regarding highly qualified human resources in information technology applications. Based on the research results, this study aims to discover six critical factors affecting human resource management and its impact on bank competitiveness. The author provides policy suggestions to enhance human resource management and bolster bank competitiveness. Hence, cultivating and strengthening human capital to align with the ongoing digitalization of the economy is both an opportunity and a problem for human resource management within the commercial banking sector. Commercial banks in Vietnam must have a skilled workforce to be successfully integrated into the global economy. Proficiency in foreign languages, knowledge of human resource management, application of scientific advancements, information technology, and digital technology, as well as mobility across regions and the world in response to market fluctuations, are essential for effective human resource management. Free trade agreements have facilitated the growth of the labor market among countries. Hence, it is crucial to cultivate top-notch human capital in commercial banks, which are closely linked to the digital economy.

5.2. Policy Recommendations

Based on banking sector development, commercial bank human resource needs, and Vietnam's commercial bank human resource management goals for 2025. The author also uses secondary data analysis to assess commercial bank human resource management and primary data analysis to assess HRM factors and explain study outcomes. The author recommends the following policies to strengthen human resource management in commercial banks in the coming years, in order of priority:

(1) Improved control and evaluation (CE): We improved control and evaluation with a standardized estimate of 0.524 with sig. 0.000, with an average value of 2.5838 (In table 1 and 2). Therefore, commercial banks should foster controlling and evaluating human resources, including control planning, methods, evaluation control criteria, and operational adjustments related to employees to ensure improved human resource management, thereby helping banks improve their competitiveness. In addition, based on overall coordination with management activities in human resource areas, human resource managers in banks build control content in labor use areas such as the recruitment process, labor records, procedures related to labor law, control of working time, labor results, training to improve vocational skills for workers, professional standards according to The Ministry of Finance's standard framework for each job level, and control the process of paying salaries, bonuses, penalties, sick leave, and activities related to motivating employees. Given the results, which show that control and evaluation (CE) has the most significant impact on HRM but has the lowest mean score (2.583), commercial banks must increase performance evaluation procedures. The tips below can help improve CE practices by deploying AI-Driven Performance Management Systems. Banks should use AI-powered HR analytics solutions to track employee performance in real time, eliminating reliance on subjective appraisals.

(2) Improve leader support (LS): We improved leader support with a standardized estimate of 0.165 with sig. 0.001, with an average value of 3.4222 (In table 1 and 2). Therefore, commercial banks should be based on employees' registration for advanced learning in each department; the personnel organization department compiles a list and develops a learning support plan. Expenditure on learning support from the professional development investment fund is appropriated annually from profits to pay for support and training to improve staff expertise. In addition to supporting activities to enhance employees' professional qualifications, there also needs to be a policy to promptly raise salaries and appropriate bonuses when they complete their studies. This will encourage workers to actively participate in learning to improve their professional qualifications and skills, thereby increasing the quality of human resources and the operational efficiency of commercial banks and contributing to enhancing competitiveness.

(3) Improved training and developing human resources (TD): Having a standardized estimate of 0.144 with sig. 0.000, with an average value of 3.0539 (In table 1 and 2). Simultaneously, through training and developing human resources, banks can prepare the following management and professional staff team by equipping them with the necessary skills to demonstrate their interests. The bank aims to develop employees, create a positive working environment, and promote employee creativity and cooperation. Finally, to improve the effectiveness of training and human resource development, banks need to comprehensively review and evaluate the ability of workers to complete tasks as a basis for retraining workers and re-evaluate them according to the occupational standards framework standards issued by the Ministry of Finance. Human resource management is not commensurate with job requirements; professional skills, qualifications, and vocational skills standards do not meet occupational requirements. Although the number of employees with university and postgraduate degrees accounts for many insurance businesses, professional qualifications suitable for job requirements are lacking.

(4) Improve incentive policies (IP): Having a standardized estimate of 0.140 with sig. 0.003, with an average value of 3.5719 (In table 1 and 2). Therefore, commercial banks should improve fairness in considering and rewarding employees, creating value that spreads throughout the bank. Besides, completing current regulations on employee reward policies: In implementing reward policies in practice at banks, new relationships arise, and inappropriate problems arise. Requirements for innovation, reform, and integration must be researched, amended, supplemented, and completed to suit the reality in which direct attention must be paid to individuals working. The employee reward policy must specify reward regulations for each enterprise employee: senior leaders, heads, deputy departments, employees, agents, and servants. Employees in their job positions, if they successfully complete their assigned tasks, even if the employee is a service employee, will also be rewarded, not just by the leader. In addition to perfecting the regulations on reward policies, managers need to notify departments and divisions in writing about the enterprise's reward rules, with detailed and clear instructions, specifically on employee standards, conditions, and reward procedures. According to the study, incentive schemes considerably impact HRM, particularly staff engagement, retention, and performance. However, the effectiveness of incentive systems varies depending on the type. Commercial banks often apply two significant types of incentives: (1) Financial rewards are provided through pay increases and bonuses. Competitive pay and performance-based bonuses motivate employees to achieve business objectives. (2) Non-monetary incentives boost

long-term employee engagement, including career growth possibilities with clear promotion paths and leadership development programs.

(5) Improved employee benefits and regimes (EB): A standardized estimate of 0.136 with sig. 0.001, with an average value of 3.1138 (In table 1 and 2). Banks must develop salary policies, deductions, allowances, and other employee benefits based on legality, adequacy, fairness, stimulation, efficiency, and stability principles. Therefore, depending on the job position, assigned tasks, and job characteristics, businesses develop appropriate salary calculation methods, such as for office workers paid on a time basis with bonuses or for office workers paid on a time-based basis with bonuses. In the sales department, salaries are paid based on time and revenue. Regarding working regimes, banks must develop a suitable regime that must follow state regulations and the specifics of the enterprise's business. The working regime needs to be developed explicitly, including the following: working hours, overtime hours, break time between shifts, number of working days per week, days on which employees are entitled to leave and receive full pay, and annual leave. This labor regime must be clearly stated in the contract, and employees and business owners must comply. Employee benefits are identified as a crucial component impacting HRM effectiveness, with a focus on remuneration, insurance, and traditional banking perks. However, rising trends in employee perks are changing how banks attract and retain talent. Employee benefits in commercial banking are emerging due to remote and hybrid work patterns. With the developments of digital banking and cloud-based processes, commercial banks are increasingly offering remote or hybrid work options. Integrate hybrid work possibilities; banks should implement remote work rules backed by secure digital banking systems.

(6) Improved work environment (WE): Having a standardized estimate of 0.109 using sig. 0.002, with an average value of 3.5569 (In table 1 and 2). Banks must develop good facilities to fully meet workers' work needs, which will help them complete their work better. In addition, business managers need to consider providing supporting facilities to increase employees' quality of life and work, such as having a luxurious tea and coffee room to relax, a gym, a beautiful and majestic lunch room, and a lunch break room for employees. With such facilities, workers feel cared for and enjoy their quality of life. Therefore, they feel happy, satisfied, and proud when choosing to work at banks. In addition, the closer the relationship between leaders and employees is, the better the work exchange process will be. Leaders and employees have good and close relationships. A good leader understands employees' desires, and good employees try to complete their work to achieve the company's common goals. The closer the relationship between leaders and employees, the more comfortable the working spirit will be for employees, and employees will develop themselves, thereby improving the quality of human resources and work for competitiveness enhancement. Banks must build a communication culture.

Moreover, using digital tools to modernize human resource management in commercial banks improves staff productivity and competitiveness. However, high implementation costs, employee reluctance, and system integration concerns impede acceptance. Banks must gradually deploy AI-driven HRM, train employees, and apply change management techniques. Addressing cybersecurity concerns and complying with data regulations are also critical. A balanced approach will enable banks to shift to digital HRM while retaining operational stability. To maintain financial viability, banks should take a phased implementation approach, focusing first on low-cost, high-impact HRM solutions before increasing investments. Strategic collaborations, government backing, and HR analytics for cost-effective workforce planning can all help manage budgets while improving HRM effectiveness.

Limitations and future research: Although the study identified and filled several research gaps and provided significant theoretical and practical contributions to human resource management concerns, it is not without limitations and practical constraints. Because many survey respondents were mostly online, there were considerable impediments to completing the author's information survey. As a result, in the future, the author wants to get numerous comments and assessments from scholars to grow and improve the paper based on a more extensive survey sample and additional interviewees, such as managers. In terms of future study directions, the author wants to continue developing the article to recognize and analyze the fluctuating and changing patterns of high-quality human resources in Vietnam between 2025 and 2030 to find more relevant directions for the banking industry.

6. Declarations

6.1. Author Contributions

Conceptualization: L.T.H. and P.T.T.; Methodology: P.T.T.; Software: L.T.H.; Validation: L.T.H. and P.T.T.; Formal Analysis: L.T.H. and P.T.T.; Investigation: L.T.H.; Resources: P.T.T.; Data Curation: P.T.T.; Writing Original Draft Preparation: L.T.H. and P.T.T.; Writing Review and Editing: L.T.H. and L.T.H.; Visualization: L.T.H.; All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6.3. Funding

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6.4. Institutional Review Board Statement

Not applicable.

6.5. Informed Consent Statement

Not applicable.

6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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