Journal of Information Systems Engineering and Management
2025, 10(16s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Cloud Computing for SME HR Management: Enhancing Efficiency and Scalability

Mingwan Jian[1*], Nur Sa'adah Muhamad[1], Shangyuan Guo[2]
[1] *Faculty of Economic and Management, the National University of Malaysia, Kuala Lumper 43000, Malaysia*
[2] *Guandong Shenzhen Yinsheng Payment Service Co., LTD., Shenzhen 518000, China*
[*] Corresponding author: Mingwan Jian, P114245@siswa.ukm.edu.my

ARTICLE INFO

Received: 08 Dec 2024

Revised: 29 Jan 2025

Accepted: 10 Feb 2025

ABSTRACT

For small and medium-sized businesses (SMEs), the quick advancement of cloud computing technology presents revolutionary possibilities in human resource management (HRM). Traditional HRM systems often fall short in addressing the dynamic and diverse needs of SMEs due to limited resources, outdated management practices, and scalability challenges. This paper explores the integration of cloud computing technology into SME HRM systems, emphasizing its potential to enhance talent acquisition, performance management, and payroll processes. By leveraging the scalability, flexibility, and resource-sharing capabilities of cloud platforms, SMEs can achieve process-oriented, standardized, and transparent HRM practices comparable to those of larger enterprises. A conceptual framework for a cloud-based HRM platform tailored to SMEs is proposed, highlighting its architecture, key components, and implementation flow. Through clever data analysis, this method not only optimizes resource allocation and lowers expenses, but it also facilitates strategic decision-making.

Keywords: Cloud computing, Human resource management, SMEs, Talent acquisition, Performance management, Compensation management.

1. Introduction

In many countries, small and medium-sized businesses (SMEs) are a major contributor to GDP and job creation, and they are essential to economic growth and innovation. However, compared to large enterprises, SMEs face a range of challenges in their management processes, particularly in human resource management (HRM)[1]. Limited financial and human resources, outdated management practices, and an inability to adopt cutting-edge technologies often hinder the growth and operational efficiency of SMEs. These constraints exacerbate the difficulties of attracting, managing, and retaining talent, thereby impeding their long-term development and competitiveness in an increasingly dynamic and competitive global market[2,3].

Traditional HRM systems primarily focus on administrative functions such as payroll, recruitment, and performance appraisals, relying heavily on localized software solutions. While these systems meet basic HRM needs, they often lack the scalability, flexibility, and customization required to address the diverse and evolving needs of SMEs. Additionally, as SMEs expand and diversify, these traditional systems fail to adapt to changing business requirements, limiting their usefulness and effectiveness[4,5]. This creates an urgent need for innovative solutions that not only address the immediate HRM challenges of SMEs but also support their strategic growth objectives[6].

The advent of cloud computing technology provides an unprecedented opportunity to revolutionize HRM practices for SMEs. As a new paradigm in IT resource utilization, cloud computing offers on-demand access to scalable resources, cost-effective solutions, and a high degree of flexibility[7]. Cloud-based HRM systems enable SMEs to transition from manual, transactional HR processes to streamlined, data-driven operations. These systems facilitate real-time data analysis, dynamic resource allocation, and enhanced decision-making capabilities, empowering SMEs to optimize their HRM practices and align them with organizational goals. Furthermore, cloud

computing supports the standardization and transparency of HR processes, fostering trust and collaboration within the organization[8,9].

Despite its potential, the adoption of cloud computing in HRM for SMEs remains in its infancy, with numerous barriers such as data privacy concerns, regulatory compliance, and a lack of awareness among business owners. Moreover, the absence of a standardized framework for implementing cloud-based HRM systems tailored to the unique needs of SMEs further limits its adoption[10]. To address these challenges, this study aims to explore the application of cloud computing technology in HRM for SMEs, focusing on its architectural design, implementation principles, and potential benefits.

This paper proposes a cloud-based HRM framework specifically designed for SMEs, leveraging advanced technologies such as distributed computing, network storage, and intelligent decision support systems[11,12]. The framework emphasizes scalability, cost-efficiency, and ease of use, making it accessible to SMEs with limited technical expertise. By integrating cloud computing into HRM, SMEs can enhance their operational efficiency, reduce costs, and achieve a level of management sophistication comparable to that of large enterprises[13].

The findings of this study contribute to the growing body of literature on cloud computing and HRM by providing actionable insights and practical solutions for SMEs. By bridging the gap between technological innovation and practical application, this research aims to empower SMEs to overcome their HRM challenges and unlock their full potential in the global economy.

2. Cloud computing

2.1. The meaning and features of cloud computing

IBM sees cloud computing as an emerging computing model that makes IT resources, data, storage, etc. available to users through a network, forming a pool of IT resources in the platform and visualising the resources in the pool for users' use[14].

The China Cloud Computing Special Committee considers cloud computing to be the consolidation and provisioning of computing resources in a network and the simultaneous provision of services to a large number of users with a unified interface that allows users to use these computing resources on an on-demand metered basis.

The Canadian Standards Association CSA sees a cloud as a service consisting of "pools" of computing, networking, information and storage that can be scaled down and up to provide users with a pay-as-you-go service model similar to utility computing[15].

In conclusion, this study makes the case that cloud computing is the commercialization and convergence of computer information technologies including network storage, distributed computing, and huge data centers. From a service standpoint, cloud computing is a collection of computer information technologies that have been combined into a single product. These technologies have been commercialized into services that offer users vast amounts of computing, storage, and network resources that they can purchase or rent as needed.

2.2. Cloud computing features

The continuous development of cloud computing technology has enabled off-site file processing, applications between multiple devices and internal data sharing. Data in the cloud are simply stored in the cloud, and if you want to use data in the cloud directly connect to the network using a device that meets the permission to access and share data[16]. The sharing of data and information files is achieved through cloud technology. Greatly simplifying the previous process of use and thus advancing teamwork and data sharing between companies.

Cloud computing achieves resource sharing through the Internet, as long as a computer can be connected to the Internet and linked to the cloud platform, technical problems are solved by cloud computing service providers, users do not need much knowledge of network technology to use cloud resources, regardless of office location and time constraints, convenient, fast and flexible[17].

2.3. Application structure

Figure 1 illustrates the five components that make up the application structure of cloud computing: the application layer, platform layer, resource layer, user access layer, and administration layer.

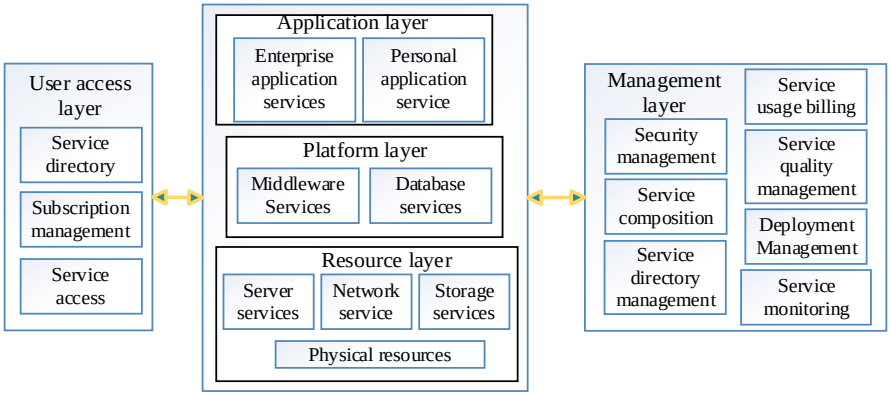

Figure 1. Cloud computing application architecture.

3. Cloud HRM architecture

3.1. Design concept and principles

Since cloud computing offers resources as a service, this article refers to the network that provides the resources as a "cloud service" and the company that provides the network resources as a "cloud service provider." The network that provides the resources is known as the "cloud" in cloud computing. The cloud computing platform is the application carrier of human resource management for SMEs. It offers shared computing and storage, server and storage equipment, network and security equipment, development environment platform construction, support service software, and other services for enterprises[18]. These services facilitate the quick and efficient completion of human affairs tasks, lower the costs associated with human resource management, and allow the company to devote more time and energy to the establishment and execution of strategic goals. In addition, a large amount of data related to human resource management can be collected, collated and analysed in a timely manner through the software, which provides strong support for the formation, implementation and execution of corporate strategic decisions, thus enhancing the soft power of the enterprise as a whole.

3.2. Cloud architecture design

Based on the idea and technology of cloud computing, cloud computing technology is applied to the construction of a cloud platform for human resource management of SMEs, and various service resources can be quickly and securely deployed uniformly on the cloud platform for human resource management, forming information infrastructure such as software, hardware and platforms, as well as visualized shared resource pools of different levels and specifications, thus forming a cloud architecture for human resource management of SMEs, and its conceptual model as shown in **Figure 2**.

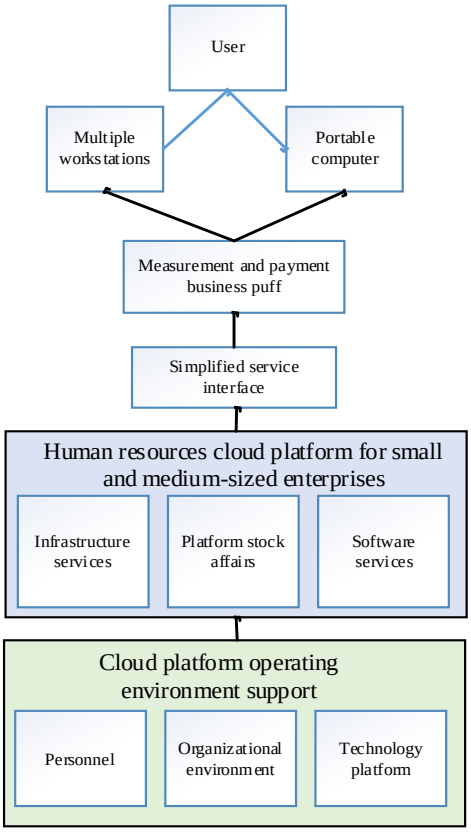

Figure 2. Conceptual model of SME HRM cloud architecture.

Roles in the SME HRM cloud architecture mainly consist of the cloud service provider, HRM users and the cloud service platform (middleware). The cloud service provider is responsible for providing various resources, solutions and diversified cloud services for a wide range of users; on the SME HRM cloud platform, various cloud services are provided to users in a flexible and variable manner according to service requests; with the support of the cloud platform, users can select various cloud services on the platform according to their actual needs and can realize the sharing of human resources among multiple entities.

The cloud platform operating environment consists of three key elements: (1) people (including service users and service providers); (2) the organisational environment (including operational guarantee mechanisms); and (3) the technical platform (system), the relationship between the three is shown in **Figure 3**.

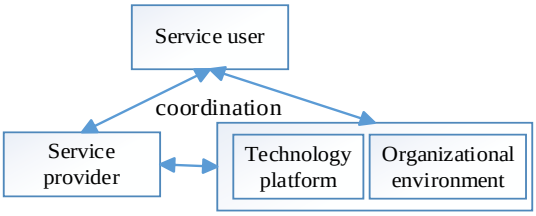

Figure 3. Relationship between the three key elements.

The SME HRM cloud platform builds a technical platform for personalised services for SMEs through the integrated use of advanced technologies such as cloud computing and the Internet, as well as intelligent decision support systems, as shown in Figure 4. The cloud platform can effectively integrate, unify and share a series of available HRM service resources, while dynamically adjusting the service process in a timely manner through HR demand analysis in order to allocate service resources in a balanced manner, and ultimately transforming service resources into HRM cloud services that can be directly deployed and used according to the actual or potential needs of different enterprises.

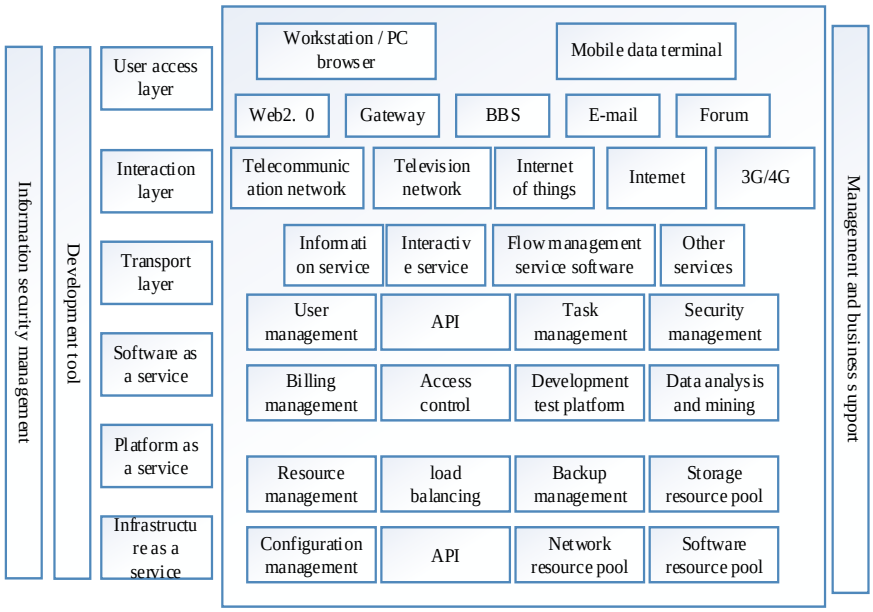

Figure 4. Overall architecture of the SME HRM cloud platform.

In this paper, the overall architecture of the SME HRM cloud platform (shown in **Figure 4**) is constructed by drawing on existing cloud platform construction technologies and platform architecture design, and combining them with the service requirements of SME HRM. In the overall architecture, SME users can call resources on demand from top to bottom, and provide service support layer by layer from bottom to top, ultimately providing technical support for SME HRM alliances, shared services, HRM systems and consulting services, etc.

3.3. Flow of use of cloud services

Adoption of cloud computing by SMEs has been accompanied by rapid development of information technology and the emergence of binding mechanisms. A service level agreement (SLA) is a contract signed between a cloud service provider and an SME user regarding service quality requirements, mainly for computing, network and security services to ensure service quality, define the service content and promise to strictly fulfill their default responsibilities. SMEs are better protected if they implement information technology through an SLA, which adequately protects the rights of both the enterprise and the cloud service provider. According to the SLA, the cloud service provider is required to monitor and manage the performance of the network provided by the cloud through the use of various technologies and solutions so that it meets the requirements of the SLA, and the SME subscriber pays the corresponding fees as required by the SLA. Any breach of the signed SLA between the two parties will be subject to the default obligations set out in the agreement. Based on this, the paper summarises the process of using cloud services (**Figure 5**).

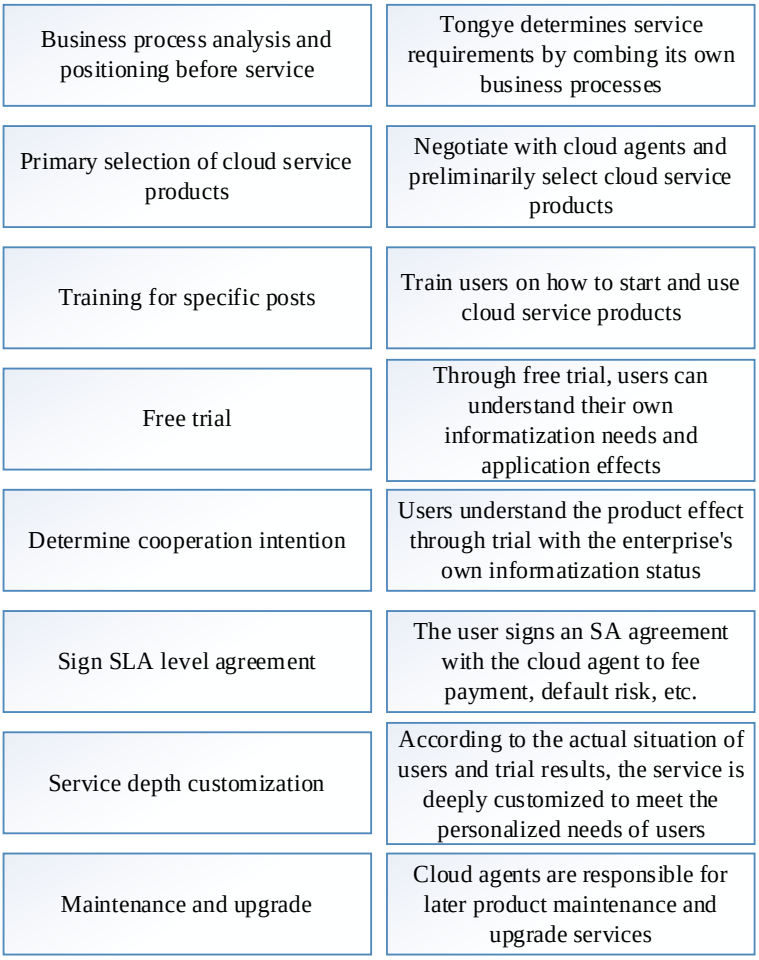

Figure 5. Cloud service usage flow.

For many companies in China, there is an urgent need for human resource management to be more efficient, and managers are eager to be freed from transactional work to engage in decision-making or strategic work. This is why HRMS have been more widely used. However, there is a gap between the current functionality of HRMS and the expectations of HR managers. Cloud computing technology has powerful data collection functions, and its introduction into HRMS can optimise the workflow of HRMS and greatly improve management efficiency.

4. Experiment

The reason for the failure of performance appraisals in many companies is the inappropriate choice of performance appraisal tools. Cloud computing technology is the foundation of performance management systems, which automatically link employee attributes with those of the performance appraisal tool and allow for flexible tool selection based on the job characteristics of the individual being evaluated. The 360-degree performance appraisal method, for instance, is used to pick managers or reserve cadres and focuses on evaluating employees' skills and development potential. Key performance indicators (KPI) appraisals are a top-down system that can be used in conjunction with management by objectives (MBO) appraisals. Critical incident method (CIM) is often used as an adjunct to other performance appraisal tools. Behaviourally anchored scoring is suitable for appraising employees who perform operations. Cloud computing technology helps implementers of performance appraisal to select appraisal tools accurately and flexibly as showed in **Figure 6**.

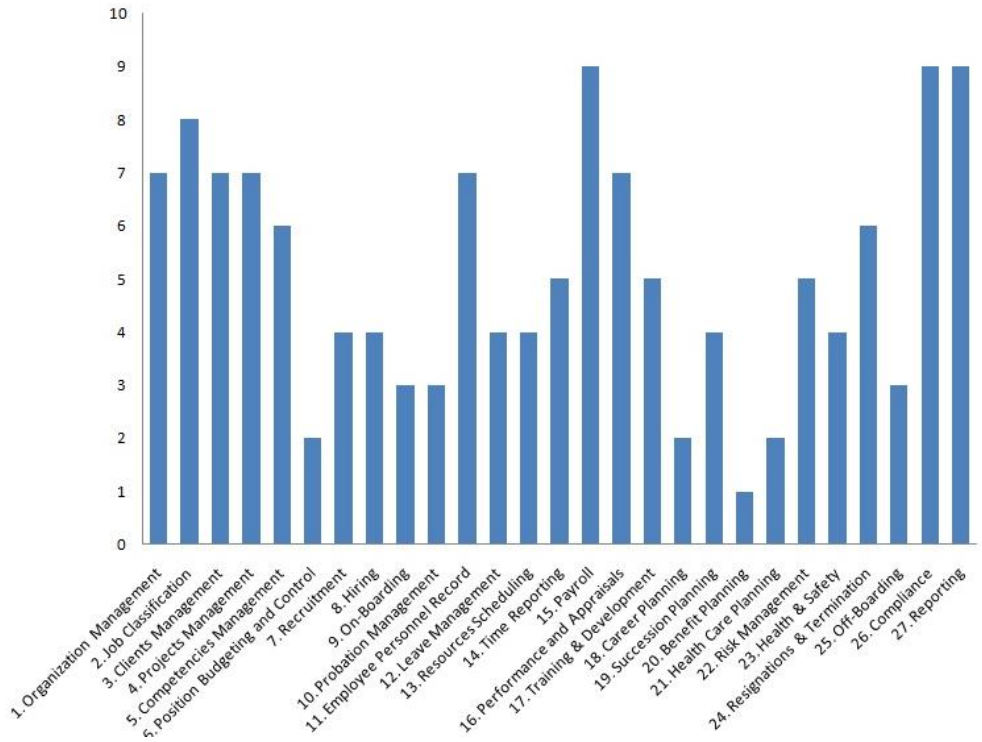

Figure 6. Effectiveness of HR appraisal under cloud computing.

As showing in **Figure 7**, the HRMS focuses more on data storage. With the introduction of cloud computing technology, the HRMS will focus more on the standardisation of processes. Setting, sampling, calculating, and analyzing the key parameters of the input side and output side of the organizational processes in the cloud, breaking down the performance criteria for each employee, and identifying the individual indicators are how the strategic objectives of the enterprise are broken down into actionable work objectives when implementing performance appraisals, such as the key performance indicator (KPI) performance appraisal. When conducting the appraisal, the employee's performance results are compared with the KPIs and automatically matched to produce the results. The performance appraisal process based on cloud computing technology will be more standardised and systematic.

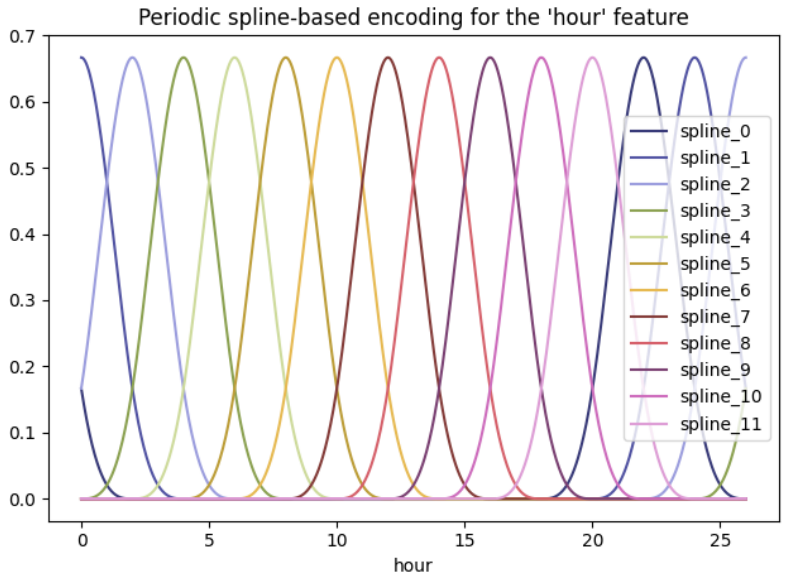

Figure 7. Duration effect of split lines for different clouds.

The HRMS has payroll statistics and calculations. The data dictionary and model dictionary compiled in the cloud computing technology isomorphic design ensures that employee payroll data is accounted for more easily and efficiently[27–29]. The vendor provides advanced payroll calculation procedures, so that when a new set of

compensation and benefit packages is issued, the system can respond quickly and implement them simultaneously. Employees can also log into the system via self-service to check their salaries, promoting a green paperless office as showed in **Figure 8**.

Figure 8. Accuracy of assessment for different business needs.

A cloud-based HRMS with more powerful data mining and data analysis capabilities. Existing companies are putting new demands on the processing and analysis capabilities of payroll data[30,31]. The frequency of data reads operations in a cloud-based HRMS are much greater than the frequency of data updates as showed in **Figure 9**, so the distributed storage approach used by cloud computing technology ensures that the HRMS can manage big data efficiently. This enables specific data to be quickly identified for analysis in a large data set. This results in more accurate and effective payroll data analysis.

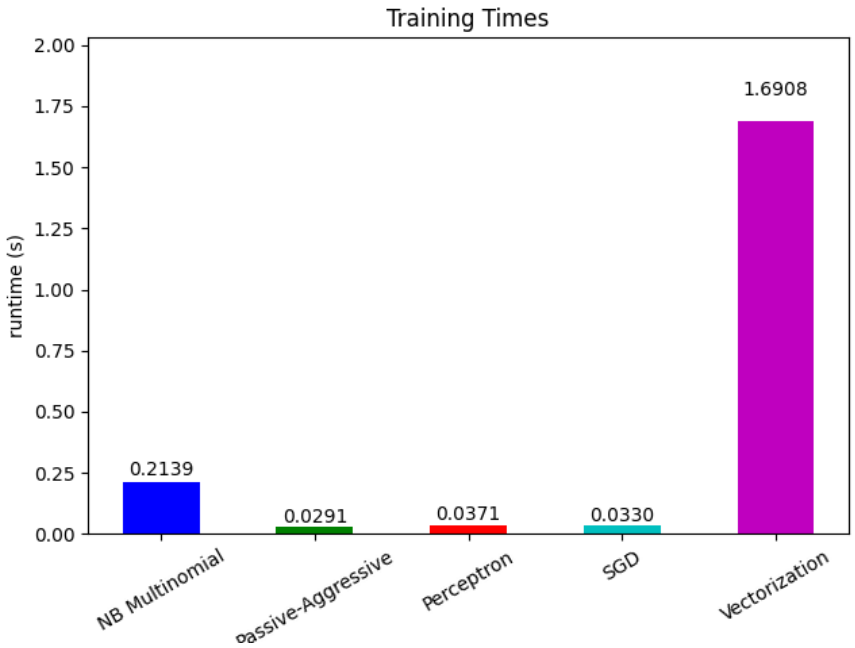

Figure 9. Computing time with different devices.

5. Conclusions

Cloud computing use in HRM provides SMEs with a game-changing way to get over constraints in cost control, efficiency, and scalability. By leveraging the flexibility and resource-sharing capabilities of cloud technology, SMEs can enhance talent acquisition, performance management, and compensation processes while achieving standardized and transparent HR practices.

The proposed cloud-based HRM framework provides a tailored, cost-effective solution for SMEs, enabling dynamic resource allocation, improved decision-making, and operational optimization. However, challenges such as implementation costs, data security concerns, and the need for awareness persist. Addressing these barriers through targeted training, policy support, and collaborative efforts will be crucial to realizing the full potential of cloud-based HRM systems.

Conflict of interest

The authors declare no conflict of interest.

References

[1] Prabhu A, Crapnell RD, Eersels K, et al. Reviewing the use of chitosan and polydopamine for electrochemical sensing. Current Opinion in Electrochemistry. 2022; 32: 100885. doi: 10.1016/j.coelec.2021.100885

[2] Zhou J, Pang L, Zhang D, et al. Underwater Image Enhancement Method via Multi-Interval Subhistogram Perspective Equalization. IEEE Journal of Oceanic Engineering. 2023; 48(2): 474-488. doi: 10.1109/joe.2022.3223733

[3] Zhou J, Zhang D, Zhang W. Cross-view enhancement network for underwater images. Engineering Applications of Artificial Intelligence. 2023; 121: 105952. doi: 10.1016/j.engappai.2023.105952

[4] Zhou J, Liu Q, Jiang Q, et al. Underwater Camera: Improving Visual Perception Via Adaptive Dark Pixel Prior and Color Correction. International Journal of Computer Vision. Published online August 31, 2023. doi: 10.1007/s11263-023-01853-3

[5] Cai C, Chen C. Optimization of Human Resource File Information Decision Support System Based on Cloud Computing. Lv Z, ed. Complexity. 2021; 2021: 1-12. doi: 10.1155/2021/8919625

[6] Zhang, Z., Zhang, C., Li, M., & Xie, T. (2020). Target positioning based on particle centroid drift in large-scale WSNs. IEEE Access, 8, 127709-127719.

[7] Johnson, E., Seyi-Lande, O. B., Adeleke, G. S., Amajuoyi, C. P., & Simpson, B. D. (2024). Developing scalable data solutions for small and medium enterprises: Challenges and best practices. *International Journal of Management & Entrepreneurship Research*, *6*(6), 1910-1935.

[8] Yuniarto, D. (2023). Implementing cloud computing in companies to increase business efficiency. *Jurnal Info Sains: Informatika dan Sains*, *13*(02), 633-639.

[9] Sharma, D., Salehi, W., Bhardwaj, B., Chand, M., & Salihy, H. (2023). Dovetailing the human resource management with the cloud computing in the era of industry 4.0: A review. *Frontiers in Management and Business*, *4*(2), 340-351.

[10] Porkodi, S., & Raman, A. M. (2024). Success of cloud computing adoption over an era in human resource management systems: a comprehensive meta-analytic literature review. *Management Review Quarterly*, 1-35.

[11] Samira, Z., Weldegeorgise, Y. W., Osundare, O. S., Ekpobimi, H. O., & Kandekere, R. C. (2024). API management and cloud integration model for SMEs. *Magna Scientia Advanced Research and Reviews*, *12*(1), 078-099.

[12] Peredy, Z., & Feierzhati, F. (2023). Cloud Computing Solutions for Speeding-up the Small and Medium Sized Enterprise (SME's) Businesses in China. *ACTA PERIODICA (EDUTUS)*, *27*, 14-33.

[13] Yaseen, H., Al-Adwan, A. S., Nofal, M., Hmoud, H., & Abujassar, R. S. (2023). Factors influencing cloud computing adoption among SMEs: The Jordanian context. *Information Development*, *39*(2), 317-332.

[14] Natrajan, N. S., Sanjeev, R., & Jain, R. U. (2024). Sustainability in small and medium enterprises: A circular economy approach using cloud computing. *Business Strategy & Development*, *7*(2), e370.

[15] Mantri, A., & Mishra, R. (2023). Empowering small businesses with the force of big data analytics and AI: A technological integration for enhanced business management. *The Journal of High Technology Management Research*, *34*(2), 100476.

[16] Oguanobi, V. U., & Joel, O. T. (2024). Scalable business models for startups in renewable energy: strategies for using GIS technology to enhance SME scaling. *Engineering Science & Technology Journal*, *5*(5), 1571-1587.

[17] Joshi, M. (2024). Reinvigorating Human Resource Management through Cloud Computing: A Systematic Review of Literature and Bibliometric Perspective: REINVIGORATING HUMAN RESOURCE MANAGEMENT THROUGH CLOUD COMPUTING. *Journal of Scientific & Industrial Research (JSIR)*, *83*(5), 490-499.

[18] Naseer, I. (2023). AWS Cloud Computing Solutions: Optimizing Implementation for Businesses. *Statistics, Computing and Interdisciplinary Research*, *5*(2), 121-132.