Human Resource Information Systems in Higher Education Institutions: A Systematic Review

Redeen Mascariñas Jr.[1], Jervene Daniel Solatorio[1], Erick Franz Rafols[1], Jaerold Marc Ramos[2], Emelyn Mordeno[3], Nay Lin Aung[4], Junil Rarugal[1,*], and Lemuel Clark Velasco[1,5]

[1]*College of Computer Studies, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines*
[2]*Institute of Open and Distance Education, Polytechnic University of the Philippines, Manila City 1016, Philippines*
[3]*Human Resource Management Division, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines*
[4]*Asia Research Institute, National University of Singapore, 119260, Singapore*
[5]*Premiere Research Institute of Science and Mathematics - Center for Computational Analytics and Modelling, MSU-IIT*

E-mail address: redeenjr.mascarinas@g.msuiit.edu.ph, jervenedaniel.solatorio@g.msuiit.edu.ph, erickfranz.rafols@g.msuiit.edu.ph, jmdramos26@gmail.com, nlaaccountancy@gmail.com, emelyn.mordeno@g.msuiit.edu.ph, lemuelclark.velasco @g.msuiit.edu.ph, junil.rarugal@g.msuiit.edu.ph

Abstract: This study explores the growing interest in Human Resource Information Systems (HRIS) within Higher Education Institutions (HEIs). A structured review following PRISMA 2020 guidelines analyzed 21 journal articles to understand the scope, methodologies, and research gaps in HRIS literature for HEIs. The objectives, frameworks, and methods, OFM framework guided the scoping analysis of objectives, frameworks, and methods, while the context, process, and content, CPC framework analyzed methodologies for context, process, and content. The review identified common objectives for HRIS in HEIs, including enhancing HR processes, communication, and decision-making, ultimately leading to improved performance and competitiveness. Insights were gained into the challenges and benefits of HR transformation through HRIS, emphasizing the need for a robust and interconnected HR function to address talent management and unique university hurdles. Additionally, the review highlighted the positive impact of HRIS on administrative efficiency and performance within public universities. However, research gaps were identified. These included limited empirical evidence, a narrow focus on specific HRIS functions, a lack of attention to contextual factors influencing HRIS adoption, and a scarcity of comparative and longitudinal studies. In summary, the findings underscore the importance of further research to address identified gaps and enhance the understanding of HRIS in the context of HEIS.

Keywords: Human Resource Management, Human Resource Information Systems, Higher Education Institutions, Universities, PRISMA

1. BACKGROUND OF THE STUDY

Managing an organization's people, its most valuable asset, is increasingly influenced by evolving HR practices. HR is central to a company's competitive edge, contributing to cost reduction, productivity enhancement, and quality improvement [1]-[5]. The Human Resource Information System (HRIS) has transformed HR functions from compliance to strategic roles. HRIS aids in gathering, managing, and analyzing key HR data, streamlining processes, and supporting organizational success [4]-[11]. Despite its benefits, HRIS adoption can be hindered by issues such as limited top management support, insufficient funding, and lack of HR knowledge among system designers [12]. Among these, many organizations nowadays employ e-recruitment facilities but instead of fully utilizing these resources, a number of these organizations are still contingent upon the use of traditional recruitment methods. Lack of management support and lesser provision of needed resources has also been evident and have led to the dismal implementation of the HRIS [12]. Therefore, these gaps became the main factors that kept organizations away from HRIS. Moreover, HRIS is hard to use when the user lacks proper knowledge on functionalities and data management, leading to critical problems during implementations. These problems include failures to accurately provide assistance in programs and identify the human resources needed to achieve organizational goals [4], [6], [12]. Similarly, HEIs face difficulties mirroring those within organizations: lack of analytical skills, user knowledge gaps, critical implementation issues, inaccurate budget

planning assistance from HRIS, and frequent failures to identify essential human resources [12], [13]The faculty members of universities using HRIS discussed that the employee data, attendance, and leave records were fully integrated within the system, and they could clearly view their records on the system [13]. The major benefits that were derived by the faculty members include reduction in wastage of time, access to real-time information, timely approvals, and decline in paperwork [14]. Nevertheless, faculty members consider the breakdown of power and breach of privacy as major concerns by the use of HRIS. Additionally, the faculty members thought that without proper knowledge of the benefits that can be obtained from HRIS, people might keep from using this technology [13], [14]. However, higher education institutions (HEIs) have unique academic and administrative challenges that call for specialized HRIS systems to meet their specific needs.

In HEIs, HRIS is not widely recognized for its benefits, despite its role in streamlining HR processes, improving communication, and reducing costs [8], [13], [14]. Adoption faces challenges such as resistance to technology, lack of knowledge, and financial constraints [8], [10], [13]. Financial issues are common across sectors, and HEIs particularly struggle with limited research and introduction to HRIS functionalities [10], [13], [15]. HRIS in HEIs is often confined to administrative functions and is not seen as a strategic partner [13]. Unlike organizations, HEIs generally lack training and development for HRIS [10]. Major obstacles include insufficient senior management commitment, inadequate knowledge, and inexperienced implementation, impacting HRIS adoption [14]. Despite existing studies, HRIS implementation in higher education remains significantly under-researched [10], [13]. This structured review aims to synthesize and analyze the literature on HRIS in HEIs, focusing on scoping, methodologies, and research gaps. It provides insights for future research and practical guidance for improving HRIS adoption and implementation in HEIs. The review is organized as follows: Chapter 2 covers methodology; Chapter 3 presents results and discussion on HRIS in HEIs; Chapter 4 identifies research gaps and offers recommendations.

2. METHODOLOGY

Literature Profiling

A literature review is essential in research as it synthesizes current understanding and identifies knowledge gaps, laying the foundation for further studies [16], [17]. This study employed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA, 2020) for transparency, minimizing bias, and facilitating evidence-based decisions [16]-[23]. Articles

were sourced from Google Scholar with keywords such as "human resource information system", "HRIS", "HCMIS", "HRMS", "human capital management information system", "human resource management system", "higher education institutions", "HEIs", and "university" [1], [4], [16]-[24]. Initially, 35,929 articles were found, but only English-language studies were included, reducing this to 27,386 [16]-[25]. Restricting the sample to publications from 1990–2023 and a minimum of two citations further reduced this to 10,375 articles [16]-[25]. Screening for relevance to HRIS excluded 8,359 articles, and removing duplicates excluded 531 more, resulting in 1,485 articles. Excluding non-HRIS related articles in HEIs left 152 articles, stored in Google Drive. Articles not indexed by Web of Science, Scimago Journal Rank, or Elsevier's Scopus databases were excluded, leaving 86 articles [16], [19]. Rigorous inclusion criteria admitting only empirical articles further reduced this to 21 eligible articles. These form the basis for the scoping, methodological, and research gap analysis in this review. Review triangulation enhanced credibility by combining results from different research methods, making the study more robust and reliable.
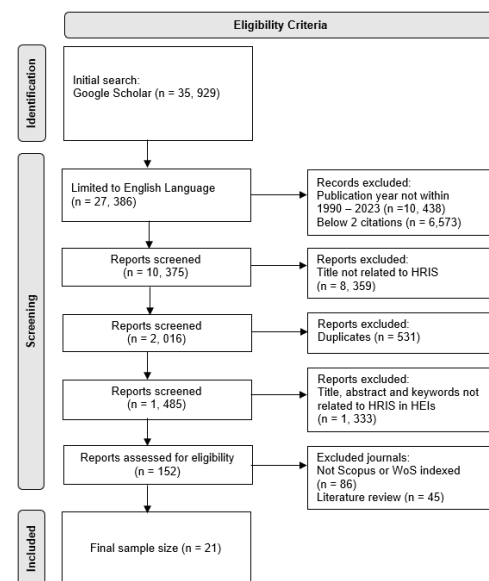

Figure 1. Study Selection Process Based on PRISMA 2020 statement [26].

2.1 Scoping Analysis

Scoping analysis is applied to determine the key components and conceptual boundaries of HRIS in HEIs. As shown in Figure 2, the objectives, frameworks, and methods (OFM) approach are applied for scoping analysis [27]. This approach helps the researchers to organize, extract, and synthesize the objectives, frameworks, and methods from twenty-one (21) journal articles. First the objective refers to predetermined goals

or targets of HRIS in HEIs [27], [28]. This was achieved by extracting the objectives from the introduction section outlined in the sample size. Both inductive and deductive coding were used to determine a new set of categories and comparisons with existing studies during the comprehensive review of the the twenty-one (21) sample size. Furthermore, framework refers to a structured approach, tools, and theoretical models that serve as guidelines to achieve the objectives [27], [29], [30]. This was achieved by identifying the frameworks applied in the sample size through both inductive and deductive coding. Additionally, methods refer to the process that is followed to attain the objectives of HRIS in HEIs[27], [31]. This was achieved by a comprehensive analysis of the sample size in the methodology section and based on the frameworks applied in the studies using both inductive and deductive coding.
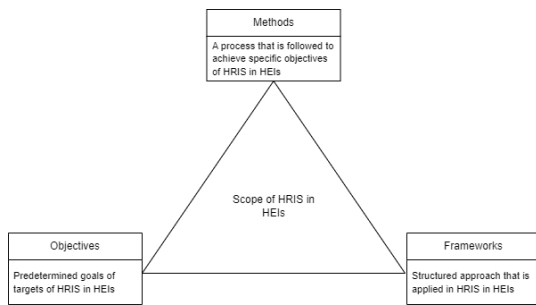

Figure 2. Objective, Frameworks, and Methods (OFM) Model

The extraction of data in HRIS in HEIs was processed by using Google spreadsheets to store the data by themes. The researchers applied both inductive and deductive coding to determine the specific scope of the study. The goals, aims, and objectives of HRIS in HEIs were critically analyzed and subsequently categorized into distinct themes. Similarly, the tools and structured approaches employed within HRIS in HEIs were examined and organized into thematic categories for frameworks. Furthermore, the methods, characterized by their unique processes, that are followed by HRIS in HEIs are also examined and classified according to themes and define the study's scope, which makes it easier to encourage well-informed decision-making.

2.2 Methodological Analysis

Methodological analysis assesses the validity and reliability of study findings by evaluating research techniques. This paper uses the context, process, and content (CPC) approach to systematically examine HRIS in HEIs [32]-[34]. The CPC approach ensures that data gathering and analysis are clearly stated, as shown in

Figure 3. It helps researchers by providing a clear focus, enhancing the impact and credibility of research contributions. The context involves evaluating HRIS functions and objectives [25], [35], [36]. Processes cover HRIS development, implementation, and deployment in HEIs [4], [16], [25], [35]-[40]. Content includes valuable data obtained to meet HRIS goals, analyzed through HRIS features and detailed data examination [4], [24], [35], [37], [41]. The CPC approach supports strategic HRIS implementation in HEIs [34]. Key methods identified include qualitative and mixed-methods analysis, archival research, data sources, search strategy, study selection, quality assessment, data extraction, and synthesis.
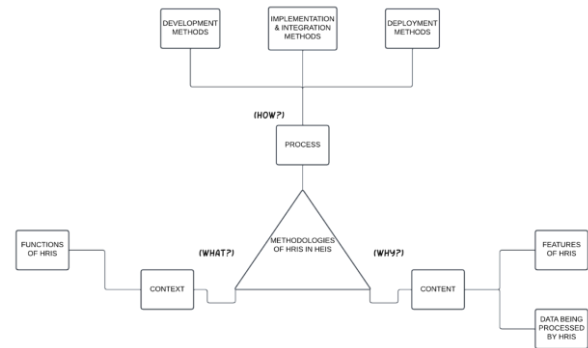

Figure 3. Context, Process, Content (CPC) Model

After profiling the collected samples, the researchers used deductive coding techniques to identify important factors and topics. Initially, the researchers outlined the overall functions and characteristics of the HRIS. Subsequently, they were examined and assessed with a set of journal articles within a specific sample size. The extraction of the HRIS data presented a notable challenge within this research study. To overcome this limitation, the researchers devised a spreadsheet as a strategic tool. Employing qualitative and deductive coding methodologies facilitated a refined and systematic approach to data extraction [42]. This approach provided distinct advantages, allowing for the identification, sorting, and filtering of related studies based on their respective years, size, and credibility. These enhanced methods streamlined the initial analysis process, rendering it more efficient and effective.

2.3 Research Gap Analysis

Identifying research gaps in existing HRIS literature for HEIs justifies future studies. This section details the steps to identify gaps in 21 journal articles. The main objective is to find common conclusions, achieved by reading, analyzing, and coding each article's conclusion section [27], [43]. The second objective is to identify frequent limitations by coding the limitations section of

each study [27], [43]. Lastly, common recommendations were identified and coded from the recommendations section [27], [43]. This evaluation used inductive qualitative coding to systematically identify recurring concepts in the conclusions, limitations, and recommendations. The concepts were tallied on a coding sheet to highlight and organize themes. Codes were re-evaluated to ensure accuracy. Findings are presented in a structured table and visualized using mind mapping to show connections among common suggestions for future studies.

3.   RESULTS AND DISCUSSIONS

The researchers used a qualitative thematic coding analysis with an open and mixed coding methodologies to carry out a structured review. The information was carefully tallied and analyzed to identify common patterns and themes. As shown in Figure 4, the blue graph represents the objectives of HRIS in HEIs. In Figure 5, the green graph represents the frameworks used in HRIS. In Figure 6, the yellow graphs represent the methods that are applied in HRIS. The scoping analysis is evaluated using the Objectives, Frameworks, Methods (OFM) approach. The results were further evaluated and led to the findings categorized into different colors. Objectives are reflected in a blue graph, frameworks are labeled in the green graph, and the methods are colored with a yellow graph. The CPC Framework was employed to classify the methodological analysis that yielded results in the designated clusters below as shown in Figure 7, the pink graph encompasses the functions of the HRIS within a specific context. In Figure 8, Figure 9, and Figure 10, the green graph is further divided into three (3) different domains—development methods, implementation and integration methods, and system deployment—crafted by the researchers during the entire process. The red graph is also divided into two different domains—features of HRIS and data processed by HRIS—within the content as shown in Figure 11 and Figure 12. Furthermore, the research gaps were identified by extracting common conclusions, limitations, and recommendations from the final sample literature. This process gathered important insights, identifying trends and challenges, in providing potential recommendations for future research. The attentive application of qualitative thematic coding analysis and frameworks like OFM and CPC has enriched the researchers' understanding for scoping and methodological analyses. This comprehensive approach not only categorized the findings into distinct clusters but also uncovered the research gaps, paving the way for informed recommendations in setting up a solid groundwork for future research inquiries. The researchers were carefully tallied and analyzed to identify the common patterns of the scope of HRIS in HEIs. As shown in Figure 4, these were the results after a comprehensive analysis

and tallied the common patterns on the objectives of the HRIS in HEIs.
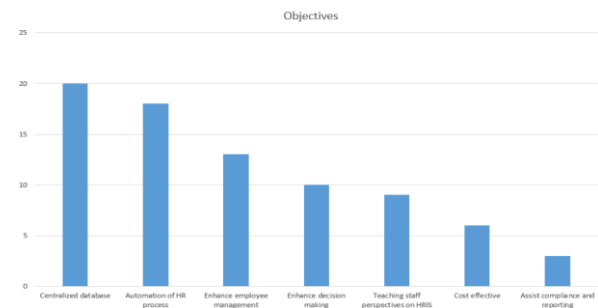

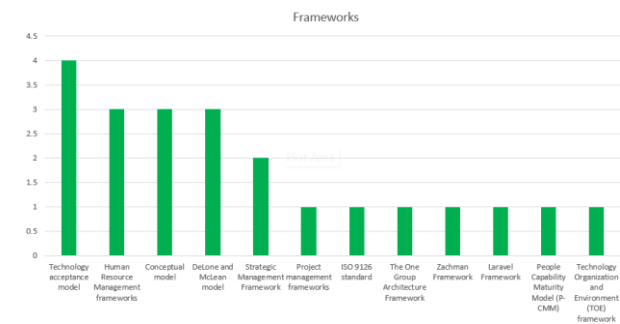Figure 4. Objectives of HRIS in HEIs.

Figure 5. Frameworks of HRIS in HEIs.

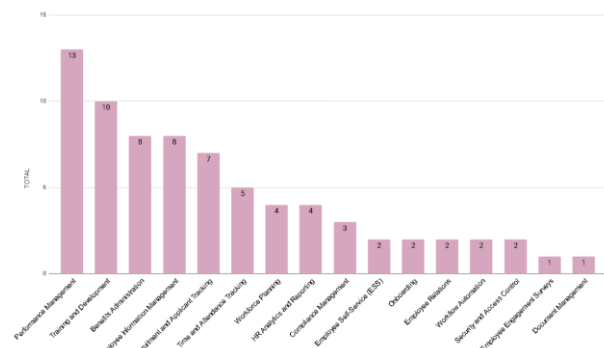Figure 6. Methods of HRIS in HEIs.

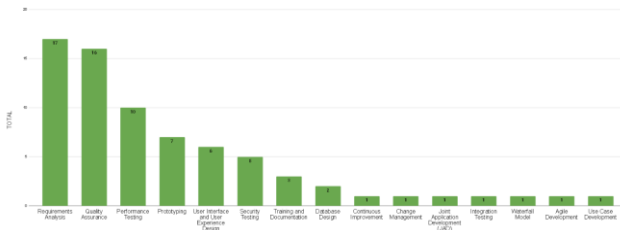Figure 7. Methodological Context (System Functions) of HRIS in HEIs.

Figure 8. Methodological Process (System Development Methods) of HRIS in HEIs.
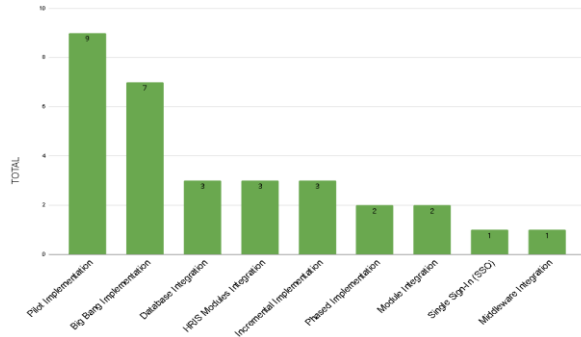

Figure 9. Methodological Process (System Implementation & Integration) of HRIS in HEIs
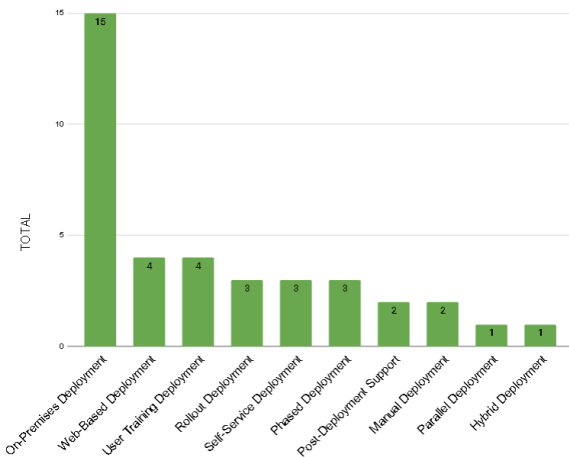

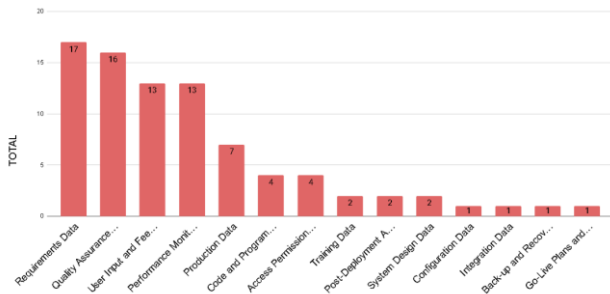Figure 10. Methodological Process (System Deployment) of HRIS in HEIs.

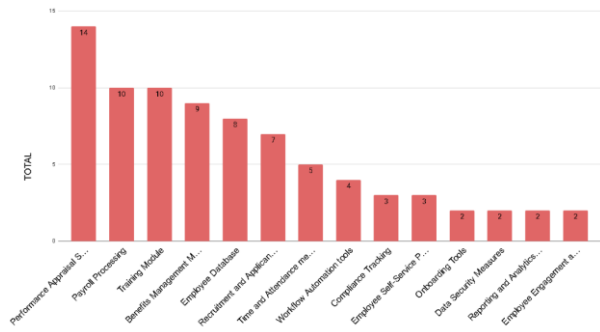Figure 11. Methodological Content (System Features) of HRIS in HEIs.

Figure 12. Methodological Content (Data being processed) Results Macro Overview

3.1 Scoping Analysis Results

HRIS in HEIs Objectives

This section discusses the scoping analysis results using the OFM framework, systematically categorizing and examining the objectives, frameworks, and methodologies defining HRIS scope in HEIs. The aim is to identify key components and trends in HRIS implementation and effectiveness. In exploring HRIS objectives in HEIs using the OFM framework, Table 1 shows the highest focus on a centralized database, with twenty articles [8]-[15], [41], [44]-[55]. This implies increased efficiency in data retrieval, storage, and updating. The second objective, automation of the HR process, is covered by seventeen articles [8]-[15], [44]-[54], emphasizing error reduction and task optimization in HR activities like payment processing and attendance tracking. Enhancing employee management is discussed in thirteen articles [9]-[14], [41], [47], [48]-[56], focusing on performance and talent management, and compensation in academia. Enhanced decision-making is covered by ten articles [8], [11], [13]-[15], [44], [48], [49], [54], [55], providing real-time data and insights for HR staff. Teaching staff perspectives on HRIS appear in nine articles [8]-[14], [44], [52], [55], exploring HRIS functions, benefits, and barriers. Cost-effectiveness is discussed in six articles [8], [11], [15], [44], [50], [55], highlighting time savings from task automation. Lastly, assisting compliance and reporting is covered by three articles [44], [45], [47], ensuring adherence to laws and regulations.

TABLE I. OBJECTIVES COLLECTED

Objectives	Count	Journal Article ID
Centralized Database	20	[8], [9], [10], [11], [13], [14], [15], [41], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55]
Automation of HR Process	17	[8], [9], [10], [11], [13], [14], [15], [44], [45], [46], [47], [48], [49], [50], [51], [52], [54]

Enhance Employee Management	14	[9], [10], [13], [14], [47], [41], [48], [49], [52], [53], [54], [55], [56]
Enhance Decision Making	10	[8], [11], [13], [14], [15], [44], [48], [49], [54], [55]
Teaching Staff Perspectives on HRIS	9	[8], [9], [10], [11], [13], [14], [44], [52], [55]
Cost Effective	6	[8], [11], [15], [44], [50], [55]
Assist Compliance and Reporting	3	[44], [45], [47]

These findings show that implementing HRIS in HEIs is not just about automating tasks. It involves improving the HR processes, managing employees more efficiently and effectively, handling data better for decision-making, considering the perspectives of different teaching staff, ensuring compliance with regulations, and being cost-efficient. The results suggest a comprehensive approach to adopting the HRIS in HEIs, recognizing its full potential to have a positive impact on various aspects of HR management and overall institutional efficiency and effectiveness. Institutions should keep these diverse objectives in mind when implementing HRIS, viewing it as a versatile solution to address different needs in the higher education setting. There are literature reviews of HRIS from different sectors that have similar findings [38], [57], [58] that HRIS can streamline processes through automation, enhance decision making and enhance employee engagement.

Frameworks of HRIS in HEIs

In examining frameworks for adopting and implementing Human Resource Information Systems (HRIS) in Higher Education Institutions (HEIs), Table 2 highlights the prominence of the Technology Acceptance Model (TAM), featured in four articles [13], [14], [47], [54]. TAM is a key framework that explains technology adoption dynamics. The Human Resource Management Framework (HRMF) appears in three articles [9], [47], [53], providing comprehensive HR management models like the Harvard and Ulrich frameworks for HEIs. The Conceptual Framework (CF) is detailed in three articles [8], [45], [46], serving as a theoretical scaffold for HRIS. The DeLone and McLean Model (DMM1) is covered in three articles [9], [10], [46], focusing on Information Systems (IS) performance across six success dimensions. The Strategic Management Framework (SMF) is discussed in two articles [41], [44], highlighting its role in organizing HEI initiatives. Project Management Frameworks (PMF) are featured in one article [11], providing guidance for project execution from inception to completion. The ISO 9126 Standard, mentioned in one article [11], ensures software quality by covering functionality, reliability, and usability. The One Group Architecture Framework (OGAF), addressed in one article

[15], serves as a benchmark for enterprise information architectures. The Zachman Framework, in one article [56], is an instrumental tool for organizing architectural endeavors. The Laravel Framework, in one article [48], optimizes web development processes. The People Capability Maturity Model (P-CMM), outlined in one article [51], details developmental stages in HRIS implementation. Lastly, the Technology Organization and Environment (TOE) framework, discussed in one article [45], explains the complexities of technology adoption in the IS domain.

TABLE II.   COLLECTED FRAMEWORKS

Frameworks	Count	Journal Article ID
Technology Acceptance Model	4	[13], [14], [47], [54]
Human Resource Management Frameworks	3	[9], [47], [53]
Conceptual Framework	3	[8], [45], [46]
DeLone and McLean Model	3	[9], [10], [46]
Strategic Management Framework	2	[41], [44]
Project Management Frameworks	1	[11]
ISO 9126 Standard	1	[11]
One Group Architecture Framework	1	[15]
Zachman Framework	1	[56]
Laravel Framework	1	[48]
People Capability Maturity Model (P-CMM)	1	[51]
Technology Organization and Environment (TOE) Framework	1	[45]

The analysis reveals that HRIS in HEIs goes beyond technology adoption, involving strategic planning, project management, HR practices, quality standards, architectural considerations, and organizational maturity. These frameworks highlight the need for a comprehensive and tailored approach to address HEIs' specific challenges and goals. For HEIs adopting HRIS, these frameworks provide crucial guidance for successful integration. Similar findings from various sectors in HRIS literature reviews include frameworks like TAM, TOE, Ulrich Model, and DeLone McLean Model [19], [57], [59].

Methodologies of HRIS in HEIs

Table 3 highlights the prominence of evaluation methods in HRIS adoption and implementation in HEIs, featured in twelve (12) journal articles [8], [9], [10], [13], [14], [41], [44], [46], [47], [50], [54], [55]. These methods emphasize policies and guidelines for systematic and uniform evaluations, involving data gathering and analysis. Management Process is mentioned in one (1) article [49], focusing on setting objectives, planning, and performance control. Project Management Methods, detailed in one (1) article [11], include frameworks like scrum, work breakdown structure, and agile methodologies. Strategic Planning, discussed in one (1) article [51], involves systematic processes for strategy,

direction, and resource allocation. The Architecture Development Method (ADM), covered in one (1) article [15], provides a comprehensive approach to developing and evolving architectures from vision to implementation. Web Development Methods, featured in one (1) article [48], ensure alignment with business requirements for website construction. Lastly, the MIT90s Framework, discussed in one (1) article [53], offers a model focusing on project success factors in software project management, such as project size, quality, development environment, software process, and management effectiveness.

Methods	Count	Journal Article ID
Evaluation Methods	12	[8], [9], [10], [13], [14], [41], [44], [46], [47], [50], [54], [55]
Management Process	1	[49]
Project Management Methods	1	[11]
Strategic Planning	1	[51]
Architecture Development Method (ADM)	1	[15]
Web Development Methods	1	[48]
MIT90s Framework	1	[53]

HRIS research in HEIs goes beyond technology, covering strategic, managerial, and evaluative aspects. Effective HRIS implementation requires understanding evaluation policies, management processes, and project management frameworks. Thus, HRIS research and implementation in HEIs should address both technical and organizational aspects. The diverse methods in HRIS research reflect a holistic view of its complexities in academic settings, emphasizing the need for comprehensive understanding and tailored approaches. Institutions should use this methodological diversity to shape their implementation strategies, ensuring thorough and effective HRIS integration.

3.2 Methodological Analysis Results

In this section, systematic extraction of key concepts has been conducted that focuses on the content, context, and process of HRIS in higher education institutions. To find significant content, a comprehensive assessment of the qualified articles was conducted to assess this process. To identify the constraints in this area and to ensure a successful implementation effort, it is essential to comprehend this analysis.

Context of HRIS in HEIs

In the Context (CPC) Framework, the functions of HRIS in HEIs were examined. Table 4 shows that Performance Management stands out, with thirteen (13)

journal articles [9], [11], [14], [41], [44], [47], [50]-[56]. Training and Development follows with ten (10) articles [8], [10], [11], [14], [15], [41], [47], [50]-[52]. These findings highlight Performance Management as a key aspect of HRIS implementation in higher education institutions. Training and Development is also significant, emphasizing the importance of enhancing employee skills. Functions like Employee Engagement Surveys and Document Management have the lowest counts, showcasing the diverse roles HRIS plays in managing HR processes.

HR Functions	Count	Journal Article ID
Performance Management	13	[9], [11], [14], [41], [44], [47], [50], [51], [52], [53], [54], [55], [56]
Training and Development	10	[8], [10], [11], [14], [15], [41], [47], [50], [51], [52]
Benefits Administration	8	[8], [9], [10], [13], [44], [46], [49], [50]
Employee Information Management	8	[11], [13], [14], [47], [48], [49], [51], [56]
Recruitment and Applicant Tracking	7	[8], [10], [11], [15], [41], [45], [47]
Time and Attendance Tracking	5	[13], [15], [44], [48], [55]
Workforce Planning	4	[11], [45], [53], [55]
HR Analytics and Reporting	4	[13], [46], [51], [53]
Compliance Management	3	[14], [47], [52]
Employee Self-Service (ESS)	2	[8], [11]
Onboarding	2	[13], [54]
Employee Relations	2	[45], [47]
Workflow Automation	2	[45], [50]
Security and Access Control	2	[49], [56]
Employee Engagement Surveys	1	[13]
Document Management	1	[51]

While the enumerated HR functions play an important role in the overall HR results, their specific contribution to varied outcomes related to system functions within HEIS may require further investigation.

The researchers' deductive coding approach, tailored to the sample sizes specific to HRIS in HEIS, aligns with the findings from relevant articles [24], [39], [38], [39], [56] [57] emphasizing the need for continuous exploration and refinement of the intricate interplay between HR functions and system outcomes in higher education information systems.

Process of HRIS in HEIs

In this section of the Process (CPC) Framework, the Development Methods of HRIS in HEIs were examined. Table 5 shows that Requirements Analysis is the most frequently employed method, involving the identification of the organization's needs and objectives. Quality

Assurance, which entails reviewing and testing the system at various development stages, follows closely. The analysis, supported by seventeen journal articles [8]-[15], [41], [44]-[46], [48], [51]-[55], highlights the importance of identifying organizational needs in HRIS development. Sixteen articles [8]-[15], [41], [44], [49]-[51], [53]-[56] emphasize Quality Assurance's role in ensuring system reliability and functionality. Other methods like Performance Testing, Prototyping, Security Testing, and User Interface/User Experience Design highlight a commitment to robustness and user-friendliness. The use of methodologies such as the Waterfall Model, Agile Development, and Joint Application Development indicates a flexible approach tailored to project needs. Overall, the findings reveal a strategic and comprehensive approach to HRIS development, emphasizing alignment with organizational needs and continuous improvement.

TABLE V.   SOFTWARE DEVELOPMENT METHODS PROCESSS

Development Methods	Count	Journal Article ID
Requirements Analysis	17	[8], [9], [10], [11], [13], [14], [15], [41], [44], [45], [46], [48], [51], [52], [53], [54], [55]
Quality Assurance	16	[8], [9], [10], [11], [13], [14], [15], [41], [44], [49], [50], [51], [53], [54], [55], [56]
Performance Testing	10	[11], [13], [41], [44], [49], [50], [53], [54], [55], [56]
Prototyping	7	[10], [11], [15], [45], [46], [47], [50]
User Interface and User Experience Design	6	[47], [48], [49], [50], [54], [56]
Security Testing	5	[46], [49], [53], [55], [56]
Training and Documentation	3	[8], [11], [14]
Database Design	2	[51], [52]
Continuous Improvement	1	[44]
Change Management	1	[10]
Joint Application Development (JAD)	1	[11]
Integration Testing	1	[51]
Waterfall Model	1	[51]
Agile Development	1	[51]
Use Case Development	1	[52]

In summary, the key development methodologies in HRIS—Requirements Analysis, Quality Assurance, and Performance Testing—are crucial for creating reliable and functional systems. Literature reviews support their prevalence and significance in effective HRIS development [4], [19], [36], [37]. This evidence underscores the importance of integrating these methodologies to maintain high standards in HRIS implementation. Within the Process (CPC) Framework, the Implementation and Integration Methods of HRIS in HEIs were examined. Table 6 shows that Pilot Implementation is the most frequent topic, addressed in nine articles [8]-[53]. This method involves deploying the system in a small, controlled environment to address issues before full-scale deployment. The Big Bang

Implementation Method, discussed in seven articles [11]-[55], involves comprehensive system-wide adoption. Topics like Database Integration, HRIS Modules Integration, and Module Integration highlight the importance of seamless integration. The variety of methods, including Incremental and Phased Implementation, suggests a tailored approach to organizational needs. Considerations for user experience enhancements like Single Sign-On (SSO) and Middleware Integration further emphasize the strategic considerations in HRIS deployment in higher education [34], [43].

TABLE VI.   SYSTEM IMPLEMENTATION AND INTEGRATION PROCESS

System Implementation & Integration	Count	Journal Article ID
Pilot Implementation	9	[8], [9], [10], [44], [45], [46], [47], [50], [53]
Big Bang Implementation	7	[11], [13], [15], [41], [49], [54], [55]
Database Integration	3	[11], [51], [54]
HRIS Modules Integration	3	[13], [48], [49]
Incremental Implementation	3	[51], [52], [56]
Phased Implementation	2	[14], [48]
Module Integration	2	[14], [44]
Single Sign-In (SSO)	1	[44]
Middleware Integration	1	[50]

These findings highlight the critical importance of effectively implementing and integrating HRIS systems to meet HEIs' deployment needs. Customizing systems to align with HEIs' specific requirements is crucial for achieving functionality and reliability [20], [34], [37], [38]. The study's thorough investigation of the sample size revealed consistent themes with existing literature, emphasizing the necessity for tailored HRIS implementation strategies in HEIs. This strategic alignment enhances system performance and meets evolving higher education demands. The section on Deployment Methods of HRIS in HEIs explored On-Premises Deployment as the most frequent method, ensuring organizational control over infrastructure, security, and maintenance (Table 7).

Deployment methods within the CPC Framework for HRIS in HEIs reveal distinct patterns and preferences. On-Premises Deployment emerges as the most prevalent method, supported by fifteen (15) journal articles [8], [10], [13], [14], [41], [44]-[49], [51], [53], [54], [55]. This method involves hosting the HRIS on internal servers, offering control over infrastructure, security, and maintenance. Its emphasis on internal control and security meets the autonomy and customization needs of higher education institutions. Alternative methods like Web-Based, User Training, Rollout, Self-Service, and Phased Deployment demonstrate flexibility in deployment strategies tailored to organizational requirements. Including Post-Deployment Support underscores the ongoing support crucial for HRIS success. The diverse

deployment methods in Table 7 highlight a strategic approach to aligning HRIS deployment with institutional preferences.

TABLE VII. SYSTEM DEPLOYMENT PROCESS

System Deployment	Count	Journal Article ID
On-Premises Deployment	15	[8], [10], [13], [14], [41], [44], [45], [46], [47], [48], [49], [51], [53], [54], [55]
Web-Based Deployment	4	[48], [50], [54], [56]
User Training Deployment	4	[8], [11], [13], [14]
Rollout Deployment	3	[9], [10], [49]
Self-Service Deployment	3	[8], [11], [47]
Phased Deployment	3	[14], [44], [52]
Post-Deployment Support	2	[9], [44]
Manual Deployment	2	[11], [55]
Parallel Deployment	1	[10]
Hybrid Deployment	1	[15]

These findings underscore the critical importance of effectively implementing and integrating HRIS systems to meet the deployment needs of HEIs. Customizing the system to align with the specific requirements and objectives of HEIs is essential for achieving a high level of functionality and reliability. Through a meticulous analysis of the sample size, researchers identified reviews that parallel the results obtained, demonstrating a consistent theme between the current study and existing literatures [4], [36], [38], [39]. This further emphasizes the need for HRIS implementation strategies tailored to the distinct context of HEIs, promoting a strategic alignment that enhances overall system performance and meets the evolving demands of higher education.

Content of HRIS in HEIs

This section of the Content (CPC) Framework analyzes HRIS features in HEIs. Table 8 reveals that the Performance Appraisal System is the most important feature, identified in 14 journal articles, highlighting its role in performance assessments, goal-setting, and feedback [9], [11], [14], [41], [44]-[56]. Payroll Processing and Training Modules follow, each represented in 10 articles, emphasizing efficient payroll management and employee skill development [8], [11], [14], [15], [41], [46]-[50], [55]. Other significant features include Employee Database, Benefits Management, Time and Attendance Metrics, Recruitment and Applicant Tracking System (ATS), and Workflow Automation. The diverse features observed, such as Onboarding Tools, Data Security Measures, Reporting and Analytics Tools, and Employee Engagement and Survey Tools, reflect a comprehensive approach to HRIS functionalities in higher education.

TABLE VIII. HR FEATURES CONTENT

HR Features	Count	Journal Article ID
Performance Appraisal System	14	[9], [11], [14], [41], [44], [45], [47], [50], [51], [52], [53], [54], [55], [56]
Payroll Processing	10	[8], [11], [14], [15], [41], [46], [47], [49], [50], [55]
Training Module	10	[8], [10], [11], [14], [15], [41], [47], [50], [51], [52]
Benefits Management Modules	9	[8], [9], [10], [13], [14], [44], [46], [49], [50]
Employee Database	8	[11], [13], [14], [47], [48], [49], [51], [56]
Recruitment and Applicant Tracking System (ATS)	7	[8], [10], [11], [15], [41], [45], [47]
Time and attendance metrics	5	[13], [15], [44], [48], [55]
Workflow Automation tools	4	[45], [50], [53], [55]
Compliance Tracking	3	[14], [47], [52]
Employee Self-Service Portal	3	[8], [11], [47]
Onboarding Tools	2	[13], [54]
Data Security Measures	2	[49], [56]
Reporting and Analytics Tools	2	[51], [53]
Employee Engagement and Survey Tools	2	[13], [45]

Specific HRIS features, such as the Performance Appraisal System, Payroll Processing, and Training Module, play a pivotal role in driving organizational efficiency and strategic human resource management within HEIs. The Performance Appraisal System fosters transparent goal-setting and feedback, Payroll Processing ensures financial transparency and compliance, and the Training Module supports continuous skill development. Collectively, these features enhance organizational efficiency and contribute to employee engagement and overall strategic HR management in HEIs. These findings align with existing literature reviews [16], [35], [40], [43], reinforcing the importance of these HRIS features for optimizing HR functions and promoting organizational success in the higher education sector. In the Content (CPC) Framework, an analysis of the data processed by HRIS in HEIs was conducted. Table 9 indicates that Requirements Data is the most processed, referring to information gathered from HR professionals and stakeholders outlining HRIS functional requirements. This includes Employee Data Management, Payroll Processing, and Performance Tracking [8]-[15], [41], [44]-[55]. This is followed by Quality Assurance and Testing Data [8]-[15], [41], [44], [49]-[56], User Input and Feedback [8], [10]-[15], [45]-[50], [54], [56], and Performance Monitoring Data [9]-[15], [41], [44], [49]-[56].

TABLE IX. DATA PROCESSED AS CONTENT

Data Processed	Count	Journal Article ID
Requirements Data	9	[8], [9], [10], [11], [13], [14], [15], [41], [44], [45], [46], [48], [51], [52], [53], [54], [55]
Quality Assurance and Testing Data	16	[8], [9], [10], [11], [13], [14], [15], [41], [44], [49], [50], [51], [53], [54], [55], [56]
User Input and Feedback	13	[8], [10], [11], [14], [15], [45],

		[46], [47], [48], [49], [50], [54], [56]
Performance Monitoring Data	13	[9], [10], [11], [13], [14], [41], [44], [49], [50], [53], [54], [55], [56]
Production Data	7	[11], [14], [47], [48], [49], [51], [56]
Code and Programming Data	4	[9], [10], [14], [51]
Access Permission Data	4	[49], [53], [55], [56]
Training Data	2	[11], [14]
Post-Deployment Analysis	2	[9], [44]
System Design Data	2	[11], [51]
Configuration Data	1	[10]
Integration Data	1	[51]
Back-up and Recovery Data	1	[52]
Go-Live Plans and Checklists	1	[52]

These results affirm the significance of the identified processed data categories as integral elements for strategic HRIS deployment and continuous enhancements, aimed at aligning with the specific needs and objectives of HEIs. The synthesis of these processed data categories not only supports the present functionality of HRIS but also lays the foundation for adaptive improvements over time. A comprehensive analysis of literature reviews revealed resonance with the findings in several articles [4], [18], [20], [21], [34], [36], [37], reinforcing the robustness of the results that highlights a shared understanding within the scholarly discourse regarding the importance of these processed data categories in shaping effective HRIS strategies for HEIs.

3.3 Research Gap Analysis Results

Common Conclusions of HRIS in HEIs

This section summarizes the common conclusions identified in the twenty-one final sample literatures related to HRIS in HEIs, organized by theme in Table 10. The primary theme is HRIS functionality and benefits, highlighting improved productivity in HR tasks [9], [13], [14], [44]-[46], [49], [52], [55]. Effective HRIS adoption requires user support, ease of use, and top management backing [11], [14], [41], [47], [55], [56]. Proposed frameworks suggest a holistic approach for integrating HRIS into broader organizational contexts [41], [45], [47], [56]. The HRIS systems must be adaptable and involve users throughout the process [11], [15], [48]. While HRIS shows high usability, further improvements are needed [44], [54]. A tailored and integrated HRIS model for HEIs is necessary [53]. Insights from a study on information systems' impact on HRM suggest future research directions [51]. One study highlights the benefits of CSCW in HRMIS, enhancing HR management through collaborative technologies [52]. Another study concludes that HRIS can boost a university's competitive edge, aiding its growth and improvement [8]. This overview

underscores the practical benefits of HRIS in higher education, streamlining processes for increased effectiveness.

TABLE X.   IDENTIFIED COMMON CONCLUSIONS

Common Conclusions	Count	Journal Article ID
HRIS Functionality and Benefits	9	[9], [13], [14], [44], [45], [46], [49], [52], [55]
HRIS Adoption Factors	6	[11], [14], [41], [47], [55], [56]
Proposed Framework for HRIS adoption	4	[41], [45], [47], [56]
Proposed HRIS System	3	[11], [15], [48]
HRIS High Usability Need for Further Improvements	2	[48], [55]
Comprehensive and Integrated HRIS Model Needed for HEI	1	[53]
Impact of Information System in Aspects of HRM	1	[51]
Benefits of CSCW in Human Resources Management Information System	1	[52]
HRIS Impact on Competitive Advantage	1	[8]

The variations in citation frequency among the identified common conclusions related to the HRIS in HEIs provides insights into the perceived significance and attention given to different aspects within the sample literature. The conclusion emphasizes the practical benefits of HRIS in higher education, particularly its role in making HR tasks easier, improving productivity, and contributing to institutional growth and improvement. The consistent attention to this aspect across multiple studies underscores its importance in the discourse surrounding the HRIS in HEIs [4], [37], [59]. It implies that researchers recognize and prioritize the positive impacts of the HRIS on operational efficiency, productivity, and overall institutional development. In practical terms, this suggests that, within the field of the HRIS in higher education, the community of researcher's places greater emphasis on the tangible and transformative outcomes of the HRIS usage rather than exclusively focusing on its usability aspects. As institutions continue to invest in and implementation of the HRIS, understanding and optimizing the practical benefits could remain a central theme in both research and practical applications.

Common Limitations of HRIS in HEIs

This section discusses common limitations identified in the HRIS literature in HEIs, organized by thematic similarities in Table 11. A frequent limitation is the focus on no more than three universities, raising concerns about the generalizability of the findings [8], [10], [13], [14], [15], [41], [44], [46]-[48], [51], [53]-[56]. Many studies rely on self-reported data, introducing potential biases and accuracy issues [8], [9], [10], [46], [47], [53], [54]. The use of observational study designs suggests caution in

establishing causal relationships [8], [9], [10], [47]. Some studies use self-developed questionnaires, potentially affecting data reliability and validity [41], [44]. Dependence on secondary sources and case studies in single studies may also affect data authenticity [49]. These limitations highlight the need for careful consideration when interpreting and generalizing findings from these studies.

TABLE XI.   IDENTIFIED COMMON LIMITATIONS

Common Limitations	Count	Journal Article ID
Focuses Not More Than Three (3) Universities Only	15	[8], [10], [13], [14], [15], [41], [44], [46], [47], [48], [51], [53], [54], [55], [56]
Relied on Self-Reported Data from the Respondents	7	[8], [9], [10], [46], [47], [53], [54]
Used Observational Study Design	4	[8], [9], [10], [47]
Not Well-Examined Questions	2	[41], [44]
Did not Measure the Actual Impact of HRIS	2	[9], [10]
Relies on Secondary Sources	1	[49]

The high citation frequency suggests a collective acknowledgment among researchers regarding the critical impact of the number of universities focused on research on the robustness and external validity of research outcomes in the field of the HRIS in higher education. This limitation was also found out by a healthcare system related study in South Africa [60]. The implications of this limitation extend beyond individual studies, indicating a broader challenge within the field. It suggests that researchers may face difficulties in obtaining a diverse and representative sample of universities, potentially due to practical constraints, and underscores the need for future studies to address this limitation to enhance the generalizability.

Common Recommendations of HRIS in HEIs

This section discusses common recommendations from the final sample of literature related to HRIS in HEIs. Key themes include HRIS implementation strategies, emphasizing monitoring and evaluating outcomes, involving users, investing in resources and training, and engaging stakeholders [11], [13], [14], [41], [44]-[49]. Technology development and evaluation focus on enhancing functionality, security, usability, generalization, and customization of system architecture, along with conducting audits and reviews [11], [15], [45], [48], [49], [51]-[54]. Training and communication recommendations stress encouraging HRIS adoption as a strategic tool and creating a positive organizational culture [41], [46], [47], [53], [56]. Future research directions suggest exploring factors influencing HRIS implementation relationships, expanding study scopes

and samples, and conducting longitudinal and comparative research [8], [9], [10], [47], [50], [54], [56]. These recommendations are summarized in Table 12.

TABLE XII.   IDENTIFIED COMMON RECOMMENDATIONS

Common Recommendations	Count	Journal Article ID
HRIS Implementation Strategies		
Invest in Resources and Training	5	[41], [46], [47], [48], [49]
Involve Stakeholders	4	[11], [13], [44], [45]
Monitor and Evaluate Outcomes	4	[41], [46], [47], [48]
Involve users	1	[14]
Technology Development and Evaluation		
Enhance Functionality, Security, and Usability	9	[11], [15], [45], [48], [49], [51], [52], [53], [54]
Consider Generalization and Customization of System Architecture	5	[11], [15], [45], [48], [49]
Conduct Audits and Reviews	5	[11], [15], [45], [48], [49]
HRIS Training and Communication		
Encourage Adoption as a Strategic Tool	5	[41], [46], [47], [53], [56]
Create a Positive Organizational Culture	4	[41], [46], [47], [56]
Future Research Directions		
Conduct Longitudinal and Comparative Studies	7	[8], [9], [10], [47], [50], [54], [56]
HRIS Implementation Strategies		
Invest in Resources and Training	5	[41], [46], [47], [48], [49]
Future Research Directions		
Conduct Longitudinal and Comparative Studies	7	[8], [9], [10], [47], [50], [54], [56]
Expand Scope and Sample	7	[8], [9], [10], [47], [50], [54], [56]
Explore Factors Influencing Relationships	7	[8], [9], [10], [47], [50], [54], [56]

The identified common recommendations for the HRIS in HEIs imply a comprehensive and collaborative approach to implementation. HRIS implementation strategies highlight the importance of Involving Users, Investing in Resources and Training, and Engaging Stakeholders, Emphasizing a Holistic Adoption Process. Technology Development and Evaluation recommendations underscore the need for continuous improvement in Functionality, Security, and Usability, with an Emphasis on Adaptable System Architecture and Thorough Audits. HRIS Training and Communication emphasize the strategic role of the HRIS, requiring a positive organizational culture for effective integration. The future research directions suggest a continuous evolution in understanding the HRIS implementation, encouraging exploration of relationship dynamics, broader study scopes and longitudinal perspectives. Overall, these directions support a forward-looking and expansive approach, encouraging researchers to examine unexplored aspects to enhance our understanding of the HRIS in higher education contexts.
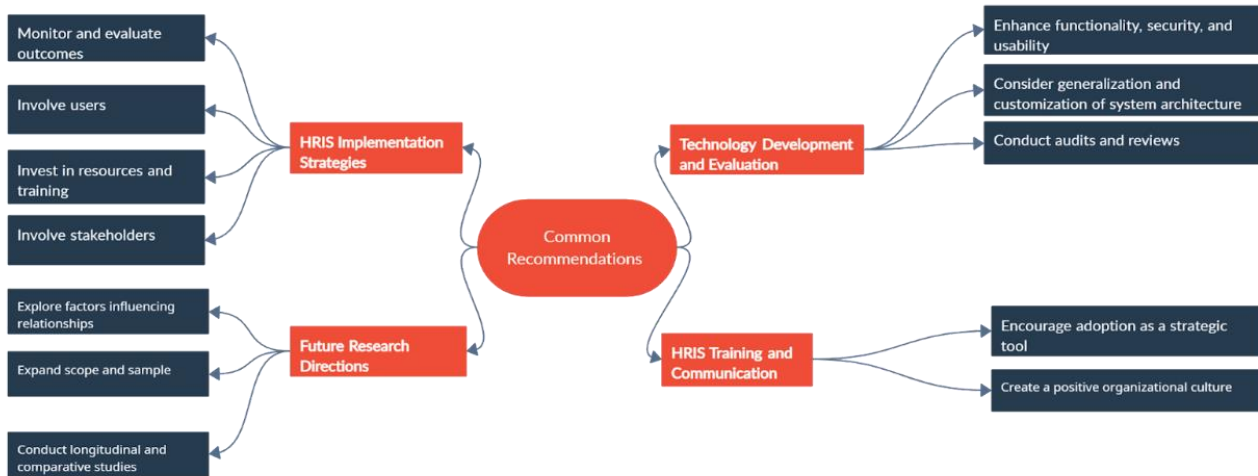
Figure 13. Common Recommendations Mind Mapping

4. CONCLUSION AND RECOMMENDATION

The structured review of twenty-one (21) journal articles on the HRIS in HEIs aimed to synthesize and analyze the literature, focusing on scope, methodologies, and research gaps. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 Framework and used both deductive and inductive coding for comprehensive analysis. The scoping analysis identified the successful automation of the HR processes, streamlining operations, and optimizing tasks as the primary scope of the HRIS in HEIs. Widely employed frameworks included the TAM, Strategic Management Frameworks, and the DeLone and McLean Model. The methodological analysis emphasized the evaluation methods for systematic and uniform assessments, with a focus on performance management as the most utilized HR function. In the content analysis, the study identified the Performance Appraisal System as the most frequently used feature, and requirements data as the most processed data in HR for developing HRIS in HEIs. The review provided valuable insights into the significance of implementing the HRIS in HEIs and highlighted gaps and limitations along the process.

For future researchers, a crucial recommendation is the Development of Comprehensive Training Programs tailored to the academic context of HEIs, emphasizing the importance of aligning training programs with the unique features and requirements of the HEIs. The study also identified several limitations in the existing literatures, such as the focus on a Limited Number of Universities, Reliance on Self-Reported Data, and the Use of Self-Developed Questionnaires. It suggested potential areas for future research, including Effective HRIS Implementation Strategies, Continuous Improvement in the HRIS Technology, and the Role of Organizational Culture in Adoption. The review significantly advanced the understanding of HRIS HEIs by addressing the insufficiency of studies in this specific context. Despite encountering limitations in sample size, the study offered valuable insights and suggested areas for future research to overcome constraints and further enrich the understanding of the HRIS implementation in HEIs. The search results provided additional insights into the impact of the HRIS in attaining competitive advantage for the higher education market, the success factors of the HRIS in public higher education institutions, and the importance of transforming the HR to better support higher education institutions. These results complement the findings of the structured review and contribute to the overall understanding of the HRIS in the context of HEIs.

REFERENCES

[1]   M. Mohiuddin, E. Hosseini, S. B. Faradonbeh, and M. Sabokro, "Achieving Human Resource Management Sustainability in Universities," *Int. J. Environ. Res. Public. Health*, vol. 19, no. 2, 2022, doi: 10.3390/ijerph19020928.

[2]   M. A. Fındıklı and E. beyza Bayarçelik, "Exploring the Outcomes of Electronic Human Resource Management (E-HRM)?," *Procedia - Soc. Behav. Sci.*, vol. 207, pp. 424–431, 2015, doi: https://doi.org/10.1016/j.sbspro.2015.10.112.

[3]   A. K. M. Masum, L.-S. Beh, Md. A. K. Azad, and K. Hoque, "Intelligent human resource information system (i-HRIS): A holistic decision support framework for HR excellence," *Int. Arab J. Inf. Technol.*, vol. 15, pp. 121–130, Jan. 2018.

[4]   A. Chakraborty and N. N. A. Mansor, "Adoption of Human Resource Information System: A Theoretical Analysis," *Procedia - Soc. Behav. Sci.*, vol. 75, pp. 473–478, 2013.

[5]   C. Sharma, S. Sakshi, S. Sharma, and N. Kondal, "Role and impact of human resource information system (HRIS) on organizational activities," in *AIP Conference Proceedings*, Feb. 2023, p. 020070. doi: 10.1063/5.0123335.

[6]   A. Ammupriya and S. Preetha, "Effect of HRIS adoption on job satisfaction mediated by employee motivation," *Ann. For. Res.*, vol. 65, pp. 6878–6894, Dec. 2022.

[7]   R. H. Al-Dmour, R. Masa'deh, and B. Y. Obeidat, "Factors influencing the adoption and implementation of HRIS applications: are they similar?," *Int. J. Bus. Innov. Res.*, vol. 14, no. 2, pp. 139–167, 2017, doi: 10.1504/IJBIR.2017.086276.

[8]   M. Elayan and M. Sleimi, "The Mediating Effect of Dynamic Capability on the Relationship between Human Resource Information Systems and the Attainment of Competitive Advantage in

Jordanian Higher Education Institutions," *Int. J. Qual. Res.*, vol. 15, pp. 533–548, May 2021, doi: 10.24874/IJQR15.02-11.

[9] A. Davarpanah and N. Mohamed, "Human Resource Information Systems (HRIS) success factors in a public higher education institution context," *2013 Int. Conf. Res. Innov. Inf. Syst. ICRIIS*, pp. 79–84, 2013.

[10] A. Davarpanah and N. Mohamed, "Human Resources Information Systems Implementation and Influences in Higher Education: Evidence From Malaysia," *Int J Asian Bus Inf Manag*, vol. 11, pp. 65–84, 2020.

[11] R. G. Luciano, "Design And Development Of Human Resource Information System (HRIS) For Private HEIS," *Int. J. Sci. Technol. Res.*, vol. 9, pp. 215–222, 2020.

[12] A. Nagendra and M. Deshpande, "Human Resource Information Systems (HRIS) in HR Planning and Development in Mid to Large Sized Organizations," *Procedia - Soc. Behav. Sci.*, vol. 133, pp. 61–67, 2014, doi: https://doi.org/10.1016/j.sbspro.2014.04.169.

[13] T. Y. Ali and A. Mahmood, "Adoption of Human Resource Information Systems by Faculty Members: Qualitative Evidence from Universities in Pakistan," *J. Organ. Stud. Innov.*, 2023, [Online]. Available: https://api.semanticscholar.org/CorpusID:261819261

[14] N. Bamel, U. Kumar Bamel, V. Sahay, and M. Thite, "Usage, benefits and barriers of human resource information system in universities," *VINE J. Inf. Knowl. Manag. Syst.*, vol. 44, no. 4, pp. 519–536, Jan. 2014, doi: 10.1108/VINE-04-2013-0024.

15] R. Setiawan, "Architecture of human resource management system at universities," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 434, no. 1, p. 012258, Nov. 2018, doi: 10.1088/1757-899X/434/1/012258.

16] K. R. Memon *et al.*, "Management of knowledge and competence through human resource information system—A structured review," *Front. Psychol.*, vol. 13, 2022, doi: 10.3389/fpsyg.2022.944276.

17] V. Sima, I. G. Gheorghe, J. Subić, and D. Nancu, "Influences of the Industry 4.0 Revolution on the Human Capital Development and Consumer Behavior: A Systematic Review," *Sustainability*, vol. 12, no. 10, 2020, doi: 10.3390/su12104035.

[18] V. N. Amrutha and S. N. Geetha, "A systematic review on green human resource management: Implications for social sustainability," *J. Clean. Prod.*, vol. 247, p. 119131, 2020, doi: https://doi.org/10.1016/j.jclepro.2019.119131.

[19] A. Tursunbayeva, R. Bunduchi, M. Franco, and C. Pagliari, "Human resource information systems in health care: a systematic evidence review.," *J. Am. Med. Inform. Assoc. JAMIA*, vol. 24, no. 3, pp. 633–654, May 2017, doi: 10.1093/jamia/ocw141.

[20] C. Truppa, S. Yaacoub, M. Valente, G. Celentano, L. Ragazzoni, and D. Saulnier, "Health systems resilience in fragile and conflict-affected settings: a systematic scoping review," *Confl. Health*, vol. 18, no. 1, p. 2, Jan. 2024, doi: 10.1186/s13031-023-00560-7.

[21] L. E. Lines *et al.*, "Interprofessional Education in Child Protection for Preservice Health and Allied Health Professionals: A Scoping Review," *Trauma Violence Abuse*, p. 15248380231221279, Jan. 2024, doi: 10.1177/15248380231221279.

[22] J. Schuurmans *et al.*, "Hypotension during intensive care stay and mortality and morbidity: a systematic review and meta-analysis," *Intensive Care Med.*, Jan. 2024, doi: 10.1007/s00134-023-07304-4.

[23] M. M. Albhirat *et al.*, "The PRISMA statement in enviropreneurship study: A systematic literature and a research agenda," *Clean. Eng. Technol.*, vol. 18, p. 100721, 2024, doi: https://doi.org/10.1016/j.clet.2024.100721.

[24] M. Elayan, "Examining the Impact of HRIS on Attaining Competitive Advantage in the Higher Education Market: A Literature Review," *Creat. Innov. Manag.*, Oct. 2019.

[25] J. H. Marler and S. L. Fisher, "An evidence-based review of e-HRM and strategic human resource management," *Hum. Resour. Manag. Rev.*, vol. 23, no. 1, pp. 18–36, 2013, doi: https://doi.org/10.1016/j.hrmr.2012.06.002.

[26] M. J. Page *et al.*, "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews," *BMJ*, vol. 372, 2021, doi: 10.1136/bmj.n71.

[27] J. J. Lacson *et al.*, "Smart City Assessment in Developing Economies: A Scoping Review," *Smart Cities*, vol. 6, no. 4, pp. 1744–1764, 2023, doi: 10.3390/smartcities6040081.

[28] C. Y. Cheok, H. A. K. Salman, and R. Sulaiman, "Extraction and quantification of saponins: A review," *Food Res. Int.*, vol. 59, pp. 16–40, 2014, doi: https://doi.org/10.1016/j.foodres.2014.01.057.

[29] S. Imenda, "Is There a Conceptual Difference between Theoretical and Conceptual Frameworks?," *J. Soc. Sci.*, vol. 38, no. 2, pp. 185–195, 2014, doi: 10.1080/09718923.2014.11893249.

[30] P. Gerbic and E. Stacey, "A purposive approach to content analysis: Designing analytical frameworks," *Internet High. Educ.*,

vol. 8, no. 1, pp. 45–59, 2005, doi: https://doi.org/10.1016/j.iheduc.2004.12.003.

[31] V. Kumar, A. Kumar, D.-J. Lee, and S.-S. Park, "Estimation of Number of Graphene Layers Using Different Methods: A Focused Review," *Materials*, vol. 14, no. 16, 2021, doi: 10.3390/ma14164590.

[32] V. J. Symons, "A review of information systems evaluation: content, context and process," *Eur. J. Inf. Syst.*, vol. 1, no. 3, pp. 205–212, Aug. 1991, doi: 10.1057/ejis.1991.35.

[33] R. Stockdale and C. Standing, "An interpretive approach to evaluating information systems: A content, context, process framework," *Eur. J. Oper. Res.*, vol. 173, no. 3, pp. 1090–1102, 2006, doi: https://doi.org/10.1016/j.ejor.2005.07.006.

[34] F. Okumus, "Towards a strategy implementation framework," *Int. J. Contemp. Hosp. Manag.*, vol. 13, no. 7, pp. 327–338, 2001.

[35] I. I. Berchin, A. R. de Aguiar Dutra, and J. B. S. O. de A. Guerra, "How do higher education institutions promote sustainable development? A literature review," *Sustain. Dev.*, vol. 29, no. 6, pp. 1204–1222, 2021, doi: https://doi.org/10.1002/sd.2219.

[36] Z. Al-Zu'bi, "Factors Motivating and Inhibiting the Practice of HRIS in Business Organizations: An Empirical Analysis," *Int. Bus. Res.*, vol. 7, pp. 139–155, Jun. 2014.

[37] L. M. C. Benavides, J. A. Tamayo Arias, M. D. Arango Serna, J. W. Branch Bedoya, and D. Burgos, "Digital Transformation in Higher Education Institutions: A Systematic Literature Review," *Sensors*, vol. 20, no. 11, 2020, doi: 10.3390/s20113291.

[38] A. Abuhantash, "The Impact of Human Resource Information Systems on Organizational Performance: A Systematic Literature Review," *Eur. J. Bus. Manag. Res.*, vol. 8, no. 3, pp. 239–245, 2023.

[39] S. Ahmed, M. T. K. Farooqi, and A. Shakoor, "Human Resource Development Practices and Faculty Development: A Review in the Context of Pakistani Universities," *Glob. Soc. Sci. Rev.*, 2018, [Online]. Available: https://api.semanticscholar.org/CorpusID:221068497

[40] F. Ghaznafar, G. Nabi, and Q. Ain, "An Analytical Study on HR Practices in the Public Sector Universities of Azad Jammu and Kashmir," *Glob. Reg. Rev.*, vol. VI, pp. 192–202, Mar. 2021, doi: 10.31703/grr.2021(VI-I).21.

[41] Y. Li, N. Li, and M. Jiang, "Employment Analysis of University Students Majoring in Environmental Materials Based on Human Resources Information System," *J. Phys. Conf. Ser.*, vol. 1549, no. 2, p. 022108, Jun. 2020, doi: 10.1088/1742-6596/1549/2/022108.

[42] K. F. Hyde, "Recognising deductive processes in qualitative research," *Qual. Mark. Res. Int. J.*, vol. 3, no. 2, pp. 82–90, Jan. 2000, doi: 10.1108/13522750010322089.

[43] L. V. P. Kaye Velarde Rentor Cafino, Armando Isla Jr. ,. Karen Mae Ty, Xavier-Lewis Palmer, Lucas Potter, Larry Nadorra and L. C. Velasco, "Virtual surgical planning in craniomaxillofacial surgery: a structured review," *Comput. Assist. Surg.*, vol. 28, no. 1, p. 2271160, 2023, doi: 10.1080/24699322.2023.2271160.

[44] Y. Ramírez and Á. Tejada, "University stakeholders' perceptions of the impact and benefits of, and barriers to, human resource information systems in Spanish universities," *Int. Rev. Adm. Sci.*, vol. 88, no. 1, pp. 171–188, Mar. 2022, doi: 10.1177/0020852319890646.

[45] M. M. Phahlane and R. M. Kekwaletswe, "A conceptual research framework for human resource information systems adoption and use in universities," in *2017 Conference on Information Communication Technology and Society (ICTAS)*, 2017, pp. 1–6. doi: 10.1109/ICTAS.2017.7920654.

[46] J. J. Masele and R. S. Kagoma, "Usefulness of human capital management information systems on payroll reliability among public universities in Tanzania," *Public Money Manag.*, vol. 43, no. 2, pp. 165–173, 2023, doi: 10.1080/09540962.2021.1906579.

[47] P. Göktaş and Y. Akgül, "The investigation of employer adoption of human resource information systems at University using TAM," in *Research Anthology on Human Resource Practices for the Modern Workforce*, IGI Global, 2022, pp. 1094–1121.

48] H. M. Shukur, S. R. M. Zeebaree, R. R. Zebari, B. K. Hussan, O. H. Jader, and L. M. Haji, "Design and Implementation of Electronic Enterprise University Human Resource Management System," *J. Phys. Conf. Ser.*, vol. 1804, no. 1, p. 012058, Feb. 2021, doi: 10.1088/1742-6596/1804/1/012058.

[49] P. Hosie, "Promoting quality in higher education using human resource information systems," *Qual. Assur. Educ.*, vol. 3, no. 1, pp. 30–35, Jan. 1995, doi: 10.1108/09684889510082408.

[50] W. J. Jones and R. C. Hoell, "Human resource information system courses: An examination of instructional methods," *J. Inf. Syst. Educ.*, vol. 16, no. 3, p. 321, 2005.

[51]   H. Kropsu-Vehkaperä and P. Kess, "Information systems support to the human resource management in universities," in *2013 IEEE 11th International Conference on Emerging eLearning Technologies and Applications (ICETA)*, 2013, pp. 207–213. doi: 10.1109/ICETA.2013.6674430.

52]   H. Ouyang and X. Lu, "On the Construction of a Human Resources Management Information System Based on CSCW for Institution of Higher Education," in *2009 International Conference on E-Learning, E-Business, Enterprise Information Systems, and E-Government*, 2009, pp. 290–293. doi: 10.1109/EEEE.2009.79.

[53]   D. Bambir, M. Drozdová, and J. Horvat, "Applicability of existing HRM models in order to develop HRIS model for university," *Int. J. Cross Cult. Manag.*, vol. 4, no. 3, pp. 28–36, 1999.

[54]   B. Kumar, I. Kumar, and S. Hussein, "Usability Study of Online Human Resource Information Systems at Fiji National University: A Case Study," *Asian J. Inf. Technol.*, vol. 14, pp. 42–48, Jan. 2015, doi: 10.3923/ajit.2015.42.48.

[55]   M. A. Jaafar, A. Rezaeian, G. A. Tabarsa, A. Otarkhani, and N. Nezafati, "The Implementation of Human Resources Information System: An Exploratory Case Study on Lebanon Universities," *Int. Bus. Manag.*, vol. 11, no. 7, pp. 1560–1567, 2017.

[56]   L. F. Berdnikova, N. O. Mikhalenok, V. A. Frolova, V. V. Sukhacheva, and A. I. Krivtsov, "Human Resource Management System Development at Smart University," in *Smart Education and e-Learning 2020*, V. L. Uskov, R. J. Howlett, and L. C. Jain, Eds., Singapore: Springer Singapore, 2020, pp. 327–337.

[57]   C. G. Iwu, E. Udekwe, A. C. de la Harpe, and J. O. Daramola, "Descriptive literature review of human resource information systems (HRIS) adoption issues in the health sector, South Africa," *Int. J. Res. Bus. Soc. Sci. 2147- 4478*, vol. 10, no. 5, pp. 261–275, Aug. 2021, doi: 10.20525/ijrbs.v10i5.1284.

[58]   Sutikman, D. A. Lantana, K. Digdowiseiso, and Z. Muhammad, "The Need And Urgency of Human Resource Information System (HRIS) on MSMEs in Indonesia: A Literature Study," *Int. J. Econ. Manag. Bus. Soc. Sci. IJEMBIS*, vol. 3, no. 3, pp. 1080–1088, Sep. 2023, doi: 10.59889/ijembis.v3i3.233.

[59]   L. Menant, D. Gilibert, and C. Sauvezon, "The Application of Acceptance Models to Human Resource Information Systems: A Literature Review," *Front. Psychol.*, vol. 12, 2021, doi: 10.3389/fpsyg.2021.659421.

[60]   H. Susilo, E. S. Astuti, and Wiyata, "Analyzing and Modeling the Role of Human Resource Information Systems on Human Resource Planning at Higher Education Institutions in Indonesia," *Russ. J. Agric. Socio-Econ. Sci.*, vol. 68, pp. 118–124, Aug. 2017, doi: 10.18551/rjoas.2017-08.14.

[61]   L. B. P. da Silva *et al.*, "Human resources management 4.0: Literature review and trends," *Comput. Ind. Eng.*, vol. 168, p. 108111, 2022, doi: https://doi.org/10.1016/j.cie.2022.108111.

[62]   S. Srivastava, B. Bajaj, and S. Dev, "Human resource information system adoption and implementation factors: a theoretical analysis," in *Research Anthology on Human Resource Practices for the Modern Workforce*, IGI Global, 2022, pp. 93–113.

[63]   E. Udekwe, C. G. Iwu, A. C. De la Harpe, and J. O. Daramola, "A systematic literature review of Human Resource Information System (HRIS) usage in the health system of South Africa," *Int. J. Res. Bus. Soc. Sci. 2147-4478*, vol. 10, no. 7, pp. 87–115, 2021.