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Comparative Study on the Impact of Human Factors on Operational Performance of Innovation Hubs

Anandhu VIJAYAKUMAR[1], Jelena DAVIDOVA[2]
[1] Turiba University, 68 Graudu iela, Zemgales priekšpilsēta, Rīga LV-1058, LV;
anandhuvijayakumarhere@gmail.com (corresponding author)
[2] Daugavpils University, 13 Vienības iela, Daugavpils LV-5401, LV; jelena.davidova@du.lv

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Abstract: To fill a gap in current literature, this paper analyses the impact of human factors on the operational performance of innovation hubs in the SAARC Nations and the European Union. Upon conducting an extensive examination of academic literature, four primary classifications of human factors were determined: organizational factors, individual attributes, the nature of a task and working environment. This research offers a cross-sectional analysis of these factors and their implications on innovation centres in the culturally and economically diverse domain of SAARC Nations and the European Union. The findings suggest that organizations functioning in the context of Innovation hubs in SAARC Nations, where centralized authority and value correctness is mostly emphasised on, face challenges in order to foster employee engagement and creativity. However, the innovation hubs of the European Union receive treatment from a more flexible and tolerant approach which is backed by progressive technology and is incredibly sensitive to concerns touching on ergonomics and safety of the working environment. This research highlights High performing, High committing, and High involvement management, management techniques to manage human factors to enhance operation performance. Adaptive and individual approach to the management of human variables, based on the differences in cultural and economic conditions of each region, is essential for effective development of the innovative substance and competitive advantage, the paper states. The results obtained from this study offer important guidance for the policymakers, managers and practitioners who are involved in managing and creating innovation hubs. It has provided a framework of how the organisation's operation performance may be improved through effective management of human resources.

Keywords: comparative analysis; HR management strategies; human factors; SAARC and European Union; innovation hubs; operational performance.

Introduction

Innovation hubs can be described as centres of excellence for innovation, investment and employment generation catalysing competitiveness in a given region. They foster the development of otherwise hard-to-create multi-disciplinary teaching and research ventures where the researchers and students are rightly prepared, guided and assisted to accommodate any possible future entrepreneurial strategies (Egessa et al., 2024). Innovation hubs have demonstrated resilience by adjusting their strategies in response to disruptions such as the COVID-19 pandemic. Nevertheless, their efficacy may be compromised by inadequate infrastructure or a lack of strategic planning (Kabelele et al., 2023).

The South Asian Association for Regional Cooperation (SAARC) is dedicated to the advancement of economic and regional integration among its eight member nations such as Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri-Lanka. Financial inclusion is essential for the reduction of poverty and income inequality, while foreign direct investment and labour force participation contribute to economic growth (Khan, 2024). While the European Union is a distinctive political and economic union

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(Jentleson, 2023). It consists of nations such as Austria, Belgium, Bulgaria, Croatia, the Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden that endeavours to achieve a harmonious equilibrium between economic development, environmental sustainability, democratic responsiveness, and international cooperation. It encourages the use of renewable energy sources to stabilize the economy and reduce environmental degradation (Lopes, 2024).

Innovation hubs play a crucial role in businesses by promoting collaboration, entrepreneurship, and research outputs. They provide a physical space for multidisciplinary interactions and generate innovative solutions. Furthermore, these hubs play an important role in promoting investments, stimulating employment and competitiveness. (Egessa et al., 2024). Besides, innovation hubs contribute to promoting entrepreneurship as they act as incubation centres that develop student talents for self-employment and innovation. However, drawbacks like lack of infrastructure base and the necessity of further management can act as obstacles to their creation. These issues must therefore be dealt with to ensure that a worthwhile distance is achieved in developing the innovation hubs (Kabelele et al., 2023).

Researchers have paid a growing amount of attention to Innovation Hubs (IHs) during the last decade. As one of the first examples of scholarly investigations of IHs, we find the research done by Gathege and Moraa (2013). Size, age, tenants, partnerships, and financiers were used to determine the comparable IH features. Because investigating IHs is a new field, only a few authors have published groundbreaking research. The results found by Friederici (2015) show that further study is required to properly understand how intermediaries operate for new types of innovation. The measurements employed to show the positive benefits of IHs on company growth were also inadequate, as shown by Friederici (2015). The features, administration, and design of innovation hubs have all been the subject of studies examining what determines their success or failure. Giaccone and Longo (2016) found as much when they analysed the organisational structure and management of several EU interregional centres for innovation.

Given that innovation hubs engage the employees, and have to fit into an organizational context, it is crucial to incorporate the human-related factors such as culture, personal characteristics, tasks and physical working environment in assessing the official performance status of the innovation hubs (Vijayakumar & Davidova, 2023). It is important to grasp that innovation processes are not a simple matter of technology and knowledge application but a cluster of innovation skills and an organizational environment able to provide propitious conditions to accrue innovation knowledge as well as routines in an organization (Aloini et al., 2020).

It is for this reason that the human factor role in the operational performance can be explained by the Human Factor Theory. The skills, experience, motivation and organizing capacity of people is of immense importance in championing innovation in innovation hubs as postulated by the human factor theory (Sitiari et al., 2022). It is indicated that innovation hubs can enhance the operational efficiency and the setting conducive to innovations by focusing on Human Resource Management (HRM) as a human factor that creates the environment for innovations, developing a suitable organizational culture and implementing the cultural factors into the practice of HRM (Martinidis, 2017). However, it is necessary to address possible challenges such as the failed cultural FIT with innovation goals or Change readiness to ensure the effectiveness of innovation hubs (Baležentis & Ingram, 2017). Modern innovation hubs have asserted themselves as crucial enablers of economic growth, innovation, and entrepreneurship, as well as technological progress. These centres act as nodes for ideas, people and resources that catalyse solutions for modern problems (Fannin, 2016; Kabadurmus, 2021). Being essential to the regional and national economies, innovation hubs are vital for the emerging and

development of the SAARC nations and the EU especially in competing and improving within the operational performance of businesses (Ravilevna, 2023). Machine and process efficiency may be improved by using human factor theory, which considers the unique abilities and constraints of human operators. Human resource practices significantly contribute to the achievement of day-to-day financial and strategic goals. Although human resource management is vital to the success of every firm, it is typically less effectively implemented in smaller establishments (Hamadamin & Atan, 2019).

Several Human variables have significant effects on the operational success of innovation centres. A variety of human factors can affect the operational efficacy of innovation hubs (Vijayakumar & Davidova, 2023). The positive predictors that can increase the impact of innovation hubs include training and mentorship, disruptive environment and collaboration and interaction. Besides, external environmental factors such as funding and institutional support also play a huge role in their success. Meaningful and realistic objectives have to be set in order to ensure that the organizational processes stay as close to optimal as possible while avoiding unnecessary disturbances from environmental or human conditions (Vijayakumar & Davidova, 2023).

The pointed-out gap in the literature is that there is limited understanding how human factors influence the business effectiveness of hubs of innovation in the different contexts of SAARC Nations and the European Union. Surprisingly, there is very limited comparative research across these locations, as well as the need for more research in human factor's specific roles in innovation hubs, particularly in the burgeoning economies of the SAARC nations. Also, there is a lack of detailed investigations into the possibility of adapting different techniques in HRM to manage the human aspects in innovation hubs across diversified cultural and economic settings. These research questions aim to fill these gaps by offering a comparative assessment of human aspects and offering guidance on how to adapt the HRM tools to improve the operational effectiveness of innovation hubs in the different regions.

The authors aim to comparatively analyse the impacts of human factors on innovation hubs' operational performance in the SAARC Nations and European Union in this review. They employ a Systematic Literature Review (SLR) to examine articles and conduct a thematic analysis to qualitatively analyse the data. Unlike traditional literature reviews, systematic reviews have distinct components.

Literature review

Innovation hubs play a critical role in determining economic growth, as well as the level of technological development within the EU and SAARC nations. Currently, SAARC nations are building their collaborative ecosystems, whereas the ecosystems of the digital innovation hubs focus on the research and corporate sectors of the EU (Wintjes & Vargas, 2023). One of the challenges that both regions face includes funding and the need to tailor their strategies depending on the context. However, the EU benefits from networks built and funding procedures present while unlike SAARC nations have the potential for development and collaboration (Jiménez & Zheng, 2021).

The development of innovation hubs in the SAARC countries is crucial in driving regional economic growth and enhancing innovation capability (Mazumder & Hossain, 2024). It serves as a platform for work and communication between people of various profiles and helps to manage knowledge and contribute to the development of the economy (Kabadurmus, 2021).

European Digital Innovation Hubs (EDIHs) provide technical expertise, testing, and the chance to "try before investing" in digital technologies including Cybersecurity, Artificial Intelligence, and High-Performance Computing to improve operations, output, and customer satisfaction. They provide innovative services, including finance, education, and

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skill development, to ease this digital shift (Johnson et al., 2021). In addition to economic problems, sustainability and circularity were also examined (Becker, 2018). The following paragraphs describe the different Human factors affecting the operational performance of innovation hubs.

Human factors and innovation hubs

There is a high level of interaction that human factors play in the innovation context within the hubs. There are several factors that may affect the efficiency and efficacy of innovation hubs, these are in line with the three Pillars of innovation hubs, that is operational/ organizational efficiency, community/ collaboration, and social affinity (Vijayakumar & Davidova, 2023). Nevertheless, it is crucial to acknowledge that innovation outcomes are also influenced by external environmental conditions and institutional frameworks. Consequently, the promotion of innovation necessitates a multifaceted strategy that takes into account both external influences and human factors (Jiménez & Zheng, 2021). The human factors affecting the operational performance of Innovation hubs are as follows:

- *Organizational culture* - Culture is assumed to affect many outcomes, both within an organization and its people. Feeling like they belong to an organization boosts morale and productivity (Mohamad et al., 2015; Solovev, 2019). Collaboration, information sharing, and acceptance of new ideas have increased (Azeem et al., 2021). Organizational culture affects people's conscious and unconscious thinking, decision-making, perceptions, emotions, and behaviours (Vijayakumar & Davidova, 2023). Top-level management support, ethics, and promotional possibilities motivate employees. When employees invest in the corporate culture, they feel more empowered and committed (Lee et al., 2018) Organizational culture may foster or discourage hopelessness (Iranmanesh et al., 2021). India's economy is among SAARC's most dynamic (Reuters, 2022). Foreign corporations are increasingly interested in India, but few studies have examined effective management practices in the country. Indian management culture emphasizes power distance, collectivism, and emotional reciprocity (Kogan et al., 2017).
- *Individual attributes* - The operational success of innovation hubs is governed by individual attributes. Human elements like as leadership, team dynamics, and individual capabilities play a vital role in influencing the efficiency of these hubs (Miyao et al., 2022; Sotirofski & Kraja, 2024). Additionally, the perceived collective effectiveness of workers, affected by the support from open innovation hubs, may promote inventive behaviour and improve overall performance (Vijayakumar & Davidova, 2023).
- *Task related aspects* - The operational success of innovation hubs is determined by elements such as ergonomics, equipment and technology, and the intricacy of work (Maroulis & Wilensky, 2015). Applying ergonomic designs and using new technologies can increase the productivity and satisfaction of the employees (Trivellas & Santouridis, 2013). Reducing complex processes and systematically approaching their handling is also important for maintaining high performance (Vijayakumar & Davidova, 2023). Nevertheless, the implementation of these task-related characteristics could present challenges including the need to devote a great deal of effort, and new business culture in many corporations (Maroulis & Wilensky, 2015).
- *Workplace environment* - Some of the characteristics that directly affect the operational efficiency of innovation hubs include physical surroundings, managerial support, flexibility for the employees, and safety measures in the workplace (Ramos et al., 2018). All these combined elements enhance employee productivity, creativity and general pleasure which are all important to foster innovation (Vijayakumar & Davidova, 2023). Proper design of the physical office premise, encouragement from the higher authorities, positive organizational culture and appropriate working conditions enhance the operation output (Suryanto et al., 2023).

Table 1 describes the human factors affecting the operational performance of innovation hubs.

Table 1. Human factors affecting the operational performance of innovation hubs

Main Factors	Sub Factors	References
Organizational Factors	Organizational Culture	Iranmanesh et al. (2021); Mohamad et al. (2015); Solovev (2019); Vijayakumar and Davidova (2023)
	Rewards and Recognition	
	Human Resource Management Strategies	
Individual Attributes	Stress	Miyao et al. (2022); Sotirofski and Kraja (2024); Vijayakumar and Davidova (2023)
	Training	
	Skills and Abilities	
	Performance	
Task Related Aspects	Ergonomics	Maroulis & Wilensky (2015); Trivellas & Santouridis (2013); Vijayakumar and Davidova (2023)
	Equipment and Technology	
	Complexity of work	
Workplace Environment	Physical Environment	Ramos et al. (2018); Suryanto et al. (2023); Vijayakumar and Davidova (2023)
	Support and Encouragement from the Top Management	
	Work Life Balance	
	Workplace Safety	

Source: own processing

The following section describes the human resource management strategies that can be used to manage the human factors affecting the operational performance of Innovation hubs.

Human resource management strategies

Human resource strategies are more likely to be successful when they are customized to the specific demands of an organization and its environment, such as the product market, according to the contingency perspective (Dhondt et al., 2020). The different human resource management strategies that can be used to effectively manage the human factors are as follows:

- *High-performance human resource management* - Effective high-performance management depends on Human Resource (HR) policies and procedures that are internally consistent and aligned with the overall business plan. It is crucial to remember that high-performance management is an ongoing procedure that consists of a cycle of actions that are distinct from one another but interconnected (Srinivasan & Chandwani, 2014).
- *High commitment human resource management* - Employees' creative actions may be greatly influenced by high-commitment work systems. An innovative approach to work involves coming up with new ideas, advocating for those ideas, and, most importantly, attempting to put them into action (Than et al., 2023).
- *High-involvement human resource management* - High-involvement work processes (HIWPs) encourage substantial employee independence and/or substantial employee input in the structure of the group or department in which they operate (Le & Le, 2023). They are beneficial to organizations because they encourage quality and innovation, to workers because they allow for more autonomy and job satisfaction, and to societies because of the increased deployment and development of human skills (Renkema et al., 2021). It would be naïve to think that by 'turning up the volume' on the benefits of the high-involvement model, we might somehow cause more people to adopt it (Boxall & Winterton, 2018). The following section describes the methodology used in this research.

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Methodology

The authors through this review aim to identify the impacts of human factors on the operational performance of innovation hubs. For this purpose, the authors utilize a Systematic Literature Review (SLR) for reviewing the articles and a thematic analysis for the analysis of data qualitatively. The purpose of systematic literature reviews is to provide a high-level overview of a specific research question, which is focused on reviewing literature related to a particular topic, such as medical or clinical outcomes. Unlike standard literature review research theses, the components of a systematic literature review are different. Due to the specificity of the research question, these reviews usually involve more than one primary author to divide the workload effectively among two or more researchers (Dada & Belle, 2023; Elsevier Author Services, 2022). The conventional approach comprises four fundamental stages: search (including determining the search string and database types), appraisal (including pre-established criteria for literature inclusion and exclusion and quality assessment), synthesis (which involves extracting and categorising the data), and analysis (which concludes with a narrative of the findings) (Mengist et al., 2020). Figure 1 describes the stages of a SLR approach.

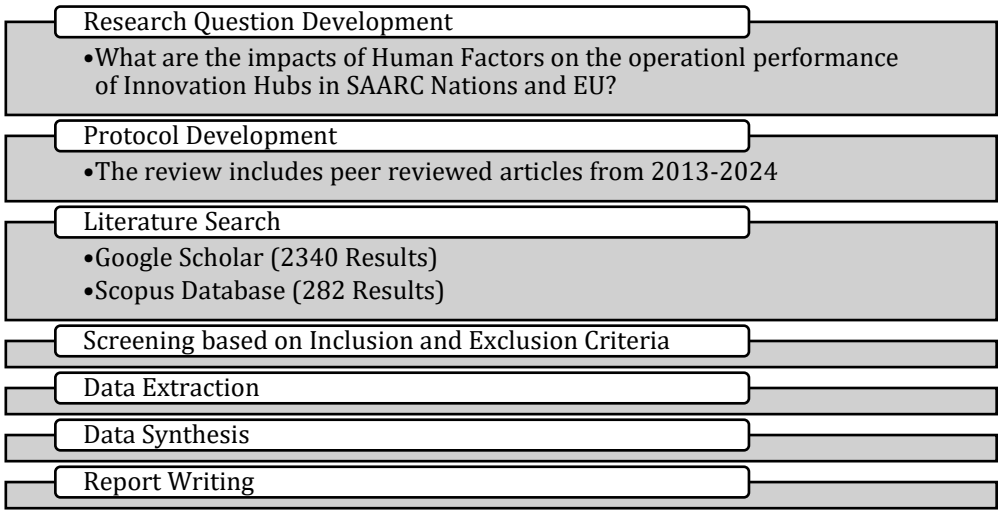

Figure 1. Stages of SLR approach
Source: own processing based on Chand and Oğul (2020)

The authors identify the literature which needs to be included in the systematic literature review through a bibliometric analysis conducted using the articles obtained from Scopus Database and Google Scholar using certain keywords. For searching the articles from Google Scholar, the authors used Key Words such as with all of the words “Human” AND “Factors” AND “Impacts” AND “Management” AND “Operational” AND “Performance” AND “European Union” AND “South Asia” With the Exact Phrase "Innovation Hubs" obtained the results of 2340 articles. In the Scopus Database the keywords used were “Innovation” AND “Hubs” AND “Impacts” (in the category Article Title, Abstract, Keywords) AND “Human” AND “Factors” (in the category all fields) and obtained 282 results. The articles search was done during 2013-2024. The criteria for inclusion and Exclusion of the articles in the review are as follows:

The criteria for including the articles is: the articles should be published in a peer-reviewed journal; the main focus of the articles should be innovation hubs; from the articles, the authors should get a clear picture of the impacts of human factors on the operational performance of innovation hubs; the articles should be focussed on the South Asian Countries or EU Nations; the articles should explain the management of the factors through Human Resource Management (HRM) practices. Next, the criteria for excluding the articles is: the articles that are not published in a peer-reviewed journal; no reference about human factors; no reference about the management of human factors.

Based on the criteria of inclusion and exclusion, the authors select a total of 50 articles from the list of articles obtained from Google scholar and Scopus for including in the SLR. The detailed illustration of the selection process is explained in the Prisma Chart shown in the Figure 2 below.

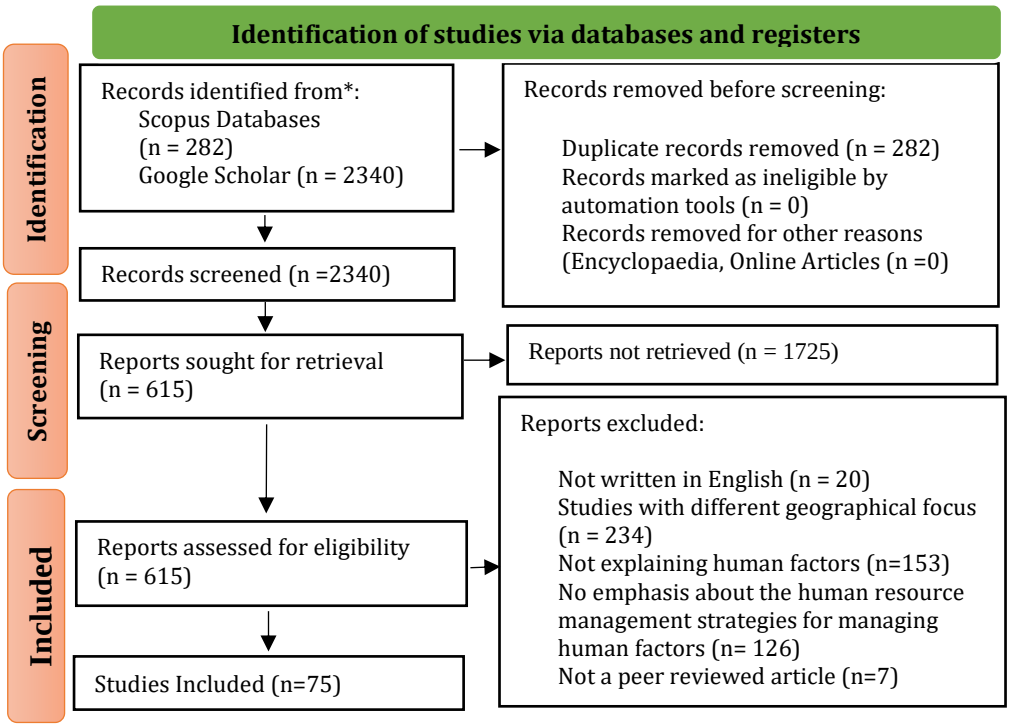

Figure 2. Prisma chart showing the process of selection of articles
Source: own processing

The following section of the research explains the thematic analysis of the research in which the authors assess the impacts of the human factors affecting the operational performance of Innovation hubs. Thematic analysis is an extensively employed yet frequently misconstrued approach to examining qualitative data (Kiger & Varpio, 2020). In the past decade, TA has grown in popularity as a method of interacting with qualitative data. It highlights the fundamental qualities of the approach, which include theoretical flexibility, a commitment to continuously and rigorously engaging with data, a recognition of the researcher's reflexivity, and the generation of complex, conceptual, meaning-based patterns (referred to as themes). The method's main strength lies in its adherence to core values, which simultaneously guarantee rigour and guidance that researchers with diverse expertise and experience find valuable, while also assuring theoretical flexibility (Terry & Hayfield, 2021).

Findings and discussions

The authors perform a thematic analysis for the purpose of analysing the impacts of Human Factors which were identified from the literature review and also the management of the factors using Human Resource Management Strategies. The theme 1 corresponds to the Impacts of human factors on the operational performance of Innovation hubs and theme 2 represents the Management of human factors using human resource management strategies. Table 2 describes the overall thematic analysis of the research.

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Table 2. Thematic analysis of this research

Themes	Sub Themes	Description	Coding	Attributes
Theme 1	Theme 1a	Impacts of organizational factors on the operational performance of innovation hubs	IHF1	Organizational culture
				Rewards and recognition
				Human resource management strategies
	Theme 1b	Impacts of individual attributes on the operational performance of innovation hubs	IHF2	Stress
				Training
				Skills and abilities
				Performance
	Theme 1c	Impacts of task related aspects on the operational performance of innovation hubs	IHF3	Ergonomics
				Equipment and technology
				Complexity of work
	Theme 1d	Impacts of workplace environment on the operational performance of innovation hubs	IHF4	Physical environment
				Support and encouragement from the top management
				Work life balance
				Workplace safety
Theme 2	Theme 2a	Management of human factors by high performance management	MHF1	High performance management
	Theme 2b	Management of human factors by high commitment management	MHF2	High commitment management
	Theme 2c	Management of human factors by high involvement management	MHF3	High involvement management

Source: own processing

The following sections describe the thematic analysis of the impacts that the human factors have on the operational performance of Innovation Hubs. The impacts of human factors affecting the operational performance of innovation hubs are assessed by the authors with the help of thematic analysis which is as follows.

Theme 1 - Impacts of human factors on the operational performance of innovation hubs

The following sections describe the Impacts of human factors on the operational performance of Innovation hubs based on Theme 1a, 1b and 1c.

Theme 1a - Impact of organizational factors on the operational performance of innovation hubs (IHF1)

The operational performance of innovation hubs in SAARC nations and the EU is significantly influenced by organizational factors, including culture, rewards and recognition systems, and human resource management strategies (Chowdhury et al., 2023). Innovation hubs in SAARC nations must prioritize the development of an inclusive and adaptable culture, the customization of rewards and recognition systems to meet local expectations, and the implementation of flexible and adaptive Human Resource Management (HRM) strategies (Vijayakumar & Davidova, 2023). Innovation hubs in the European Union (EU) can capitalize on a culture that prioritizes collaboration and diversity, as well as diversified rewards and recognition systems that prioritize employee well-being and non-monetary rewards. The operational performance of both regions can be improved by leveraging the experiences and practices of the other (Solovev, 2019). Table 3 outlines the comparison of organizational factors in SAARC Nations and the European Union.

Table 3. Comparison of organizational factors

Attributes	SAARC Nations	European Union
Organizational culture (OF1)	High power distance, collectivism, and emotional reciprocity Efficiency, low risk-taking quality	Perception, culture with a commercial bent enthusiasm, action, entrepreneurship, short-term perspective and a manager with leadership qualities Risk taking, flexibility, experimentation
Rewards and recognition (OF2)	Competitive pays, appraisals	Poor employee recognition compared to SAARC
Human resource management strategies (OF3)	High involvement management	High performance management

Source: own processing based on Azeem et al. (2021), Chowdhury et al. (2023), Solovev (2019)

Therefore, culture, rewards system, and human resource management strategies as organizational factors appear to have more impact on the operational performance of innovation hubs in both EU and SAARC nations. The performance and operations of innovation hubs depend on cultural differences between the two regions, where the EU is individualism-oriented and encourages risk-taking and flexibility while the SAARC nations are more structured and emphasize hierarchy and collectivism. In addition, the rewards and recognition of star performers subcategories are different. The SAARC countries prefer hierarchy and financial rewards and remunerations, while the EU focuses on intrinsic motivation and the welfare of employees. The highly performed management is preferred by the EU, whereas high involved management is preferred by the SAARC nations. Thus, it is imperative to understand and adapt such organizational factors to the specifics of the given regions to enhance the operational effectiveness of innovation hubs. The following paragraph discusses how Individual attributes of Innovation Hubs affect the operational performance of Innovation Hubs.

Theme 1b - Impact of individual attributes on the operational performance of innovation hubs (IHF2)

In comparison to the European Union, the SAARC nations have lesser levels of agitated employees. This can be attributed to the less fast-paced and high-pressure work environments in SAARC nations, as well as the strong social and cultural support systems. SAARC nations also prioritize training and invest in employee development programs to enhance performance and address skill disparities (Ahmed & Hussain, 2022). Nevertheless, they encounter obstacles due to a scarcity of qualified labourers. Conversely, the European Union experiences elevated levels of stress among its employees as a result of the high demands and strain present in their work environments. In the long term, the EU may experience skill shortages as a result of its reduced emphasis on training (Vasić et al., 2023). Nevertheless, the EU capitalizes on its superior workforce and prioritizes sustainable development and long-term strategic objectives, thereby cultivating an environment of innovation and expansion (Aiginger, 2021).

Performance management training aims to equip employees with the skills and mindsets needed to succeed. It aims to increase output and promote trainees through traditional methods such as one-on-one meetings and annual reviews (Malik et al., 2021). Newer firms are increasingly focusing on education and development, replacing traditional performance management training methods (Lehn, 2020). Table 4 presents a comparison of the individual attributes in SAARC Nations and the European Union.

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Table 4. Comparison of individual attributes

Attributes	SAARC Nations	European Union
Stress (IA1)	Comparatively low number of stressed employees	High percentage of stressed employees
Training (IA2)	Training is considered as important in SAARC organizations	Training is considered as a waste of time.
Skills and abilities (IA3)	Lack of skilled labourers	Comparatively a greater number of skilled labourers
Performance (IA4)	Mainly aims on cost, profit	Main emphasis on innovation, growth

Source: own processing based on Ahmed and Hussain (2022), Aiginger, (2021), Hervas-Oliver et al. (2020), Vasić et al. (2023)

Therefore, when comparing the EU and SAARC countries, there are significant differences in employee characteristics. The countries of SAARC are facing issues related to shortage of skills and short-term oriented reward systems although they give importance to training and lack stress. In this aspect, the EU has a highly trained human resource that is more inclined towards innovativeness and development. However, it is faced with higher levels of stress for the employees and a diversified training model. Both regions can establish efficient strategies for operation if they understand these differences at innovation hubs.

Theme 1c - Impact of task-related aspects on the operational performance of innovation hubs (IHF3)

Budget constraints and a lack of awareness among SAARC nations have resulted in a lack of concern for ergonomics in the workplace, which can result in inefficiencies and health issues for employees (Sawunda Hannadige, & Weerasinghe, 2021). Conversely, the European Union prioritizes ergonomics, investing in ergonomic furniture and design to improve the productivity and well-being of employees (Hervas-Oliver et al., 2020). The SAARC nations are also constrained by equipment and technology, which impedes their capacity to compete on a global scale. Conversely, the EU has access to more sophisticated tools and technology, which provides them with a competitive advantage and fosters innovation (Chou et al., 2024).

Ergonomic programs minimize accidents, waste, and absenteeism in businesses. Ergonomics programs boost morale, productivity, and product quality. An ergonomic audit may reveal a company's commitment to workers' health and productivity (Mtunga et al., 2018). Table 5 outlines a comparison of task-related aspects in SAARC Nations and the European Union.

Table 5. Comparison of task related aspects

Attributes	SAARC Nations	European Union
Ergonomics (TA1)	Less concerned about ergonomics	More concerned about ergonomics
Equipment and technology (TA2)	Less advanced equipment and technology	More advanced equipment and technology
Complexity of the work (TA3)	Less complex, more efficient	More complex, more productive

Source: own processing based on Chou et al. (2024), Hervas-Oliver et al. (2020), Sawunda Hannadige and Weerasinghe (2021)

To sum up, the European Union and SAARC country's strategies for managing innovation hubs' operational efficiency is different. The SAARC nations often neglect ergonomics, and constantly employ less developed equipment and technology to implement their solutions enabling cost control and operational optimization. On the other hand, the European Union focuses on ergonomics, investment in new technologies and equipment along with complex working processes for promoting innovations and sustainable development strategies. To increase the level of operational performance of establishments in the

innovation, it is necessary to combine the task-oriented approaches with the regional conditions and goals. The next section analyses how elements related to the tasks affect the operational performance of innovation hubs. The influence of the workplace environment is continued in the subsequent section as related to innovative hubs.

Theme 1d - Impact of workplace environment on operational performance of innovation hubs (IHF4)

In SAARC nations, innovation hubs frequently prioritize the physical environment, with a lesser emphasis on productivity, aesthetics, and comfortability. This has the potential to impede operational performance by affecting employee morale and efficacy (Peng & Jia, 2023). Conversely, the European Union prioritizes employee productivity, aesthetics, and comfort by investing in well-designed workspaces that prioritize the physical environment. This can improve operational performance by fostering creativity and increasing employee satisfaction (Hamed et al., 2023).

The management style in SAARC nations is more authoritative and top-down, with centralized decision-making and limited employee input. This can impede employee engagement and creativity, which are essential for innovation (Gayen et al., 2024). The EU, on the other hand, promotes collaboration and participation in decision-making through a more visionary and involved management approach (Brasoveanu, 2024). Long commutes, ineffective coworkers, and demanding supervisors exacerbate this issue. Regrettably, pervasive internet access has worsened (Boxall & Winterton, 2018).

Risky jobs cause a loss of productivity, injuries, and low morale. Nonetheless, many organizations are concerned about the expense of adding safety measures. This is true; however, spending little on preventive treatment is better than spending a lot on emergency care. Safety management software may improve incident reporting and provide real-time visibility, ensuring improved safety standards and a faster resolution of safety problems. Some firms struggle to make major changes to boost their productivity and efficiency (Carnevale & Hatak, 2020). Table 6 outlines a comparison of workplace environments in SAARC and the European Union.

In summary, the physical environment, management support, work-life balance, and safety of the workplaces in the European Union and SAARC nations are significantly different. SAARC nations prioritize efficiency and centralized decision-making, whereas the EU prioritizes employee well-being, collaboration, and safety-related standards. These discrepancies can affect operational performance and have implications for the management of innovation hubs. The following section describes the management of the human factors explained in the previous sections using human resource management strategies to enhance the operational performance of innovation hubs.

Table 6. Comparison of workplace environment factors

Attributes	SAARC	European Union
Physical environment (WE1)	Less emphasis on physical environment	More emphasis on physical environment
Support and encouragement from top management (WE2)	Authoritative, top down	Visionary, involved
Work-life balance (WE3)	Positive	Positive
Workplace safety (WE4)	Moderate emphasis on safety	High emphasis on safety

Source: own processing based on Brasoveanu (2024), Gayen et al. (2024), Hamed et al. (2023), Peng and Jia (2023)

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Theme 2 - Management of human factors by human resource management strategies (MHF)

SAARC Countries have different HR management needs. Without human capital, knowledge, and technology, firms cannot compete globally. Human resource management in SAARC's transitional economies should focus on developing and maintaining highly skilled workers as global firms that manufacture high-quality commodities. Therefore, Asian companies may profit more from a contingency approach to HR management than from a universalist approach (Cooke, 2018; Riaz et al., 2021). Figure 3 outlines the different HR strategies and their features.

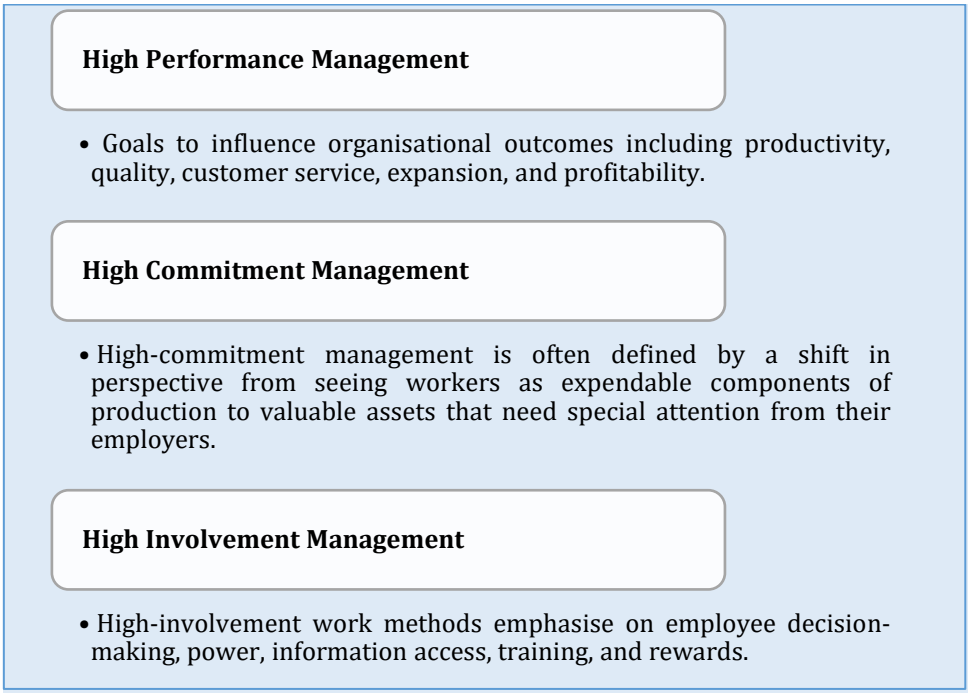

Figure 3. Different HR strategies
Source: own processing according to Harney, Fu and Freeney (2018)

Possible drivers of a stakeholder approach in the EU include the region's robust social security system and the growing influence of social partners on work interactions (trade unions and employee representatives). EU countries and governments control the market and the management of workers to ensure the continent's enduring commitment to social welfare. Governments in the EU, with a focus on the labour market, often enact employment protection (Garmendia et al., 2021). Regarding Human Resource Management (HRM) choices such as hiring, firing, and staff development, EU companies have less leeway than their SAARC counterparts. As a result, nations such as Germany, France, and Spain are striving toward a more adaptable employment contract by easing restrictions on terminating employees and making it easier for businesses to hire contract workers (Noon et al., 2017).

Flexible work arrangements (such as yearly hours contracts, fixed-term contracts, and work from home) may be part of the European Union Human Resource Management's (HRM) organizational career management policies, as well as career planning and succession planning. European Union HRM may include ideas such as cultural adaptability, productivity, and sharing of information and new ideas. For this reason, cultural adaptation is essential for comprehending European Union management practices, since the European Union is not becoming more homogeneous (Harteis & Goller, 2014). Descriptions of each of the strategies are presented in the following sections.

Theme 2a - Management of human factors using high-performance management HR strategy (MHF1)

In SAARC Nations the Indian businesses have begun to use high-performance work systems to improve both qualitative and quantitative performance (Datta et al., 2023). Multinational corporations (MNCs) headquartered in other countries, particularly those based in India, have been the forerunners in new forms of organizational innovation. Firms in India are not immune to the spread of these technologies (Averina et al., 2019).

Because of their unique perspectives, workers may interpret the same event or piece of data differently. Many factors, including one's history, outlook, set of beliefs, hopes, ambitions, credentials, and environment, play a role in the vetting process. Therefore, this is not the case for everyone. This causes people to react differently to the same external information based on their unique filters (Becker, 2018).

Top companies in both the commercial and governmental sectors worldwide increasingly use performance management systems as a matter of course. Saville and Holdsworth conducted a survey among Britain's largest companies, finding that a large majority of respondents found such systems to be "very good' or" good' for purposes such as evaluating past performance, establishing personal goals, enhancing current output, establishing financial incentives, gauging future potential, and inspiring employees to grow professionally (Akter, 2021) The next section describes the high-commitment HR strategy.

Theme 2b - Management of human factors using high commitment management HR strategy (MHF2)

High-commitment Human Resources Management (HRM) techniques have been acknowledged for their ability to boost corporate performance in both the EU and SAARC areas. These tactics concentrate on increasing employee engagement, skill development, and job enrichment (McCune Stein & Ai Min, 2019). In the EU, high-commitment HRM practices are connected to higher organizational performance via increased employee flexibility and engagement (Revuelto-Taboada et al., 2021). In the SAARC context, high-commitment management approaches are investigated for their efficacy in combining employee well-being with organizational control, considering local culture variables. However, the success of these tactics may differ dependent on local cultural and economic situations, necessitating a nuanced implementation. (Kogan et al., 2017) The high-involvement management strategy is explained in the following section.

Theme 2c - Management of human factors using high involvement management HR strategy (MHF 3)

High Involvement Human Resource Management (HIHRM) initiatives are vital in improving employee engagement and creativity in areas like the EU and SAARC. These tactics establish a supportive atmosphere that supports autonomy and dedication, boosting organizational effectiveness (Rubel et al., 2018). In the EU, HIHRM is associated to enhanced involvement and creative work behaviour, driven by self-determination theory. In SAARC, HIHRM strongly impacts technological adaption and innovation performance in Bangladesh's ready-made clothing sector (Wood, 2023). Despite external constraints such as political instability, HIHRM tactics may be successful in both locations (Al Adresi & Darun, 2017).

It is crucial to recognise the possible limitations of the study. The limitations of this study encompass restricted applicability, possible prejudice in the selection of literature, a transient time frame, a singular qualitative methodology, reliance on secondary data, variations in human factors across different regions, restricted range of HRM strategies, difficulties in quantifying operational performance, cultural and economic disparities, and ethical concerns. By acknowledging these constraints, the study may provide a more

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thorough comprehension of its results and propose potential avenues for future investigation to overcome these constraints.

Conclusions

This research aims to evaluate the impact of human factors in relation to the operational efficiency of innovation hubs in the SAARC Nations and the European Union. It is quite informative regarding cultural, organizational, and personal differences that impact innovation outcomes.

The study has revealed the myriads of challenges and opportunities that innovation hubs face in the right management of human resources. It is done by studying certain human factors in these places, organizational culture, personal characteristics, job parameters and environment respectively. It is important to note that the SAARC Nations focus on formal structures, productivity, and costs while these factors offer some advantages and limitations. While such features improve productivity and control, they can also act as inhibitors to inspire innovation and engage employees. The significantly downplayed fact concerning ergonomics, advanced technologies, and working environment highlights specific areas requiring improvement in innovation hubs in SAARC Nations to foster a more conducive environment for innovation. However, innovation hubs in the European Union regions are characterized by risk-taking, flexibility and strong organizational management support. The emphasis on up-to-date technology and design, as well as the professional approach to the organization of safety at work also demonstrates the concern for creating an environment that supports creativity. However, as with other methods, the adoption of such a process implies the presence of large amounts of financial resources and a focus on the future, which is often unfeasible in certain environments.

The report also stresses the cardinal importance of using Human Resource Management (HRM) tools to manage these human factors. Effective employee commitment is acknowledged as high-performance management, high-commitment management, and high-involvement management, which may help to coordinate employee activities with organisational goals and objectives, thereby enhancing the operational productivity of the innovation centres. Finally, based on the analysis of the results obtained in this research, it is necessary to emphasise the necessity of individualisation of the management of human aspects within the innovation hubs, given the peculiarities of the cultural and economic environment of each region.

If more flexible and participative HRM practices are infused in innovation hubs across SAARC Nations, the improvement in innovation intensity and employee satisfaction may be significant. In the same breath, the European Union's focus on polished technology and optimal work environment lays a strong foundation for sustained advancement. It also points out the need to balance between meeting the tactical operational goals and achieving strategic innovation goals.

This study contributes to a greater understanding of human aspects in innovation enabling policy makers, managers and practitioners involved in the generation and coordination of innovation centres. Since innovation hubs are also meant to foster economic development, creativity, and maintain a competitive edge in the global innovative ecosystem, they might also improve their operational performance by finding and mitigating the human factors that influence it.

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