

IDENTIFICATION AND EVALUATION OF HUMAN FACTORS AFFECTING THE OPERATIONAL PERFORMANCE OF INNOVATION HUBS

Anandhu VIJAYAKUMAR ¹, Jelena DAVIDOVA ²

¹Turība University, Riga, Latvia

²Daugavpils University, Riga, Latvia

Corresponding author: anandhu, vijayakumar, anandhuvk2019@gmail.com

Abstract: The research has been carried out to identify and evaluate the human factors affecting the operational performance of innovation hubs. The authors conduct a systematic review of relevant literatures and identify certain factors that found to affect the operating performance of Innovation hubs. Through a quantitative research methodology, such as a structured questionnaire, the authors gathered responses from HR experts in the form of an online survey. The survey responses were analyzed with the help of factor analysis, which helped the authors gather 2 components out of 14 survey variables. With the help of factor analysis, the authors developed a model for enhancing the operational performance of innovation hubs. The model can act as a template for further research in the field. Companies can utilize this model for enhancing the operational performances of their innovation hubs.

Keywords: Employee factors, Human factors, Innovation Hubs, HR Management Strategies, Operational Performance, Organizational performance.

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Introduction

As a key driver of long-term success in today's cutthroat business climate, innovation hubs have risen to prominence as a critical topic of discussion. Academics are trying to identify the factors that shape its dynamics. The human factors are often cited as the driving force for innovation hubs. Some countries are much ahead of the pack when it comes to their capacity to innovate. (Atkinson et al., 2015). Thus, fostering human aspects at all echelons and in all sectors of society might be essential for laying the groundwork for creativity (Averina et al., 2018).

The company's accumulated knowledge is most firmly embedded in its human resources but also obvious in its processes, procedures, and other features. Innovation and technical abilities come through intentional, deliberate, time-consuming, expensive, non-linear, path-dependent, and cumulative learning (Atkinson et al., 2015). Human resources, habitual activities, and interpersonal interactions are necessary for fresh ideas. The human component affects innovation beyond the supply side. This encompasses concept reception, acceptability, and spread.

These innovation centre' performance may depend on human variables, which were identified and mitigated. Determining what drives and directs the hub's architecture, optimising the information acquired there, capturing new ideas developed there, coordinating and managing the hub's network, encouraging innovative behaviour, and incorporating human aspects are some of the challenges.

Human factors theory considers human limits and strengths to optimise equipment and processes. Human resource policies and practises support a company's goals, finances, and long-term vision. Human resource management is essential to any business, but smaller companies typically handle it poorly. People's personality affects innovation centres' efficacy. Innovation centres may perform better if these human variables are recognised and handled.

Human factors drive innovation creation, development, and dissemination throughout organisations, nations, and continents. This study examines how human variables affect the innovation hub's operations. Innovation Hubs indirectly boost organisational performance by providing a suitable

environment for quality improvement. So, this study examines human factors that may inhibit innovation centres. Accordingly, this research may aid enterprises and boost the industrial sector by enhancing the deployment of Innovation Hubs. The significance of human factors to organisational success is, therefore, the focus of the study topics. Therefore, the research questions are: What all are the Human Factors that affect the operational performance of the innovation hubs? How to enhance the operational performance of the innovation hubs by efficiently managing these human factors with the help of a model?

1. Literature Review

Human capital may directly and indirectly boost economic growth. Technology may also benefit from human capital investment and education. Technical advancement may benefit from a diversified workforce's human resources and talents. (Jimenez et al., 2017). The human factors affecting the operational performance of innovation hubs can be classified as follows:

- Organizational factors
- Individual Attributes
- Workplace Environment
- Task Related Aspects

1.1. Organizational factors

A happy workplace enhances production, involvement, and morale. A hostile work atmosphere reduces productivity, increases employee turnover, and disengages workers from their jobs and the organisation (Mulas et al., 2017). Culture and employee involvement are intertwined (Kelly et al., (2016). This would provide the foundation for employees' professional growth within the organisation (Sambuli et al., 2017). The difference between inventing and innovativeness is highlighted in the context of organisational innovation (Loorbach et al., 2020). Organizational innovation is placed within the context of innovation concepts (Mwantimwa, 2019); the difference between innovating and innovativeness is clarified; and the key typologies, primary sets of antecedents, and performance consequences of generating and adopting innovations are uncovered (Jimenez et al., 2018).

Top-level compensation schemes should reflect strategic objectives. Extrinsic job motives include money and material benefits (Mwantimwa, 2017). Good labour has its advantages, (Radulescu, (2019) such as job satisfaction and knowing one's efforts benefitted others (Pancholi, 2018). Companies seek hard employees who can adjust to shifting priorities (Riedler et al., 2020). Employee devotion and production determine an organization's success (Rowe et al., 2019); thus, HR management support and rapport are important (Mtunga et al., 2018).

1.2. Individual Attributes

In the workplace, stress is nothing new (Rundel et al., 2020). Human resources professionals are aware that many workers suffer from stress due to their jobs at some time (Yeung, 2020). Stress has serious biological impacts and may cause both mental and physical health problems if not managed (Kanthar et al., 2017), the goal of performance management training is to help workers develop the knowledge, abilities, and attitudes necessary to be successful in their jobs (Lagakos et al, 2018).

Traditional methods of performance management training like one-on-one meetings and yearly evaluations are giving way to more tech-driven alternatives (Lee et al., 2020). Every person craves acknowledgement and praise for their efforts. Managers utilise a number of factors to determine a worker's value to the organisation (Glauber, 2022). The team itself determines the criteria for success, which may include such factors as output, flexibility, teamwork, and quality (Philipson et al., 2019). Employees are praised and compensated depending on their performance ratings (Lee et al., 2020). Employees get a chance to air their grievances about their jobs at performance reviews. It is crucial

for firms to recruit competent workers, yet employees' carelessness may undermine their efforts. (Rundel et al., 2020).

1.3. Task Related Aspects

Ergonomics is a method that takes a systemic view of the relationship between workers and their tasks, as well as the methods by which those tasks are carried out (Greenberg et al., 2018). Ergonomic programmes are often implemented by businesses to lessen the financial burden of injuries, cut down on waste, and curb absenteeism (Mura et al., 2018). Employees may be unable to meet rising expectations owing to a lack of personal resources as the complexity of work grows exploitative (Visagie et al., 2021). Due to the burdensome process, employees' valuable human resources are drained as they try to do difficult tasks. Good equipment and technology help employees work better. (Rundel et al., 2020).

Opportunities for growth and wealth accumulation motivate individuals to pool their resources in order to accomplish formidable goals (Zavratnik et al., 2019). When one resource motivates another to acquire, a growth spiral might be triggered. When given the chance to take on more difficult jobs, employees are more likely to develop their skills and amass more resources (Tiwasing et al., 2022). This idea proposes that "job crafting" and other forms of worker self-management are encouraged and even justified by increasing job complexity. Employees become more engaged and creative when given more challenging jobs. Employees will be encouraged to learn new skills to complete tasks. (Musik et al., 2019)

1.4. Workplace Environment

The "work environment" includes the workplace, its employees, and their resources. (Ataise et al., 2020). Any of these factors may adversely affect employees' well-being, relationships with coworkers, collaboration, production, and health. (Chirchietti, 2017). The following table 1 outlines the factors identified from the literature review.

Organizations may maintain a competitive edge by valuing the physical workplace. This scholarly study shows that workplace layout modifications might affect productivity and morale (Cherunya et al., 2020). Office design may affect productivity, cooperation, creativity, HR management, and bottom-line performance, according to research. Improved workplace involvement, output, pleasure, and satisfaction (Mtunga et al., (2018).

Support from supervisors and coworkers affects workplace morale. This covers how well they handle managerial issues, how much they like their work, and how much professional growth they are provided. (Petersen, 2020) Workplace quality determines organisational success. Loyalty increases when employees like their jobs and bosses (Radulescu, 2019).

Individuals who pursue excellence and perfection are sometimes accused of ignoring their personal life (Riedler et al., 2020). Overworked persons often work longer hours and are disappointed with the results. Health, personality, resilience, professional position, age, stage of life, and gender all affect work-life balance Rowe et al., (2019). Two organisational characteristics that may affect workers' work-life balance are the length of hours worked and the job's complexity or stress. (Radulescu, 2019).

Table 1 Factors Identified from Literature Review (Created by authors)

Main Factors	Sub Factors	Citations
Organizational Factors	Culture	Kelly et al., (2016), Loorbach et al., (2020), Mtunga et al., (2018),

	Rewards and Recognition System	Mulas et al., (2017), Mwantimwa, (2019), Mwantimwa, (2017)
	Human Resource Management Strategies	Pancholi, (2018), Radulescu, (2019), Riedler et al., (2020), Rowe et al., (2019), Sambuli et al., (2017).
Individual Attributes	Stress	Rundel et al., (2020), Yeung, (2020).
	Training	Kanthar et al., (2017), Lagakos et al, 2018)
	Skills and Abilities	Lee et al., (2020), Glauber, (2022)
	Performance	Philipson et al., (2019), Lee et al., (2020),
Task Related Aspects	Ergonomics	Greenberg et al., (2018), Mura et al., (2018),
	Equipment and Technology	Visagie et al., (2021), Rundel et al., (2020),
	Complexity of the Work	Zavratnik et al., (2019), Tiwasing et al., (2022), Musik et al., (2019)
Workplace Environment	Physical Environment	Ataise et al., (2020), Cherunya et al., (2020), Chirchietti, (2017).
	Support and Encouragement from Top Management	Mtunga et al., (2018), Petersen, (2020),
	Work Life Balance	Radulescu, (2019), Riedler et al., (2020), Rowe et al., (2019).
	Workplace Safety	Sambuli et al., (2017), Glauber, (2019).

Improved safety is good for both quality and productivity. Actions that put employees in danger may point to incompetent management (Sambuli et al., 2017). Turnover will rise as managers and workers coast. Staff dissatisfaction and anxiety lower quality and production. Employees can focus on their job when they feel comfortable at work. When a corporation prioritises security, disruptions will decrease (Glauber, 2019)

Management also shapes workplace culture. Long commutes, unproductive coworkers, demanding supervisors, and unsociable hours add to this issue. (Mtunga et al., 2018), Remote workers are expected to be accessible at all times, even outside of regular office hours and during personal time (Petersen, 2020).

2. Methodology

One way a researcher could approach a study subject is by the methodical collection of data, analysis of the data, and the development of findings. A study's methodology describes the way it went about gathering data. In the realm of academia, "methods" and "methodology" are often used interchangeably.

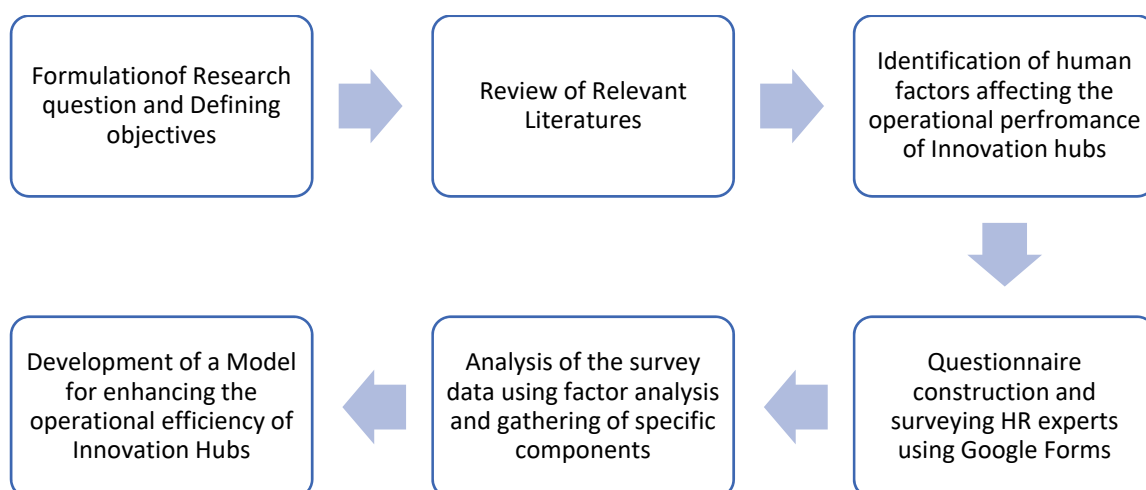


Figure 1 Overall Methodology of the Research (Created by authors)

2.1. Primary Data Collection Methods

This report's core data came from a comprehensive online survey of HR experts. Since it directly collects data from the population of interest, the questionnaire is a main research tool. Interviews are

less structured than the questionnaire, which may make it more successful. Based on the literature research, a Google Forms questionnaire was built. Figure 1 provides a concise summary of the survey questions.

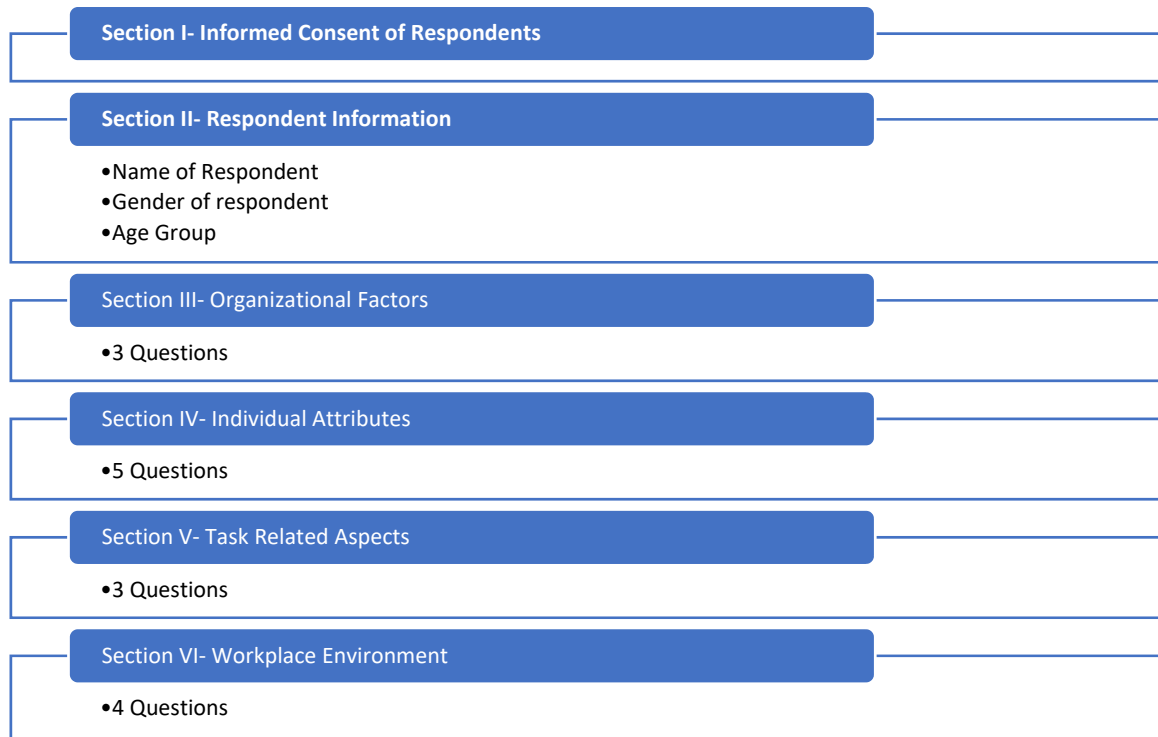


Figure 1. Concise Summary of Survey (Created by authors).

The questionnaire is divided into 6 parts, with a total of 18 questions. The language used for this survey is English. The poll was conducted online using Google Forms. The following are the primary factors that were taken into account while deciding to include this survey:

- Organizational Factors
- Individual Attributes
- Task Related Aspects
- Workplace Environment

2.2. Sample Characteristics

Calculating the response rate involves dividing the total number of survey questions by the number of questions that were answered in full (Fincham, 2008).

Table 2. Sampling details (created by authors)

Research Type	Exploratory research
Data Gathering Approach	Quantitative approach and Descriptive research
Type of Sampling	Non-Probabilistic Convenience Sampling
Sampling unit	Experts in HR management
Sampling size	219
Data Analysis- Methods	Factor Analysis
Confidence level	95%
Margin of error	5%

The authors of this thesis sent 230 invites, of which 219 were accepted. The results of an empirical analysis of this project are summarised in Table 2. A substantial (or acceptable) research return rate is essential for ensuring that the results are representative of the target population and that the

questionnaire is functioning well. The sample is selected using convenience sampling, which is not a statistically valid approach. The response rate can be calculated by using the following equation (1).

$$\text{Response Rate (RR)} = \frac{\text{Total attributed Conversions}}{\text{Total Unique Users}} \times 100 \quad (1)$$

$$RR = \frac{219}{230} \times 100 \quad (2)$$

Therefore, the response rate of this survey is 95%.

In the survey there were 123 male participants 94 Female participants and 2 participants of other gender. The majority of the participants were from the age group of 25-34 (91). There were 61 participants from 18-24 age group, 42 from 35-44, 13 from 45-54 and 6 from 55+.

2.3. Descriptive Statistics

It is possible to better explain, display, or summarise data using descriptive analysis, which makes use of the patterns revealed within the data. The gathering of data is the starting point for every statistical analysis. The researcher may learn about the characteristics of a group via the examination of both quantitative and qualitative data. Surveys allow researchers to investigate more individuals than descriptive methods. Only if the surveys are accurate can a full and comprehensive examination of the unit be performed (Yellapu, 2018).

To address the factors identified from the literature review, a survey was constructed using Google Forms. This survey is divided into two parts. Obtaining informed consent from participants is a key aspect of every research project. It was completely up to the individual whether or not they wanted to participate in the survey. The next sections included questions based on the factors uncovered by the review of relevant literature.

2.4. Factor Analysis

The basic idea of Factor Analysis is to reduce the number of variables needed to express the whole set. Variables and factors are terms used to describe conditions that may alter an outcome. The researchers are employing factor analysis because, Factor analysis (FA) is a statistical method for reducing a large number of variables or items down to a smaller number by focusing on the underlying dimensions that help to explain the connections between the original set of variables or items. (Yong, 2013).

2.4.1. Development of a Model Using Factor Analysis

The factor analysis might be used to provide a framework for enhancing the operating efficiency of Innovation hubs.

According to Yong (2013), the factor analysis model may be written in algebraic form as follows: Given a sample of n subjects and p measured variables ($X_1, X_2, \dots, X_p$), variable I may be written as the linear combination of m factors ($F_1, F_2, \dots, F_m$), where $m < p$.

Thus,

$$X_I = a_{i1}F_1 + a_{i2}F_2 + \dots + a_{im}F_m + e_i \quad (1)$$

where:

a_i s the factor loadings (or scores).

The values of α_s will vary as per the values of factor analysis.

The percentage of variance discovered by factor analysis is transformed into a ratio, which is then used to the model-proposal equation for refinement.

3. Results and Discussions

Results from a review of the relevant literature point to four primary criteria and fourteen secondary ones. These questions were included in a survey for HR professionals. The survey is broken down into sections, and questions relevant to each one has been labelled and numbered. Thanks to this survey, the authors now has enough information to do a factor analysis. The following table 7 outlines the factors identified from the theoretical framework.

The table 8 below presents summary of descriptive data from the survey.

Table 3. Descriptive Statistics of the Survey Data (Created by authors)

	Mean	Std. Deviation	Analysis N
Culture	4.164	1.2745	219
Rewards and Recognition System	3.918	1.1424	219
Human Resource Management Strategies	4.032	1.3077	219
Stress	2.365	1.2829	219
Training	3.804	1.2753	219
Skills and Abilities	4.073	1.3560	219
Performance	3.9041	1.25433	219
Ergonomics	3.584	1.4258	219
Equipment and Technology	4.110	1.2875	219
Complexity of the Work	3.758	1.1337	219
Physical Environment	3.744	1.3267	219
Support and Encouragement from Top Management	4.018	1.4141	219
Work Life Balance	4.256	1.1164	219
Work Place Safety	4.315	1.0563	219

The descriptive results of the survey data are shown in the table above. As the standard deviations for all the variables were more than 0.5, a wide range of respondents was likely sampled. Multiple viable explanations were shown (less than the mean value). Authors conducted extensive literature analysis, narrowed focus to 14 critical variables, and surveyed HR professionals to get their input. After that is complete, factor analysis may be performed on the data. The purpose of factor analysis (FA), a kind of multivariate statistical analysis, is to identify the driving forces underlying correlations among a large number of variables.

Table 4 Results of KMO Test (SPSS Software).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.905
Bartlett's Test of Sphericity	Approx. Chi-Square	1838.187
	df	91
	Sig.	.000

The KMO MSA value for this study was 0.905, (Table 4), which is much higher than the threshold of 0.5, indicating that the variables were credible. Variables from the research questions having a significance-value of 0.000 may undergo further processing in order to be ready for component analysis. The results of the PCA are shown in the table that follows. Using the criterion of selecting components with Eigenvalues greater than one, the authors ultimately settled on maintaining just two independent variables. The results of a principal components analysis of the total variance are shown in Table 5.

Table 5. Principal Component Analysis Results (SPSS Software)

Component	Initial Eigenvalues	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings
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	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.791	41.363	41.363	5.791	41.363	41.363	5.730	40.927	40.927
2	3.142	22.444	63.807	3.142	22.444	63.807	3.203	22.879	63.807
3	.819	5.849	69.655						
4	.708	5.060	74.715						
5	.534	3.812	78.528						
6	.507	3.623	82.151						
7	.471	3.363	85.514						
8	.425	3.033	88.547						
9	.368	2.629	91.176						
10	.336	2.402	93.578						
11	.260	1.857	95.436						
12	.234	1.669	97.105						
13	.221	1.577	98.682						
14	.185	1.318	100.000						
Extraction Method: Principal Component Analysis.									

An SPSS principal component analysis is shown in the table above. A matrix known as the Component Matrix stores information on the component's linkages between its constituent factors. The amount of variation that may be attributed to the eigenvalue squares is provided in the Total Variance Explanation. Using the rotated component matrix, one can examine the Pearson correlations between the components and the items. Possible features of a component are identified by its factor loadings. In Table 6, the rotated component matrix can be seen. Matrices revolve around the origin due to the fact that zero vector remains unchanged after multiplication (origins coordinates).

Table 6. Rotated Component Matrix (SPSS Software)

	Component	
	1	2
Culture	.885	
Rewards and Recognition System	.837	
Human Resource Management Strategies	.854	
Stress	-.720	
Training		.798
Skills and Abilities	.887	
Performance	.816	
Ergonomics		.785
Equipment and Technology	.798	
Complexity of the Work		.676
Physical Environment		.624
Support and Encouragement from Top Management	.854	
Work Life Balance		.708
Work Place Safety		.690
Extraction Method: Principal Component Analysis.		
Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Every element in the table is given a positive or a negative value in the rotated component matrix if the value is greater than 0.4. The authors may use the rotated component matrix to examine the relationships between many components. The following components were derived by the authors from the factor analysis:

Component 1- Managerial Aspects

A correlation coefficient of 0.6 or greater was required for inclusion in the analysis of any variable. After rotation, the components matrix takes on only positive values for all variables except for one. Because of this, the authors is going to focus on these eight factors for the further study: Culture (0.885), Rewards and Recognition System (0.837), Human Resource Management Strategies (0.854), Stress (-0.720), Skills and Abilities (0.887), Performance (0.816), Equipment and Technology (0.798), Support and Encouragement from Top Management (0.854). The following figure 2 outlines the factor loadings of Component 1.

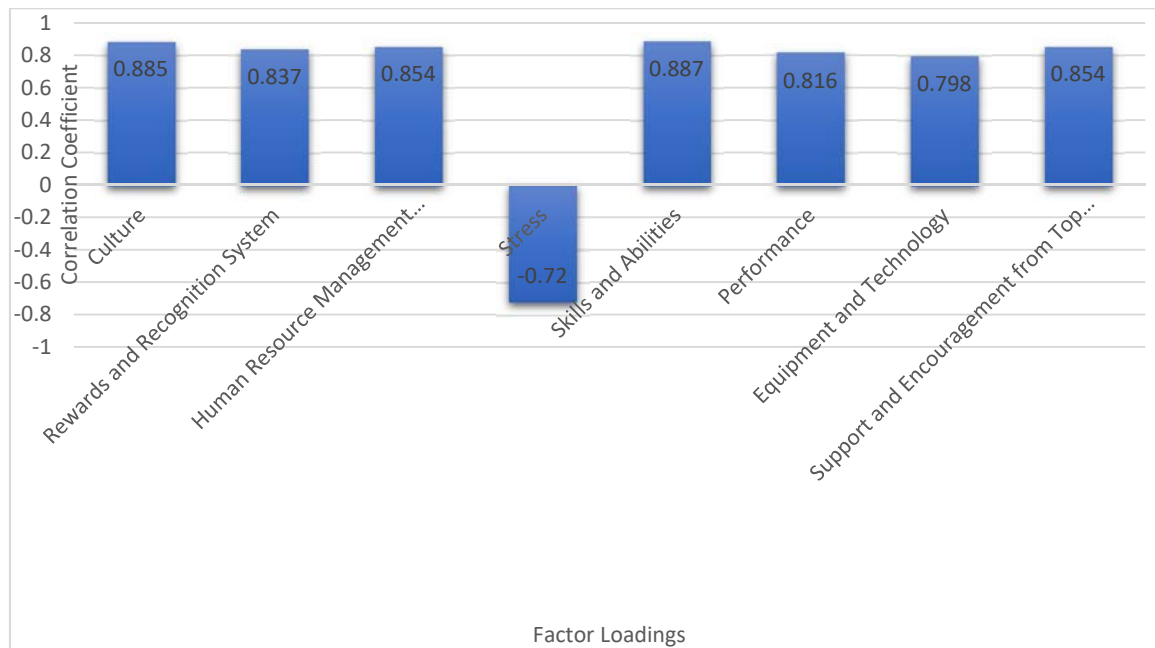


Figure 2. Factor Loadings of Component 1 (Created by authors)

- "Culture" relates to a company's guiding principles and innovative management. It considers cooperation, debate, and risk. Culture often influences a company's operations and values. It's also the focus when discussing how successfully a company manages innovation. A happy workplace enhances production, involvement, and morale. A hostile work atmosphere reduces productivity, increases employee turnover, and disengages employees from their job and the firm.
- Extrinsic and intrinsic motives may be part of workers' pay. Extrinsic employment motivations include money and material perks. Job satisfaction and knowing one's efforts helped others are benefits of good work. Many charity workers are underpaid. Helping a good cause costs money.
- Strategic planning that promotes the HR manager's corporate vision is key. Their support and interaction with employees are vital, as employee devotion and production determine an organization's success. The HR department's role is to encourage goal-setting, motivation, communication, and empowerment via personal responsibility.
- Occupational stress is frequent. Many workers endure job-related stress, according to HR professionals. Expectations and lifestyle changes have raised worker stress. Unmanaged stress may harm mental and physical health. Employee morale, productivity, and organisational objectives suffer from stress. Errors, poor performance, mental health difficulties, burnout, and workplace unrest result from job stress.
- Ability combines sensory and cognitive capacities, reaction knowledge, and physical implementation. Possessing the requisite information, abilities, and skills. Effectiveness in work determines productivity. A group's success depends on its members' talents. Workload is the sum of a worker's duties in a certain time period.
- Managers assess employees using many characteristics. The team determines productivity, flexibility, collaboration, and work quality. Performance evaluations determine employee rewards. Performance assessments let workers communicate concerns. Successful companies hire productive workers. Poor work might hurt the firm.
- Excellent equipment and technology may aid employees. New tool users may work faster. Modern technology like instant messaging may improve company communication and problem-solving. They solve issues promptly. Enquiries, comments, and complaints handled quickly may improve worker-supplier or customer relationships.

- Superiors and peers' support affect the working culture. Whether they can report difficulties to their superiors and have them addressed, whether they feel valued, and whether they receive adequate training and growth to execute their tasks successfully are all factors. Workplace quality affects corporate success. Happy employees who get along with management are more involved in the company's success.

Component 2- Employee Level Factors

Every potential variable has to have a correlation coefficient of 0.6 or higher to be included for the study. After rotation, the components matrix now has only positive values for all but one of its variables. As a result, the authors have narrowed the emphasis to these six aspects for the remainder of the research: Training (0.798), Ergonomics (0.785), Complexity of the Work (0.676), Physical Environment (0.624), Work Life Balance (0.708), Workplace safety (0.690). (Figure 3).

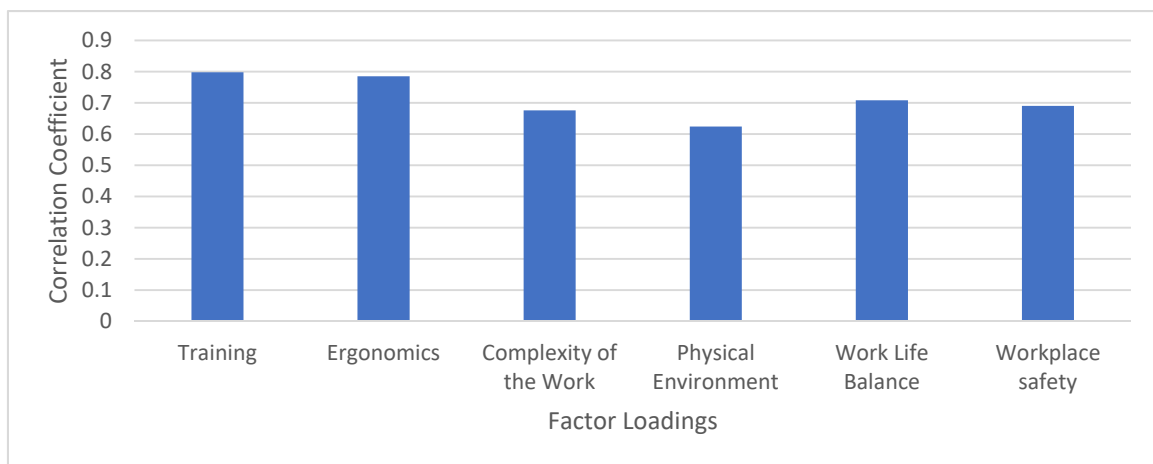


Figure 3. Factor Loadings of Component 2 (Created by authors)

- Performance management training improves workers' knowledge, skills, and attitudes in collaboration with the organisation and their manager. Performance management training improves productivity and careers. Tech-driven performance management training is replacing one-on-one and yearly evaluations.
- New technologies, business restructuring, and creative workplace activities have resulted from intense global competition. Ergonomics programmes at some firms avoid human error-related workplace injuries. Ergonomics analyses workers' tasks. Ergonomic programmes cut injury, waste, and absenteeism.
- The complexity of stream activity depends on the difficulty and challenge of the essential talents. Given the emotional, psychological, or physical nature of work and its consequences on performance, core motivation is crucial to any organisation and its employees.
- Valuing the workplace may help companies stay competitive. This study shows that office layout influences productivity and morale. Office layout may affect performance, cooperation, creativity, HR management, and profitability. Engagement, productivity, enjoyment, and satisfaction may enhance.
- Work-life balance became difficult when individuals began working from home without control over their hours or responsibilities. Work-life balance may appear contradictory in the midst of the coronavirus 2019 (COVID-19) outbreak, which has led to high unemployment rates worldwide. Regardless of the requirement for work, it's important to maximise personal fulfilment at work and in life.
- Quality and output increase with safety. Poor management may cause risky behaviour. Supervisors and workers will be unbalanced and turnover will rise. When individuals are

irritated, unsatisfied, or unable to work, quality and productivity drop. Workplace security may improve concentration. As a company's security improves, disruptions decrease.

Model for the Enhancement of Operational Performance of Innovation Hubs

Factor analysis may help narrow down an investigation's variables to the most important. Factorial analysis helped the authors identify two main components and get statistically significant findings. The section that follows gives an example, detailing a practical approach to enhancing the operational performance of Innovation Hubs:

$$Y = 0.41C1 + \dots + 0.36C0, \quad (2)$$

Where,

Y= Enhancement of Operational performance of Innovation Hubs

C1= Managerial Aspects

C0= Factors that do not have a lot of variation

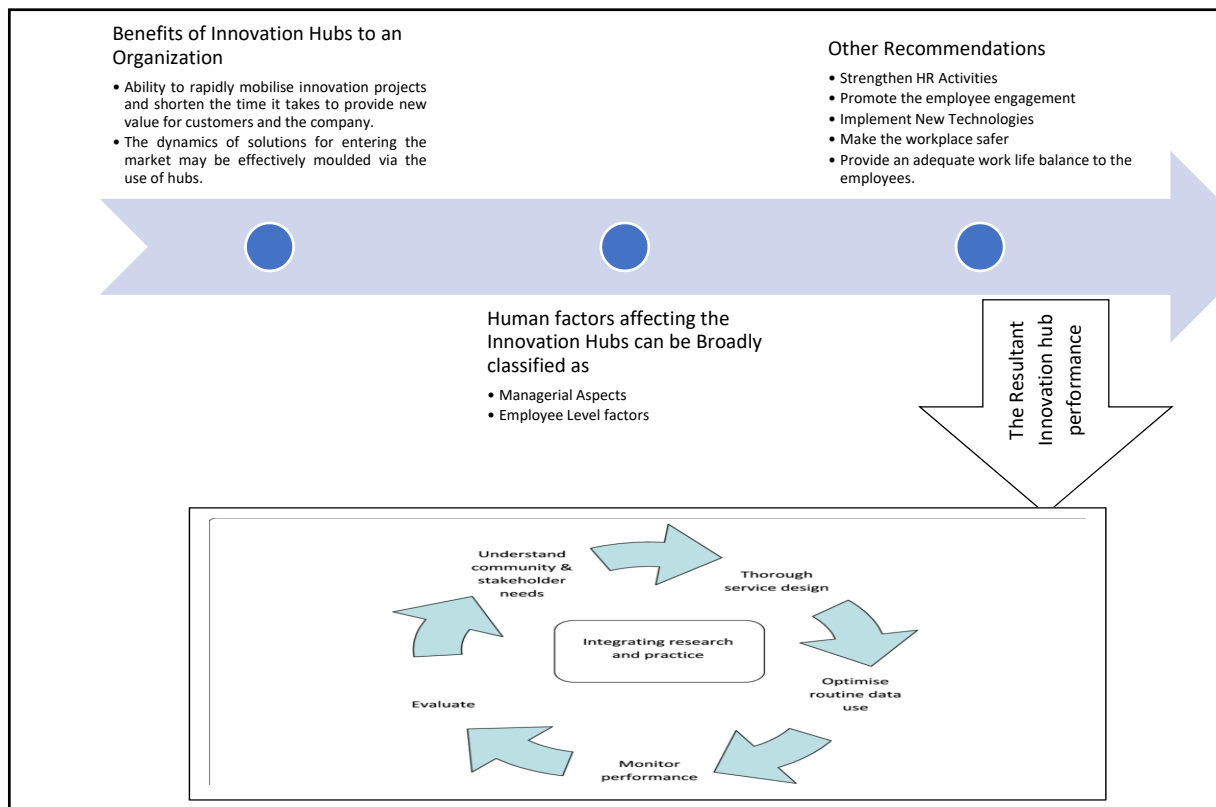


Figure 4. Model for Enhancing the Operational Performance of Innovation Hubs (Created by authors)

The aforementioned figure 4 outlines the conceptual model proposed by the authors for enhancing the operational performance of Innovation Hubs. The model can be implemented in the current systems for enhancing their efficiency. The model contains the following:

- Benefits of Innovation Hubs to an Organisation- Ability to rapidly mobilise innovation projects and shorten the time it takes to provide new value for customers and the company. The dynamics of solutions for entering the market may be effectively moulded via the use of hubs.
- Human factors affecting the innovation hubs can be broadly classified as- Managerial Aspects, Employee level Factors.

- Other Recommendations For enhancing the Operational performance of innovation hubs- Strengthen HR Activities, Promote the employee engagement, Implement New Technologies, Make the workplace safer, Provide an adequate work life balance to the employees.

Conclusion

This section wraps up the paper by providing a brief overview of the findings. The paucity of literature on human variables in innovation hubs prompted this investigation. The study's overall objective is to develop a model for the enhancing the operational performance of innovation hubs.

By answering the research question 1: What all are the Human Factors that affect the operational performance of the innovation hubs?

- After reviewing the literature, the authors concluded that innovation hubs are essential to a successful economy, but that their performance is highly reliant on human factors.
- In order to boost the efficiency of Innovation hub operations, it is necessary to address the aforementioned human elements.
- The authors constructed a questionnaire using Google forms for the purpose of eliciting responses from HR specialists of various companies.

By answering the research question 1: How to enhance the operational performance of the innovation hubs by efficiently managing these human factors with the help of a model?

- This research employed a quantitative strategy, based on a custom-made questionnaire, for its methodology.
- A total of 219 professionals, all HR specialists from various companies, participated in the survey.
- The survey data in this research was analysed using descriptive statistics and factor analysis.
- Two subcomponents were extracted from the total of fourteen survey variables with the use of factor analysis.
- The results of the factor analysis were used to inform the creation of a mathematical equation model, which in turn formed the basis of a model for enhancing the operational performance of Innovation Hubs. The mathematical model is as follows:

$$Y = 0.41C1 + \dots + 0.36C0,$$

Where, Y= Enhancement of Operational performance of Innovation Hubs, C1= Managerial Aspects, C0= Factors that do not have a lot of variation

The limitations of this research are as follows:

- To begin, the instrument might be considered somewhat weak since company-to-company perspective differs on how much of impact human variable have on Innovation hubs.
- Second, this poll in India is using a rather small sample size.
- In this investigation, the authors only use one kind of data analysis, known as Factor Analysis. This further narrows the scope of the study's findings.
- Other human aspects affecting innovation hubs may be addressed as well. This, however, may be the subject of further study.
- The financial performance of the company after the implementation of the model is not discussed in the research work.

The implications for Future Research are:

- Even though the Innovation Hubs in India are the major focus of this investigation, researchers may also examine related subjects in other parts of the globe.
- Other methods, such as AHP, may be included into future research to go more deeply and cover more ground.
- Companies can implement the model developed in this research for enhancing the performance of their innovation hubs.
- The model developed in this research has potential, and it might be tweaked and used by businesses to make their own Innovation Centres even more effective.
- It is possible that in the future we may discover new facets, and that state-of-the-art techniques will be created to further improve the efficiency of Innovation Hubs.

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