Workplace Wellbeing in Startup Incubation Centers: A Comparative Study in Shimoga, Karnataka

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Abstract - Startup incubation centers have emerged as significant architectural typologies within academic and semi-urban ecosystems. While policy frameworks emphasize entrepreneurship development, limited attention has been given to the spatial and environmental dimensions that shape workplace wellbeing within such centers. This research investigates the role of architectural configuration, environmental comfort, and spatial planning in influencing workplace wellbeing within three incubation environments in Shivamogga, Karnataka: K-Tech CIF Innovation Hub (Durgigudi), NAIN Labs at JNNCE, and Anveshana Technology Business Incubator at PESIT.

The study is based on qualitative field observations, telephonic interactions with incubation coordinators, and contextual analysis of state-level innovation initiatives. It examines parameters such as ventilation, daylighting, spatial zoning, collaborative interface, flexibility, and adaptability. The findings reveal that while environmental comfort levels are generally satisfactory, spatial programming and interaction-oriented design significantly affect participation intensity and innovation engagement. The study concludes that incubation environments in tier-2 cities require architecture that prioritizes flexibility, informal interaction zones, and climatic responsiveness to enhance workplace wellbeing and entrepreneurial outcomes.

Key Words:* *Workplace Wellbeing; Incubation Centers; Spatial Configuration; Built Environment; Innovation Spaces; Shivamogga; Architectural Analysis; Startup Ecosystem

1.INTRODUCTION

The relationship between built environment and human productivity has been widely acknowledged (Judith Heerwagen,2000) within architectural discourse. However, emerging workplace typologies such as startup incubation centers have not been extensively examined from a spatial wellbeing perspective, particularly within tier-2 cities. Incubation centers represent hybrid environments combining elements of academic laboratories, collaborative offices, innovation studios, and entrepreneurial workspaces. These environments are expected to foster creativity, collaboration, and sustained engagement.

In Shivamogga, Karnataka, institutional initiatives under state-supported innovation programs have resulted in the establishment of multiple incubation spaces. These include the K-Tech CIF Innovation Hub in Durgigudi, the NAIN laboratories within JNNCE campus, and the Anveshana Technology Business Incubator at PESIT. While these initiatives have demonstrated measurable outputs in terms of student participation and startup formation, the architectural characteristics of these environments remain underexplored.

This study shifts the analytical focus from administrative performance to spatial performance. It investigates how environmental comfort, spatial hierarchy, zoning clarity, and collaborative interfaces contribute to workplace wellbeing in these incubation environments. Rather than evaluating policy effectiveness, the research emphasizes how architecture shapes behavioural patterns, engagement density, and innovation culture within semi-urban academic ecosystems.

2. CONTEXT: SHIVAMOGGA & THE INCUBATION TYPOLOGY

Shivamogga presents a moderate tropical climate with high monsoon rainfall, a semi-urban density, and a strong presence of educational institutional clusters. These contextual conditions have direct implications for architectural design, making cross-ventilation essential, daylight optimization important, and shaded circulation necessary. Additionally, the incorporation of semi-open spill-out spaces becomes valuable in responding to both climatic and social needs.

Thus, incubation spaces here must respond climatically and socially ,not just programmatically.

The city hosts several engineering and professional colleges, creating a student-centric demographic environment conducive to innovation-driven initiatives.

Architectural strategies that incorporate operable windows, shaded openings, and semi-open transitional spaces are particularly relevant in this context.

Within this setting, incubation centers operate either as independent hubs or as embedded laboratories within academic institutions. The typology often consists of open workstations, small meeting rooms, brainstorming areas, and prototype labs.

However, spatial scale, flexibility, and interaction intensity vary across institutions.

Under Karnataka's innovation initiatives such as K-Tech CIF and NAIN, over 1000 students have reportedly benefited from entrepreneurial exposure in Shivamogga, with approximately 40 projects incubated under NAIN initiatives, and a smaller number transitioning into operational startups. These figures indicate programmatic progress. Yet the question remains: does the architecture of these spaces actively enhance or limit workplace wellbeing and innovation density?

The incubation typology in Shivamogga thus presents a unique opportunity to examine the spatial dimension of entrepreneurial ecosystems within a tier-2 urban setting.

3. AIM AND OBJECTIVES

Aim

To analyse the influence of spatial configuration and environmental design on workplace wellbeing within startup incubation centers in Shivamogga, Karnataka.

Objectives

1. To examine environmental comfort parameters such as ventilation and daylighting in selected incubation centers.

2. To analyse spatial zoning, circulation patterns, and collaborative interfaces within the case study environments.

3. To compare typological differences between institutional labs and structured incubation hubs.

4. To interpret how spatial characteristics influence user engagement and innovation participation.

5. To propose architectural strategies for future incubation ecology environments in tier-2 cities.

4. METHODOLOGY

This research adopts a qualitative, case-study-based architectural methodology. The study does not rely on quantitative environmental measurements but instead emphasizes descriptive spatial assessment grounded in field observation and stakeholder interaction.

Methods Used:

1. Environmental assessment through experiential evaluation of ventilation and daylight quality
2. Telephonic interaction with incubation center manager Mr. Mallesh Kumar
3. Telephonic interaction with NAIN college coordinator Dr. Manjunath
4. Review of institutional documentation and publicly available information

No numerical environmental measurements were recorded, and no fabricated spatial dimensions are included in this study.

4.1 Parameters for Spatial Analysis

The spatial analysis of the incubation environment is guided by a set of carefully selected architectural parameters, which provide a systematic framework for evaluation. Environmental comfort, including natural ventilation and daylighting, assesses how interior conditions support user wellbeing, productivity, and sustained engagement. Spatial zoning and functional clarity examine the organization of work areas, meeting rooms, and collaborative zones, highlighting how clearly defined spaces enhance workflow and usability. Circulation and movement flow focuses on the ease with which users navigate the facility, ensuring accessibility while minimizing interruptions.

The analysis also considers collaborative and informal interaction spaces, emphasizing the balance between structured work areas and zones that foster spontaneous idea exchange, peer learning, and creativity. Flexibility and adaptability evaluate the capacity of spaces to accommodate changing team sizes, new projects, or evolving technological requirements. Integration within the institutional context looks at how the facility interacts with the broader academic campus, leveraging proximity to resources, networks, and complementary functions. Finally, expansion potential assesses the facility's ability to scale operations, accommodate additional users, and support future entrepreneurial growth. Together, these parameters offer a comprehensive and structured lens for comparing case studies, ensuring that the evaluation remains firmly rooted in architectural and functional considerations while capturing the nuances of startup incubation environments.

Fig 1:workplace wellbeing conceptual framework

Image courtesy:World Health Organization

5. CASE STUDY ANALYSIS

5.1 K-Tech CIF Innovation Hub – Durgigudi

Fig 2: K TECH CIF hub in shimoga

Source: IKP Knowledge Park

The K-Tech CIF Innovation Hub at Durgigudi exhibits a semi-formal incubation environment integrated within an institutional building framework, with clearly defined meeting zones. The space demonstrates good ventilation and moderate daylight availability, contributing to overall environmental comfort. The furniture layout follows a structured arrangement, reinforcing functional clarity; however, the presence of informal breakout zones is limited, which may restrict spontaneous interaction and collaborative engagement.

Spatial Strength:

One of the notable strengths of the incubation environment is its clear functional segregation, which enhances overall spatial organization. By distinctly separating zones for individual work, team collaboration, and formal meetings, the layout supports an efficient workflow where activities do not interfere with one another. Users can navigate the facility with ease, accessing the resources they need without disrupting other ongoing tasks. This spatial clarity improves usability, reduces confusion, and ensures that each area is optimized for its intended function, ultimately contributing to a more productive and focused entrepreneurial environment.

Spatial Limitation:

Despite the benefits of functional segregation, the facility exhibits low visual permeability between working clusters, which limits spatial connectivity. The restricted lines of sight and physical separation between zones reduce opportunities for passive interaction,those chance encounters or informal observations that can spark collaboration, idea sharing, and creative problem-solving. While the structured layout supports focus, it may inadvertently create silos, hindering spontaneous engagement among students and startup teams. Introducing visual links, transparent partitions, or open transitional spaces could help bridge these clusters, fostering a more connected and dynamic incubation ecosystem.

5.2 NAIN Labs – JNNCE

Fig 3: NAIN led at JNNCE campus

source:Jnnce.ac.in

Spatial Context:

The incubation facility is strategically positioned within the heart of the academic campus, making it easily accessible to students, faculty, and visiting entrepreneurs. Its central location fosters a seamless integration with other academic resources such as lecture halls, libraries, and research centers, enhancing interdisciplinary collaboration. By being embedded within the campus, the facility also benefits from the academic ecosystem, where knowledge exchange, mentorship, and networking opportunities are naturally facilitated. This positioning reinforces the role of the incubation space as a bridge between theoretical learning and practical, entrepreneurial application.

Observations:

The facility currently encompasses two well-established laboratories alongside a newly inaugurated lab, collectively forming an expanded incubation setup. The design prioritizes natural ventilation and abundant daylight, creating a bright and comfortable working environment that positively impacts productivity and creativity. The spatial layout has been deliberately configured to support open brainstorming sessions, informal discussions, and collaborative project work. The integration of old and new spaces also allows for flexible use of resources, accommodating both individual workstations and group project areas.

Quantitative Insight:

Since its inception, the incubation environment has made a measurable impact on the student body and the broader entrepreneurial ecosystem within the campus. Over 1,000 students have benefited from access to the labs, mentorship, and entrepreneurial guidance offered by the facility. Approximately 40 projects have been nurtured within this environment, spanning various domains and technological applications. Notably, four successful startups have emerged from these incubated projects, demonstrating the effectiveness of the facility in transforming ideas into viable business ventures. These numbers highlight the facility's role as a catalyst for innovation and a tangible contributor to student entrepreneurship outcomes.

Spatial Strength:

One of the key strengths of the incubation environment lies in its attention to user comfort and wellbeing. The provision of natural ventilation and well-lit interiors ensures that occupants experience minimal fatigue and enjoy a healthier workspace, which can significantly enhance focus and creativity. The spatial configuration supports flexible work patterns, allowing users to alternate between individual concentration and collaborative teamwork seamlessly. By creating a physically and visually comfortable environment, the facility effectively promotes sustained engagement, mental alertness, and productive interaction among students, researchers, and startup teams.

Spatial Gap:

Despite its strengths, the facility experiences underutilization in certain areas, primarily due to a low density of active startup teams rather than any inherent spatial shortcomings. The issue stems from engagement-density imbalance while the infrastructure is robust and well-designed, not all areas are consistently occupied or leveraged to their full potential. This presents an opportunity for targeted programming, events, and outreach initiatives to attract more student teams and external collaborators. Addressing this engagement gap could optimize the utilization of the space, creating a more vibrant and dynamic incubation ecosystem without the need for structural modifications.

Fig 4 : Student Innovation Lab Environment at NAIN Illustrating Informal Incubation Spaces with Collaborative Learning and Shared Resources

source:jnnce.ac.in

5.3 Anveshana TBI – PESIT

Spatial Typology:

The incubation center follows a structured spatial typology that emphasizes formal organization and systematic workflow. Its design reflects a deliberate approach to supporting entrepreneurial activities, where spaces are planned to accommodate both individual work and team-oriented processes. The spatial arrangement prioritizes order and clarity, with dedicated zones for meetings, discussions, and project execution. This typology reinforces a professional environment, signaling to students and startups that disciplined work habits and organized collaboration are central to the facility's ethos.

Fig 5: ANVESANA led at PESIT Campus

source:anvesana.co.in

Observations:

The facility features clearly delineated meeting rooms and formal discussion zones, allowing teams to conduct organized interactions, strategy sessions, and presentations in a controlled environment. These spaces are complemented by interior conditions such as regulated lighting, temperature, and acoustics that foster concentration and reduce distractions. The structured environment supports professional engagement by providing spaces where ideas can be communicated efficiently, decisions can be made, and project milestones can be systematically tracked. While this formal arrangement enhances productivity, it also sets the tone for disciplined work and organized collaboration.

Spatial Strength:

A primary strength of the incubation environment is its ability to establish a professional startup ambience. By combining formal meeting areas, workstations, and controlled interior conditions, the facility promotes focused work, strategic planning, and structured team interactions. This professional setting prepares student teams for real-world business environments and instills habits of organized collaboration, time management, and accountability. The clear spatial definition ensures that entrepreneurial activities are executed with precision and purpose, aligning with the goals of the incubation program.

Spatial Limitation:

While the formal layout enhances discipline and professional engagement, the absence of informal spill-over areas limits opportunities for spontaneous interactions, casual brainstorming, and serendipitous collaboration. Without relaxed corners, lounge areas, or flexible open spaces, students and teams may miss chances for unplanned idea exchange or social networking, which can often catalyze innovation. Introducing semi-informal or adaptive spaces could complement the structured typology, balancing formal professionalism with opportunities for creativity and peer-to-peer engagement.

6. COMPARATIVE SPATIAL SYNTHESIS

Parameter	K-TECH CIF	NAIN	ANVESANA
ventilation	Good	Very good	Moderate
Daylighting	Adequate	High	Moderate
Spatial Flexibility	Moderate	High	Moderate
Informal Interaction	Limited	Moderate	Limited

Table -1: Comparative spatial Analysis of case studies

7. INTERPRETATION

The analysis reveals that environmental comfort across all three incubation centers is largely satisfactory. Shivamogga's climatic conditions have encouraged reliance on natural ventilation and daylighting, which positively influence workplace wellbeing.

However, the most significant spatial variable influencing innovation intensity is not environmental comfort but spatial configuration.

Key interpretations include:

1. Open and flexible layouts encourage collaborative behaviour but require strong incubation identity to sustain startup seriousness.

2. Highly structured layouts support professional engagement but may limit spontaneous interaction.

3. Informal spill-over zones are minimal across all case studies, suggesting an architectural gap in interaction-oriented planning.

4. Spatial permeability and visual connectivity influence behavioural clustering and innovation density.(Thomas Allen,1977)

5. Academic-embedded incubation spaces require clearer spatial demarcation to strengthen entrepreneurial

identity.

The findings suggest that incubation architecture must balance three critical dimensions: environmental comfort, spatial flexibility, and interaction intensity.

8. DISCUSSION

The study demonstrates that incubation success is not purely programmatic; spatial design significantly influences participation intensity and user engagement. The findings indicate that architecture operates as a behavioural catalyst, shaping how individuals interact, collaborate, and occupy space within incubation environments. Spatial configurations that encourage visibility, accessibility, and proximity tend to foster higher levels of interaction, while rigid or compartmentalized layouts may limit spontaneous engagement.

Informal edges, such as spill-over spaces and transitional zones, emerge as critical triggers for innovation by enabling unplanned discussions and idea exchange. At the same time, climatic responsiveness forms the foundation of workplace wellbeing, as comfortable environmental conditions support longer durations of occupancy and sustained productivity. Furthermore, spatial adaptability is essential to accommodate the evolving nature of startups, allowing incubation environments to respond to changing team sizes, work modes, and functional requirements over time.

Together, these themes highlight that effective incubation design must move beyond static planning and instead embrace dynamic, user-responsive spatial strategies that actively support innovation culture.

9. ARCHITECTURAL IMPLICATIONS

Based on the study, several architectural implications emerge for the design of future incubation centers in Shivamogga and similar tier-2 urban contexts. These implications highlight the need for a balanced approach that integrates environmental responsiveness, spatial flexibility, and interaction-driven planning. By aligning architectural strategies with both climatic conditions and user behaviour, incubation environments can be designed to support innovation, enhance workplace wellbeing, and accommodate the evolving nature of entrepreneurial activities.

9.1 Climatic Responsiveness

Given Shivamogga's tropical climate, future incubation environments must prioritize cross-ventilation through operable openings (Victor Olgyay,1963), shaded facades to reduce glare, daylight optimization without overheating, and semi-open transitional spaces that support passive cooling.

Environmental comfort forms the baseline of workplace wellbeing. Passive design strategies reduce fatigue and enhance sustained engagement.

9.2 Flexible Planning Modules

Incubation environments should adopt modular spatial grids that support a high degree of flexibility and adaptability over time. Such planning enables reconfigurable workstations that can respond to changing team sizes and work styles, while movable partitions allow spaces to be easily redefined for privacy or collaboration. Adaptable prototype zones are essential to accommodate diverse stages of product development, from ideation to testing. Additionally, the ability to scale spatially ensures that growing startups can expand within the same environment without disruption. This approach allows the incubation space to evolve continuously, aligning with the dynamic and uncertain nature of entrepreneurial activities.

Startup environments are dynamic. Architecture must accommodate growth, contraction, and transformation without requiring structural overhaul.

9.3 Central Collaboration Spine

The concept of a central collaboration spine positions a shared interaction zone at the core of the incubation center, serving as both the social and creative hub. This central spine is designed to encourage spontaneous encounters, idea exchange, and cross-team collaboration by integrating informal seating arrangements, display walls for showcasing projects and ideas, and open discussion steps that double as gathering or presentation spaces. Shared resource tables can provide flexible workstations that support group activities, quick huddles, or impromptu brainstorming sessions. By organizing the facility around a central spine, the design not only enhances spatial connectivity but also fosters a sense of community, motivating students and startup teams to engage more actively, exchange knowledge, and co-create in a dynamic environment.

9.4 Layered Zoning Strategy

Instead of rigid segregation, incubation centers should incorporate a layered zoning approach that includes quiet focused work zones, semi-open collaborative areas, formal meeting rooms, and informal spill-over corners.

Layered zoning ensures behavioural diversity within a single spatial ecosystem.

9.5 Visual Connectivity

Visual connectivity plays a crucial role in enhancing engagement and collaboration within the incubation center. By incorporating elements such as glass partitions, open layouts, and clear visual corridors, the design allows occupants to observe other teams at work, fostering a sense of shared purpose and collective energy. This transparency not only reinforces accountability but also generates psychological stimulation, as witnessing the progress and activity of peers can inspire creativity, motivation, and informal knowledge exchange. Maintaining sightlines across work zones encourages spontaneous interactions and serendipitous discussions, strengthening the social and intellectual cohesion of the incubation environment. Effective visual connectivity thus bridges functional segregation while preserving focus, supporting both collaboration and productivity simultaneously.

10. CONCLUSION

This research examined workplace wellbeing within three incubation centers in Shivamogga through an architectural and spatial lens. The study demonstrates that environmental comfort levels across the case studies are generally satisfactory, supported by adequate ventilation and daylighting strategies suitable for the local climatic context.

However, spatial configuration plays a more decisive role in shaping innovation engagement. The comparative analysis reveals that:

- Structured hubs provide professional clarity but limit informal interaction.
- Open academic labs encourage flexibility but require stronger incubation identity.
- Informal interaction zones are minimal across all cases.
- Visual connectivity and permeability significantly influence collaborative intensity.

The findings indicate that incubation environments in tier-2 cities must evolve beyond simple laboratory or office typologies. Architecture must intentionally design for interaction, adaptability, and identity reinforcement.

Workplace wellbeing in such environments is not merely a matter of comfort but of behavioural stimulation. The built environment can either catalyse or constrain entrepreneurial energy (Christopher Alexander,1977). By integrating climatic responsiveness, flexible planning, and interaction-focused zoning, future incubation centers can significantly enhance innovation culture within semi-urban academic ecosystems.

11. CONTRIBUTION

11.1 Theoretical Contributions

This study contributes to the theoretical understanding of incubation environments by extending the discourse on workplace wellbeing into the specialized context of incubation architecture, particularly within tier-2 cities. It emphasizes that spatial configuration including factors such as environmental comfort, functional zoning, collaborative cores, and visual connectivity,directly influences the intensity and quality of innovation activities. By foregrounding the role of physical space, the research challenges the conventional view of incubation centers as primarily policy-driven or resource-centric initiatives. Instead, it positions architecture as a strategic determinant of creative performance, highlighting how design decisions can enhance collaboration, knowledge exchange, and startup productivity. This approach offers a framework for integrating wellbeing and innovation outcomes into the planning and evaluation of entrepreneurial spaces, providing new theoretical insights for architects, urban planners, and innovation managers alike.

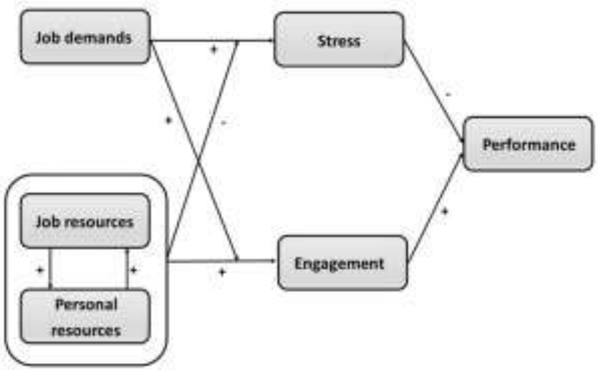

Fig 6:Job demand-Resources (JD-R) model

Source:Bakker & Demerouti (2007)

11.2 Methodological Contributions

The research applies qualitative spatial analysis combined with stakeholder interaction as a framework for evaluating incubation environments. This approach involves direct observation of spatial characteristics, experiential assessment of environmental conditions, and insights gathered through discussions with key stakeholders. It enables a nuanced understanding of how users perceive and interact with the built environment. This methodology is particularly valuable in contexts where numerical or instrument-based data is limited, but qualitative insights related to comfort, usability, and behavioural patterns are rich and informative. By focusing on lived experience and spatial perception, the study is able to capture aspects of workplace wellbeing that may not be reflected through quantitative measurements alone.

11.3 Practical Contributions

The study provides architectural design strategies for future incubation centers in Shivamogga and similar contexts. These strategies emphasize flexibility, climatic responsiveness, and the integration of interaction-oriented spaces within incubation environments. The recommendations can guide architects, institutional planners, and policymakers in designing spaces that not only accommodate functional requirements but also enhance user engagement and collaborative potential. By addressing spatial configuration alongside environmental comfort, the study contributes to the development of adaptable and dynamic innovation spaces that can evolve with changing startup needs and institutional frameworks.

12.SCOPE FOR FUTURE RESEARCH

Future studies can expand the scope of this research by incorporating more detailed and measurable approaches to spatial and environmental evaluation. This may include measured environmental performance analysis to quantify parameters such as thermal comfort, daylight levels, and ventilation efficiency. Behavioral mapping of user interaction frequency can provide deeper insights into how spatial configurations influence collaboration patterns and engagement intensity. Post-occupancy evaluation studies would help assess user satisfaction and long-term performance of incubation environments. Additionally, comparative analysis across multiple tier-2 cities can broaden the contextual understanding of incubation typologies in similar urban settings. The integration of acoustic and ergonomic assessments can further enhance the evaluation of workplace wellbeing by addressing comfort beyond visual and spatial parameters.

Such investigations can deepen understanding of spatial wellbeing in entrepreneurial ecosystems.

13.FINAL REMARKS

Incubation centers represent a transformative typology in contemporary architectural practice. In cities like Shivamogga, where educational institutions form the backbone of innovation initiatives, the built environment must evolve to support entrepreneurial ambition.

This research demonstrates that architecture is not a passive container for innovation but an active catalyst. By designing spaces that balance flexibility, identity, and interaction, incubation environments can foster not only startups but also sustainable workplace wellbeing.

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