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INCUBATION AND INNOVATION CENTRE AT NAVI MUMBAI

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ABSTRACT

Incubation centres play an important role in nurturing and growth of new small business by supporting them in early stages of development. Architecturally, incubation centre is a physical unit for young entrepreneurs to come together , facilitate spontaneous interaction and evolve themselves by understanding different aspects related to business , entrepreneurship in their respective fields. Such center contributes significantly in the economic and social development of the country by fostering entrepreneurship and generating large employment opportunities by training the entrepreneurs for certain period of time then providing various opportunities to grow and excel at comparatively lower capital cost. National Business Incubation association (NBIA) categorizes incubators by following 5 incubator types – academic institution, non-profit development corporation, for profit property development venture capital firms and combination of above.

Technology business incubation and innovation centre act as a powerful tool for economic development. As they promote the concept of growth through innovation, application of technology. They support economic development strategies for small business development, and encourage growth from within local economies of a region . Understand the potential of Start-ups as they are one of the most promising solution for job creation and incubation centres like physical spaces provide physical solution to those problems faced by start-ups .

The research primarily comprises of understanding the functioning of research and innovation industry, studying different models and processes involved and lastly translating all their requirements spatially, which can supplement the entire innovation process. Incorporating qualitative and quantitative requirements of different stakeholders in order to create a micro-climate, which is conducive for all, rather than a selected few. The focus is on 'Place making' demonstrating how configuration of spaces can initiate and influence our social behaviour largely. It can play a vital role in the way to live and work. The thesis focuses on developing a built ecosystem for nurturing innovation and start-ups, designed specifically for new sphere of operation.

1.0 INTRODUCTION

What are Start-ups?
A start-up is a young company that is just beginning to develop. Start-ups are usually small and initially financed and operated by a handful of founders or one individual. These companies offer a product or service that is not currently being offered elsewhere in the market, or that the founders believe is being offered in an inferior manner. [7]

- A business concept or idea involving a product, service, process, or new technology
- People to support the work, whether as employees, vendors, or advisors
- A process by which the product or service will be delivered, or the technology will be developed .

What is Incubation?
Incubator is an environment to nurture and grow new small business by supporting them in early stages of development.

Incubation can also be defined as a process of training , learning from mentors , understanding the market trends (worldwide) and developing their own culture and work style before setting up in market.

The term incubation refers to the process of support, while incubator stands for the organization and infrastructure that are set up for these purposes.

What is Innovation?
Innovation is turning an idea into a solution that adds value from a customer's perspective. In its modern meaning

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it is "a new idea, creative thoughts, new imaginations in form of device or method". [8]

Innovation is often also viewed as the application of better solutions that meet new requirements, unarticulated needs, or existing market needs. A single innovation is a culmination of lengthy processes of previous innovations. The sources of innovation are economic changes, technological changes, new knowledge, new markets, etc. These things make a person think of a new product, services or business process.[8]

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What is Incubation and Innovation Centre?

The institution that assists entrepreneurs in developing their business and solving problems associated with it, especially in the initial stages, by providing an array of business and technical services, initial seed funds, lab facilities, advisory, network and linkages to budding creative entrepreneurs.

About The Project

Aim – To design a collaborative environment between training institute and co-working space for young entrepreneurs and other allied facilities by using cost effective methods.

Objective

- To Understand the relationship between innovation and the physical work environment.
- To establish architectural elements aid in creating physical work environment, learning activities and support innovation.
- To study relevant spaces and support facilities for such center.

Scope

The type of work places that support innovation range from corporate industry to co-working spaces , innovation campuses and many others understanding of independent setup of such centers is considered.

The study will primarily focus on incubation facility in India and comparative analysis of approach to the project globally through case studies.

Limitation

Incubation centres is new platform for start-up in India . Existing incubation centres are in their initial stages of growth continuously however responses to such centres have increased. The design of incubation Centre depends upon the program conducted thus the design represent new innovation in design of incubation centres.

2.0 BACKGROUND STUDY

2.1 HISTORY AND EVOLUTION

In today's global economy, we have observed that government of India is focusing on various sectors for growth of MSMES. Various programmes and policies have been implemented for the same. One of such flagship programmes launched in 2016 is start up India, intended to catalyse start-up culture and build a strong and inclusive ecosystem for innovation and entrepreneurship in India. The broad scope of Start-up India's programs is outlined in the Action Plan to support Start-ups, which includes Enhancement for infrastructure including incubation and innovation centres.

The concept of incubation centre for business related fields began since 1959 in US when Joseph L. Mancusa started a Batavia Industrial centre in warehouse and thus immense support to such a concept by government and growing economy of the state , Incubation centres expanded in US , in 1980s in UK and Europe through various related forms innovation centre , techno parks etc . Growth of such centres accelerated in 1970 and 1980 by identifying the need to revitalize regions suffering from job losses in basic industries . Evolution of internet had major impact as it promoted networking , connecting and most importantly it became a digital library . Specifically talking about incubation in this western countries Internet Incubator , Accelerator or venture Catalyst made its appearance and thus helped in this process of incubating start ups and young entrepreneurs.

As we see the typical organization had division of work and its allocation whereas only bosses required knowledge that allowed for complete picture of work. However today in the innovation driven organization, each and every individual works parallelly, communicate throughout the process and gains learning experience when trained accordingly to achieve better results. Young entrepreneurs today require supportive workplace environment that stimulate their innovative and creative capacities. They require spaces that will solve a lot of problems they face by providing connectivity , mentorship and collaboration.

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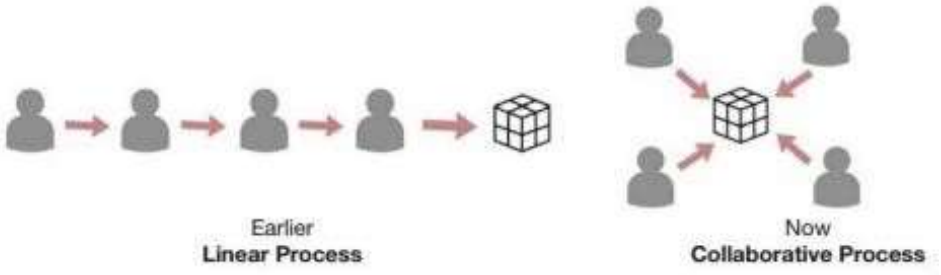

Fig 1 Illustrating work style
Source Ayush K. 2012 Co- Lab Research park and Entrepreneurship Center

Over the last two decades, emergence of start-ups in India and the associated ecosystem has developed drastically. Consequently, support has increased in many dimensions such as office space and allied infrastructure, business support (financially by providing seed funds) in regards to mentoring and networking. In early 2000 that India started Technology Business Incubators (TBI) initiative support by National science & technology entrepreneurship department (NSTED), mostly under institutes like IIT, IIMS, ICT.

The new generation of facilities being practically adopted in colleges and universities globally are innovation centres known by: {innovation + incubator+ maker centres}. The goal of these colleges and universities is to foster fresh talents and facilitate an environment equipped and able to produce leaders who can innovate solutions for the challenges of our time and the future ahead. These centres are focused on accelerating discovery through problem-based, multidisciplinary learning that addresses 21st-century challenges.

Thus, the concept of incubation centre was observed at institutional level, at smaller scale. success of such initiative brought the focus of government to this movement of start-up India, skill India to encourage innovation in different fields. As per increasing employment needs, and growing entrepreneur skills the scale of such incubation centre is now increasing and thus state level incubation and innovation centres are established. for example, T-Hub at Hyderabad, Techno hub at Rajasthan, Kerala Technology Innovation Zone at Kochi and so on. Today India has the 3rd highest number of incubators with over 250 incubators being present in India.

2.2 CLASSIFICATION OF INCUBATORS

Types of Incubators depend upon the targeted field of entrepreneurs and in their organizational structure. Some of incubators are highly adaptable, with differing goals, such as diversifying regional economies, providing employment opportunities for and increasing wealth of their local areas, and transferring technology from universities and major corporations. In incubation centre the user group to be trained i.e. startups are at the forefront of developing new and innovative technologies . They create products and services that improve the quality of lives in communities around the world with their problem analysing skills and problem solving strategies.

Difference between Incubators and Technology parks is that they train start-up and early-stage companies. Commercialization comes in backdrop and Training becomes main motive as per the vision of organization. Research and technology parks, on the other hand, are large-scale projects that include everything from corporate, government or university labs to very small companies and major impact on economy whereas role of incubators becomes employment generation and economic generation for future . Most research and technology parks do not offer business assistance services, which is the main core idea of a business incubation program.

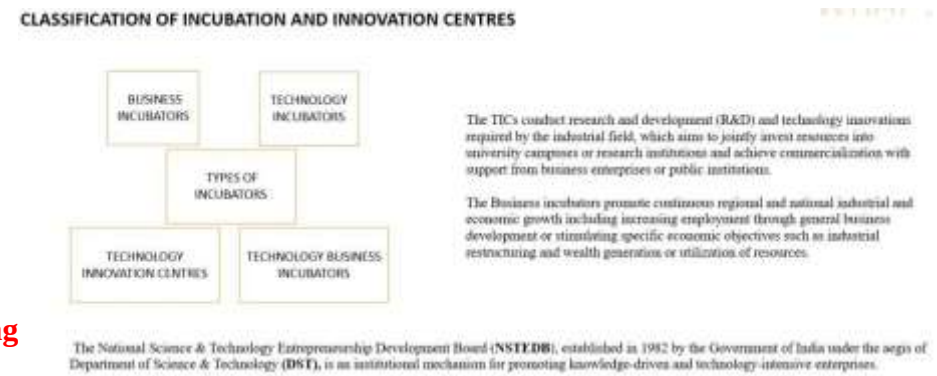

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Fig 2 Classification Of Incubation and Innovation Centres
Source - Author Ref - nsted.com

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There are a variety of incubators, which are defined below:

1 Business Incubators – Focuses on General Business Development , industrial restructuring for economic growth by promoting regional and national industries

2. Technology Incubators (TI) – Targets to boost technology at its development stage , by assisting technology based start-up firms in completion of the technologies under development. These are located at or near universities, R&D institutes, and Science and Technology parks. Technology incubators, combine broadly the functions of technology business incubator and innovation centre.

3 Technology Innovation Centres (TIC)- The TICs conduct research and development (R&D) and technology innovations required by the industrial field, which aims to jointly invest resources into university campuses or research institutions and achieve commercialization with support from business enterprises or public institutions. As a concept the TIC is similar to that of the Technology Parks, and, at the R&D stage, to the TI. [2]

4. Technology Business Incubators (TBI) - The TBI is a venture of universities, public research institutes, local government and private institutions to promote and bolster a new technology intensive enterprise. TBI refers to the type of incubation where the focus group consists of innovative, mostly technology-oriented, or knowledge-intensive service sector enterprises and interactions with the academic sphere giving a substantive element of the incubation process. [2]

Source : nsted.com

Fig.3 Growth Of startup
Source Microsoft Venture, Zinnov , Nasscom, Startup India Report 2015

2.3 REWORKING WORK ENVIRONMENT

Coworking space is basically a type of workplace where we share the same work environment, thus making a community in the same area. The phenomenon of these coworking spaces have thrived significantly all over the world since they are the only option for start-up founders to start opening their business. Co-working spaces are broadly considered office spaces for a low risk, month-to-month fee, complete with wrap-around services. .Design is a major factor why people tend to choose coworking space rather than an ordinary corporate office. [5]

The nature of co working space have change throughout the course of history. In the millennial era most of the work can be done in isolation with mere virtual human connection through internet . this mobility and flexibility in working spaces change the nature of workspace do not only provide private secluded office space but also

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promoter public interaction with in workers to work collaboratively together.

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This can be achieved through various means-

Outdoor spaces – Nature has always been a source of inspiration as it refreshes the mind and thus positive impact on productivity and creativity . this can be either by visual connect or physical accessibility to such spaces.

Connectivity – complete segregation of spaces won't work in this kind of typology designer must understand and try to amalgamate this space which need dedicated space , services such as labs , and common spaces such as offices to promote interaction among researchers.

Meeting space – in addition to formal meeting and conference room including informal meeting areas, interaction zones which would act a space for brainstorming sessions as well as breakout zones. Location of such zones should be strategically located and well connected to spaces in particular floor plate.

Learning – facilities such as libraries, workshops areas should be provided to further train employees or young entrepreneurs who are joined as trainee.

Mobility - an employee shouldn't be where the work is (working desk) the work should be where employee is (interactive zones) use of technological advancement can play a major role on this.

Socialize – socializing spaces such as café , restaurant , amphitheater etc. can be provided.

Focus – some space with decent level of privacy should be provided to allow workers/ researchers to concentrate.

Trends influencing the design of innovative workspaces

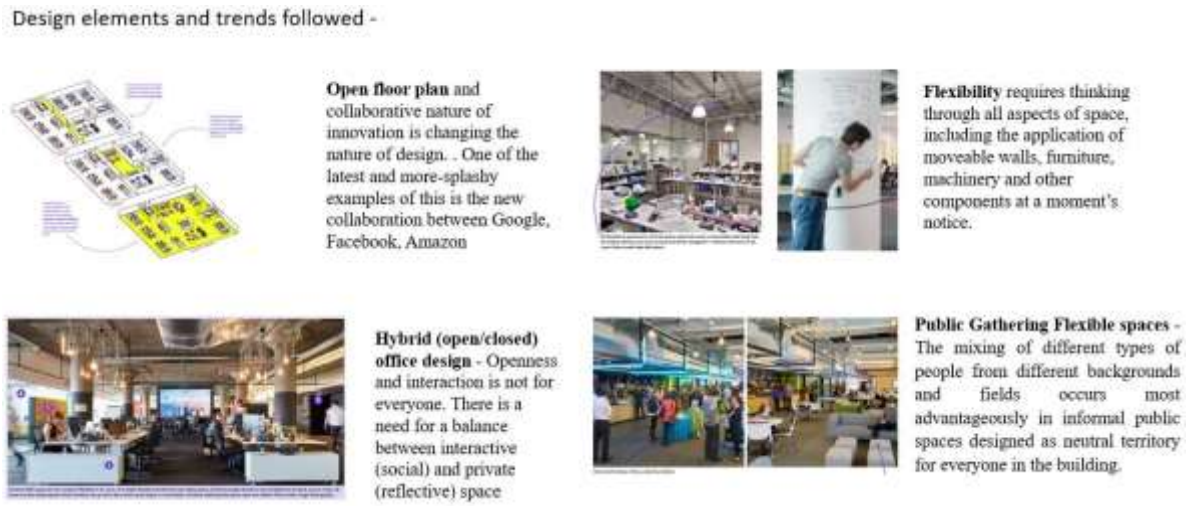

Fig.4 Trends influencing the design of innovative workspaces
Source Julie W. Dan W. (April 2017) Innovation Spaces:The New Design of Work

2.4 DESIGN CONSIDERATIONS FOR A LABORATORY ARCHITECTURE

Lab Classification - Laboratories can be classified as wet or dry labs.

Wet labs require **chemical resistant work surfaces** and cabinets that are liquid tight to contain spillage. Chemical and glassware storage and fume hoods are significant factors in space planning and furniture selection.

Dry analytical labs typically require a lot of large shelving to **support instrumentation**. Height-adjustable work surfaces may be required to allow large counter-mounted **equipment** to be placed at a comfortable operating height or be completely removed to provide instant space for the addition of floor mounted equipment.

Lab Planning concepts –

Identifies as lab areas, non-lab area at planning stage and zoning as shown in adjoining figure.

Lab Layout - Typically a lab has a width varying from 10'-0" to 20'-0" and depth which may vary from 20'-0"

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to 30'-0".

The width criteria is based on two rows of equipment and lab tables of 2'-6" depth along each wall and a 5'-0" aisle in the centre for movement.

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Circulation A single corridor with the multiple options is the most adopted one.

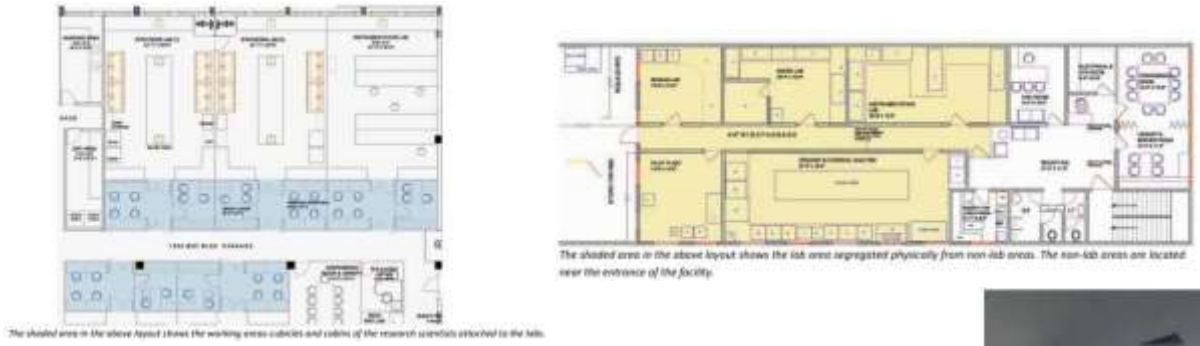

Fig.5 Circulation In labs
Source Arena Consultants , Feb 28, 2010 Basic Architectural Design Considerations for a Laboratory

Lab Aesthetics & Finishes

The walls can be treated with a minimum thickness of epoxy coating or can be finished with regular washable lustre paint with low voc , or can be glazed aluminium anodized frames.

A grid of 2'x2' **modular false ceiling** above the service carriers gives a finished look to the lab. The biggest advantage of modular ceiling is that it controls the volume of lab thereby reducing the HVAC load and cost.

The air ventilation system should provide dust free environment. Temperature should be between 23 to 27 degree C and humidity should be not more than 65%.

Fig.6 Lab Finishes
Source Arena Consultants , Feb 28, 2010 Basic Architectural Design Considerations for a Laboratory

Source- Arena Consultants , Feb 28, 2010 Basic Architectural Design Considerations for a Laboratory

3.0 LITERATURE REVIEW

3.1 LITERATURE REVIEW 1 - THE INSTITUTIONAL CONTEXT OF INCUBATION: THE CASE OF ACADEMIC INCUBATORS IN INDIA

V.K. Narayanan , Jungyoun S. (May , 2019) The Institutional Context of Incubation: The Case of Academic Incubators in India from https://www.researchgate.net/publication/333057212_The_Institutional_Context_of_Incubation_The_Case_of_Academic_Incubators_in_India

In 'The Institutional Context of Incubation: The Case of Academic Incubators in India' Author talks firstly about stimulated entrepreneurship among youth . The purpose of this article is to initiate a focus on institutional perspective as a complement to the extant theory and research on incubators, a focus that is needed as emerging economies adopt this organizational form to stimulate entrepreneurship.

The paper talks about how we focus on academic incubators in India, incubators that are associated with major educational institutions, for several reasons. First, academic incubators have had the longest history in India and thus have relatively stable operations. The academic incubators also differ among themselves, partly reflecting the differences among the institutions in which they were located. For example, incubators in engineering institutions (e.g., IIT's) could rely on the home institutions' technical expertise, and often restrict the start-ups they admit to insider, i.e., their own students and/ or faculty. Those in management institutions (e.g., IIM's) are typically open to outsiders, but have to acquire technical expertise as and when needed or build linkages to engineering institutions. Second, unlike the newly emerging private incubators, academic incubators are public entities created to stimulate entrepreneurship in India. Third, because many of these academic institutions are

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national, and intake students from all over the country, they are less subject to the variations in institutional context, in a diverse country such as India. We still lack a clear understanding of how incubators are established for what purpose, why entrepreneurs are motivated to join incubators, and social norms surrounding incubators in the respective culture that shape the process of starting a business. (c5)

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Quite likely these differences among the incubators partly explain differences in their responses to the influence of the institutional context.

Thus, designing and incubator wrt academic institutions ,their field of study and areas where this academic incubators are not been included but still there is need then understanding this for programme development is important.

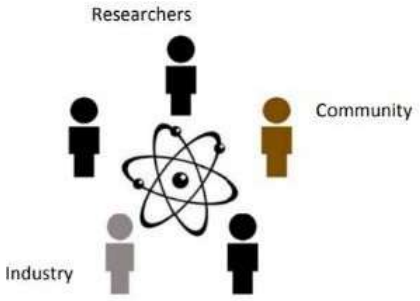

Fig.7 Collaborative Research

Source Ayush K. 2012 Co- Lab Research park and Entrepreneurship Center

3.2 LITERATURE REVIEW 2 - ARCHITECTURE FOR SCIENCE

Michael J. (2004) Architecture For Science from https://www.lsnet.in/books/architecture-for-science_michael-j.-crosbie_9781920744649?t=107502

The author discusses the nature of science, its rate and reasons of change and role of architects. He mentions that laboratories are a relatively new invention and says one of the characteristics of laboratory buildings is their dependence on technology, equipment and those technologies, which are woven through the building to make scientific work possible.

He continues, "reliance on high-powered mechanical systems and energy makes laboratories tough candidates for sustainable design."

"The design should mend past planning mistakes on the campus, reuse some existing structures, and help to create a new quadrangle to reinforce campus identity and sociability. It should also provide a dynamic centre for the sciences, which encourages researches to cross-pollinate disciplines." Constants are not merely required design codes, but answering "the deepest and most ancient needs of those inside who need light, air and social interaction to produce their best work." In such highly designed environments where first consideration often seems given to the work at hand rather than the comfort to the staff, it is important to reduce the stress associated with intensive research by answering the deepest and most ancient needs of those inside to produce their best work. He mentions the new movement toward collaboration in scientific activities.

On how the building should respond to changes, the author believes that one measure of success is how building can adapt to changes in use, occupants, and technology over time within reasonable initial budget constraints.

"Key to a successful building is the designer's knowledge of how the components of each category are designed and how they are assembled to best meet the needs of users." "Why do science buildings need to accommodate change? If the average duration of its research program is three years, it is conceivable that up to 30 percent of the building can be undergoing some level of intervention at any time.

Thus , Designing lab and office spaces with respect to todays need and scope of flexibility with future.

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4.1 CASE STUDIES – COMPARATIVE ANALYSIS

	Salk Institute San Diego , USA	Deshpande sandbox startups Hubali, India	NICCA Innovation Center Tokyo , Japan
VIEWS			
SITE AREA	5 Acres	6.09 acres, 3.5 acres developed	1.5
ARCHITECT	Louis kahn	Deepak Hiremath and associates	Tetso kobori architects
OCCUPANCY	850 users	500 users	250 users
FIELDS STUDIED	Biological research	Electronics – business based	Chemical – research – business based
REASON FOR SELECTION	Concept , material, services Design complement each other.	Green concept, passive design techniques – climate responsive design approach executed very well	Innovative construction techniques to make maximum use of natural light. Amalgamation of space can be observed.
CLIMATIC ZONE	Meditterranen	Warm and humid	Warm and humid with extreme winters
VIEWS			
COLLABORATIVE LEARNING AND COWORKING SPACES	Linear zoning of space connecting with bridges	Interactive zones well designed conventional office design approach broke by achieving visual connect	Overlooking brides and workspace – bazaar concept
FLEXIBILITY IN CONFIGURATION	Highly flexible the labspaces , no issue with services.	To some extent can be observed with respect to interiors.	Collaborative environment and common office space highly flexible labs provided with individual mechanical services at periphery .

Table 1 Comparative analysis of case studies
Source Author

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4.1 CASE STUDIES - COMPARATIVE ANALYSIS

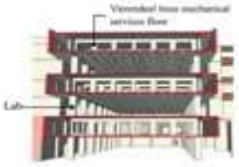
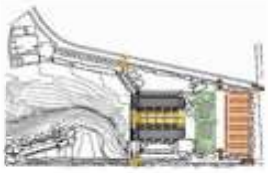
	Salk Institute San Diego , USA	Deshpande sandbox startups Hubali, India	NICCA Innovation Center Tokyo , Japan
IMAGE REFLECTED BY BUILDING	Serene , calm as described monastery image can be observed distinctively	Climate responsive approach for material selection with modern approach difference in interior and exteriors can be observed	Modern building , façade treatment a formal look
FAÇADE AND FENESTRATION	Exposed concrete finish Wooden windows , inclined walls for view towards ocean	Glazed window shaded by shaft provided for ventilation ,green wall ,inclined rcc wall with brick cladding	Screens and louvers – industrial approach Glazing as envelope
VIEWS			
SUSTAINABLE FEATURES		Green wall , courtyards for stack effect , wind towers for cooling air passive stratigies widely used	Radiant cooling reduces use of HVAC Load during winter and even during summers by 20% . Natural light almost used to lit 70-80% of floor
CONSTRUCTION	PT slabs , RCC construction	Porotherm bricks, rcc frame structure	Rcc structure with curtain walls
SERVICE INTEGRATION	Use of vierendel truss,I nterstitial floor , mechanical services located to extreme end of floor plate	Services are designed in eastern side of buiding	Services are located in triangle shape as per staircase travel distance coupled up with toilet services at one end and lift and mechanical service at another.
SITE PLAN				

Table 1 Comparative analysis of case studies
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4.2 CASE STUDIES - CONCLUSIONS

Apart from various points covered in Table 1 following points can be considered while designing Incubation And Innovation Centre

SALK INSTITUTE , SAN Diego ,USA

Site planning Movement and Circulation

- Strong Central Axial Movement for pedestrians, Peripheral Vehicular Movement
- Orientation - wrt. Prevailing winds (west), North – South axial orientation.

Space allocation , distribution and Program Analysis

- Wet labs higher percentage of allocation at floor level up to 80 % with office space – co working typology towards atrium.
- Dedicated labs for Offices for researchers facing central court.
- Central court – space quality intangible aspect almost 33% of built.

  Although a strong philosophy of central courtyard creates a formal character , to achieve informal character or encourage communal interaction various activities can be planned in central court .

DESHPANDE SANDBOX STARTUPS

Site planning Movement and Circulation

- Major built massing on site for maximum use of north light .
- Free on ground campus for workshop zones
- Peripheral vehicular movement similar to Salk Institute.

Space allocation , distribution and Program Analysis

- Labs are designed at upper level ; office spaces are designed at level ground and consecutive 2 levels.
- Flexible spaces for dry labs with just HVAC as main services , (no dedicated exhaust system)
- Workshops are designed at site level with dedicated exhaust system as per equipment's.

NICCA INNOVATION CENTRE

Site planning Movement and Circulation

- Major built mass centrally placed occupies site area
- .Introvert planning
- Absence of open space.

Space allocation , distribution and Program Analysis

- Wet labs (usage of chemicals) around periphery , dry labs along atrium are major use with higher percentage of allocation at floor level up to 75 % with office space – co working typology towards atrium.
- Introvert building design
- Common shared space – (cafeteria) designed at ground level visually connected to labs and offices due to atrium .

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5.0 CONCLUSION

There are different type of incubation and innovation centres classified by NSTED , NBIA on the basis of fields for training , location and spaces / infrastructural setup provided by such centres. Salk institute can't be directly classified directly as incubation centre because main activity is research . However research spaces designed are flexible enough to accommodate new upcoming technology and services . The Sandbox Start – ups is India's one of the biggest incubation centre which gives a clear idea of how incubation centres work, the ideology , spaces provided by organization / client . The typology of sandbox start-up coincides with the architectural intervention of thesis project and thus gives a clear idea of practicality of the project in Indian context. NICCA innovation centres shares a different approach for collaborative research and co – working spaces and can define future of innovation centres. Apart from planning the climatic condition were quite similar despite varied material palate, overall form and ambience , form can were observed.

About proposed Incubation centre - The Centre that assists entrepreneurs in developing their business and solving problems associated with it. The setup forms a linkage between academic , training – research chemical , biological , biotech lab spaces and commercial industry for technology (mechanical , electronic and telecommunication ,e-commerce , marketing , management, ,art and design sector where workshop & office spaces are required . Following points can concluded from above research for architectural interventions

ARCHITECTURAL INTERVENTIONS -

- To design incubation centre that would be cost effective with respect to climate of Navi Mumbai (Warm and Humid), material, design of flexible spaces include creation of communities that stimulates interaction, collaboration and teamwork among the companies hosting in incubators.
- Thus , understanding the essence of such collaborative environment , advanced technology and building services , flexibility of spaces can be used as per changing needs of incubation centres.
- Designing open floor plans , To establish architectural elements aid in creating physical work environment, learning activities and support innovation. (Fig. 4)
- Providing Pockets , spaces / Floors for public gathering and to achieve collaborative environment
- Hybrid (open – close) module of office designed as illustrated in (Fig. 4) to achieve visual connect.
- For labs - Minimize areas requiring controlled environments, Flexible connections should be used for connecting gas and other plumbed utilities. A shutoff valve should be located within sight of the connection and clearly marked .
- The entire facility should have fire safety provisions with a consideration of integrating the same with HVAC system
- Provision for Future Integration of Services makes it more flexible.
- Building Envelope – As per climate of Navi Mumbai east and west facades prone to direct heat gain thus shading , louvered system , opening and fenestration needs to be considered.

Thus , above points concluded from case studies and research gives an overview also would help to achieve aim and objectives to design incubation and innovation centre .

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