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LALITPUR

YOUTH HUB: A HUB FOR INNOVATION

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE

Bachelor's in Architecture

By

BISHAL SUNAR

074/BAE/209

APRIL 2023

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CERTIFICATE

This is to certify that this thesis entitled "Youth Hub: A hub for Innovation" at Baneshwor, Kathmandu submitted by Mr. Bishal Sunar has been examined and has been declared successful for the partial fulfillment of the academic requirement for the completion of the Degree of Bachelor of Architecture.

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DECLARATION

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ABSTRACT

With the changing technologies and scientific advances, people are better exposed with immense opportunities for networking and interaction. Since the covid epidemic, the majority of young people have been jobless and have an inclination for entrepreneurship. Because of this, young people are continuously working to create new things using technologies and scientific advancements. The Youth Hub fills that role. Youth hub are the equipped spaces where the young could develop and practice their creative skills, collaborate, and share ideas with each other and test their ideas both in their free time and in the context of work, business, and entrepreneurship.

The purpose of this thesis is to give such young people access to working environments, spaces for entrepreneurship, and spaces to invent new things. This thesis looks at how architecture can assist create environments where young people can innovate more easily. It emphasizes on the crucial elements of flexibility, connectivity, cooperation, and communication that are necessary for innovation.   This proposal contains the makerspace, incubator, and coworking spaces that young people need for innovation and business, as well as areas where they can get some refreshment.

Thus, Youth hub is a space which will cater to the youths that are currently in pursuit of starting something new but are lacking the means and space to do so. This project will provide the youth with place to share ideas, work and come up with something new, test those ideas and learn to test those ideas.

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1 INTRODUCTION

While our world is changing exponentially with new technologies and scientific advances, we believe society's response to them is stunted by embracing the myth that Youth are a problem and lack the capacity to lead effectively. It poses a great threat to our security and prosperity. If we simply flip our lens to view Youth as a premier asset class or as energy to harness, imagine how much more we, as a global community, would be adept in solving the greatest social and systemic challenges of our time. (Authority, n.d.) 41% of the population in Nepal are between ages 15-35 (GROUP, Empowering Adolescents And Youth In Nepal As Partners In Innovation For Development, 2021). They are educated, energetic, and diverse. They are hungry for jobs, for community and for opportunity to actualize their purpose as human beings. Part of this purpose must be attained through meaningful employment. The other, through connection. To others in activities of significance - and to themselves. With the fast-changing global economy and our systems on the brink of major development and disruption, we don't have the time to wait for young leaders to turn 40. We must empower and engage them now. Youth have the raw materials, fresh ideas, and moldable talents to usher in the innovations and creative solutions to the challenges that they and our societies face every day - and those future generations will also face (Authority, n.d.).

YOUTH is best understood as a period of transition from the dependence of childhood to adulthood's independence. That's why, as a category, youth is more fluid than other fixed age-groups. Yet, age is the easiest way to define this group, particularly in relation to education and employment, because 'youth' is often referred to a person between the ages of leaving compulsory education and finding their first job. The United Nations, for statistical purposes, defines 'youth', as those persons between the ages of 15 and 24 years, without prejudice to other definitions by Member States (UNDESA).

The central and most active part or place is called as hub (Dictionary, n.d.). The Youth Hub is a home for Youth to connect them to people (Authority, n.d.). Youth hub are the equipped spaces where the young could develop and practice their creative skills, collaborate, and share ideas with each other and test their ideas both in their free time and in the context of work, business, and entrepreneurship. Basically, it is a place for youth to share, learn and test ideas mainly for entrepreneurs who are startup. It includes spaces like coworking for sharing, innovation center for learning and testing ideas. Students who are interested in learning about fabrication from any field including engineering, arts, IT, architecture can learn from here. A youth hub is a physical space where rural youth can come together for various activities, such as skill trainings, discussions, access to resources and more. Through youth groups, young people are connected to the hubs to access capacity-building services for better employment and entrepreneurship.

1.1 NEED IDENTIFICATION

As an increasing number of youths are engaged in start-ups and new business ventures, the demand for workspaces is growing rapidly. A sharing and working platform are needed for the youth at present who are in search of a platform to be creative and innovate something new. A facility which will provide a platform where young entrepreneurs can collaborate, think of something new and test their ideas and learning

youth can get training programs is needed. A space that will give Nepali Youth (students, entrepreneurs, and citizens) access to modern tools to design, build and manufacture just about anything is required. Youth of Nepal has passion for making things. It is necessary to encourage entrepreneurship by providing a technology-centered space where young Nepali innovators and entrepreneurs can explore and develop a culture of creating and nurture peer-to-peer learning in an informal setting. The space which includes new technology, including 3D printers and laser cutters. This space will help to unlock people's imagination, ideas, economic opportunities, and entrepreneurship in Nepal. Not only this they also require a platform for supporting the growth in field of entrepreneurship.

However, there are not enough of these resources available right now to support entrepreneurs who are starting out. There are no such facilities where they can test their products and prototype them in a small scale.

Thus, this thesis research can help young startups and students from any field provide with a space to learn something and test their ideas without any limits.

1.2 IMPORTANCE OF THE RESEARCH

- To develop the report and set as a reference for future generation for this kind of research work.
- The hub can be an impactful project for the youth of our community who are in constant search of opportunities and innovative ideas.
- To help youth unleash their entrepreneurial and leadership potential and the next generation of changemakers.

1.3 PROBLEM STATEMENT

There are not many facilities targeted solely for interaction and collaboration between the youths. Also, the space provided for the youth lack the consideration to the spirit of youth and environment they desire. Those which are present are mostly in a residence turned buildings and are not of national scale. Also, there are no facilities that has for cheap workspaces, business support facilities, digital fabrication, and training in a single setting. Thus, a space that can address those issues is required at present context.

1.4 OBJECTIVE

- To provide a platform for sharing, testing, and learning for startups.
- To explore various strategies and design language in development of innovative and collaborative spaces.
- To create an architectural space which focuses on entrepreneurial and leadership potentials.

1.5 METHODOLOGY

The project will be oriented to meet the requirements for the completion of bachelor's degree in architecture. Although it is an academic requirement, it will be based on ground

reality. To get the right results, it is necessary to follow systematic procedures and methods. For this, data, and information from several sources were collected, analyzed and the ones suitable were incorporated in design.

According to the nature of the project following methodologies will be applied to come up with the final design.

1.5.1 PRIMARY SOURCES

- Observation
- Survey
- Case Studies
- Interviews
- Questionnaires

1.5.2 SECONDARY SOURCES

- Internet
- Books/ Journals
- Library records
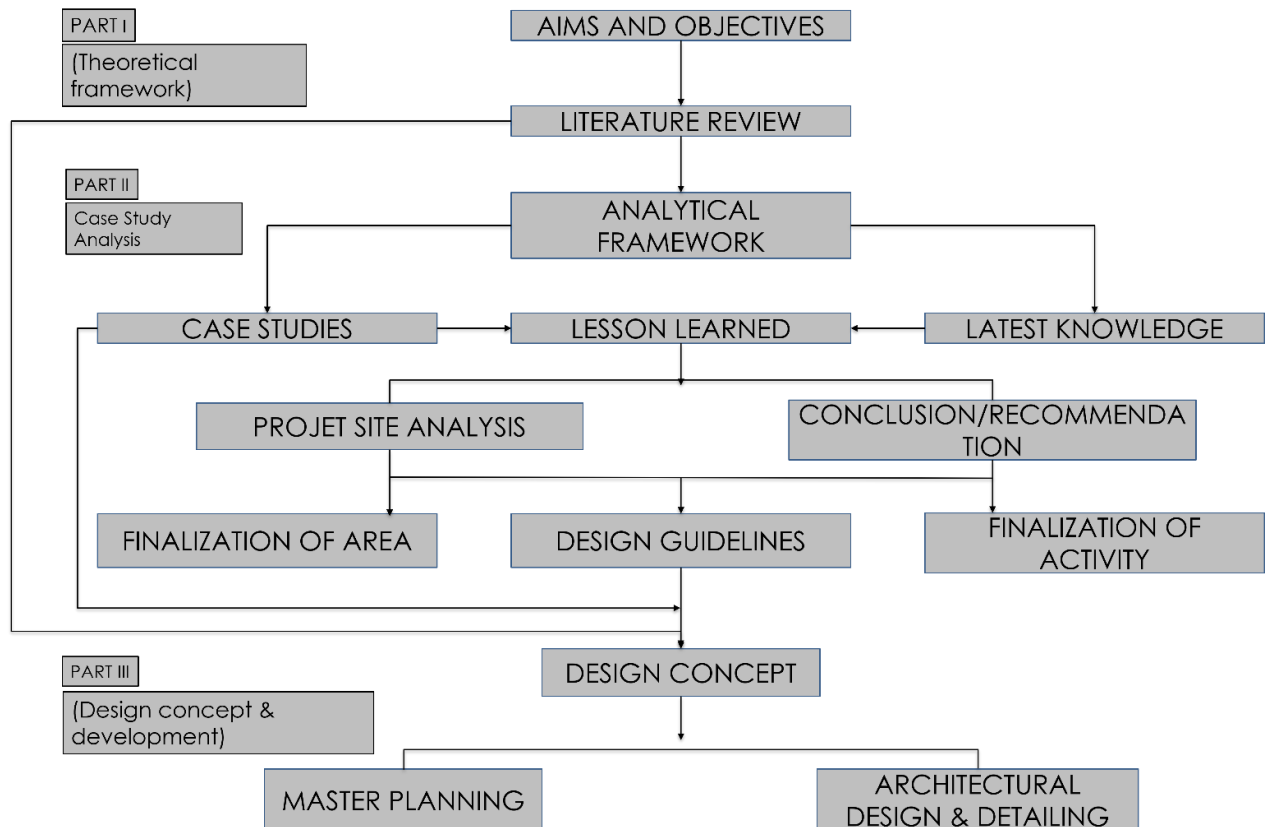
Figure 1 Research Methodology Flowchart

2 LITERATURE REVIEW

2.1 YOUTH

'*YOUTH*' is best understood as a period of transition from the dependence of childhood to adulthood's independence. That's why, as a category, youth is more fluid than other fixed age-groups. Yet, age is the easiest way to define this group, particularly in relation to education and employment, because 'youth' is often referred to a person between the ages of leaving compulsory education and finding their first job.

The United Nations, for statistical purposes, defines '*youth*', as those persons between the ages of 15 and 24 years, without prejudice to other definitions by Member States (United Nations Department of Economic and Social Affairs [UNDESA],2008).

Different countries have defined the youth age in different ways. From the viewpoint of physical and mental development, youth denote the age group falling between the state of adolescence and adulthood. This is the most active, energetic, and dynamic group. A look at the experience of various countries of the world also shows that the age group of the youth seems to be different. In most of the countries the youth age has been fixed in between 15 to 35 years whereas international organizations like the United Nations and the World Bank have considered the age group of 15 to 24 years as of the youth. In the context of uniformity yet to be introduced regarding the growth age group in different bodies of Nepal Government, " Youth Vision-2015" has classified it into two age groups of 16 to 24 years and 25 to 40 years and the group wise priorities have been determined accordingly (Government of Nepal [GoN],2015).

Table 1 DEFINITIONS OF YOUTH

Entity/Instrument/ Organization	Age	Reference
UN Secretariat/UNESCO/ILO	Youth: 15-24	UN Instruments, Statistics
UN Habitat (Youth Fund)	Youth 15-32	Agenda 21[7]
UNICEF/WHO/UNFPA	Adolescent: 10-19, Young People: 10-24, Youth: 15-24	UNFPA[8]
UNICEF /The Convention on Rights of the Child	Child until 18	UNICEF[9]
The African Youth Charter	Youth: 15-35	African Union, 2006[10]

2.2 PRESENT STATUS OF YOUTH IN NEPAL

Nepal has been placed at 145 in the world youth development indicator. Even if compared to South Asian countries, the youth development indicator of Nepal seems to be the weakest. Even though the ratio of fully unemployed youth in Nepal has been shown merely as 2.3% in the government figures, the ratio of semi employed youth is

about 36%. According to the International Labor Organization, the fully unemployed ratio is 19.2% whereas the semi unemployed ratio is 28.3%. Nearly 36% of the unemployed youth force in Nepal is not connected with economic production and skills. The marginalized, minority, indigenous and physically challenged youth suffer from higher ratio of unemployment. Almost half of the youth labor force is still dependent on agriculture for survival. 7% of the five hundred thousand and 38 thousand youth annually going out for foreign employment are unskilled (GoN, 2015)

'Youth Vision-2025' is a concrete and special strategic work plan formulated with a farsighted approach to materialize the rights, aspirations and needs of the youth. It has internalized the Directive Principle of four 'A' and four 'S'. It has emphasized national spirit, unity, equity, justice, cordiality, inclusiveness etc. required for development of the country. It has placed the issue of preparing responsible youth at the center stage to achieve economic affluence by making extensive involvement in the youth.

Taking into consideration the progress achieved in the youth sector at the international level and the condition of Nepal, "Youth Vision-25" has fixed five strategic Pillars of the youth development in the present times (GoN, 2015).

The Youth Vision 2025 aims in "Making the Nepalese youth strong, competent, competitive and self-reliant, to build a modern, just and affluent Nepal through their meaningful participation and promotion of their leadership capacity." The 5 strategic pillars of the youth development in the present times can be listed below as:

- Quality and Vocational Education
- Employment, Entrepreneurship and Skill Development
- Youth Health and Social Security
- Mobilization, Participation and Leadership Development
- Sports and Entertainment (GoN, 2015)

2.3 PRESENT PROBLEMS AND CHALLENGES BEFORE THE NEPALI YOUTH:

- Lack of equality, time-relevant and employment-oriented education, inaccessibility to vocational skills and technology, goalless,
- Unemployment and semi unemployment,
- Youth escape and political instability,
- Absence of youth friendly investment and environment of entrepreneurship (GoN, 2015).

2.4 PROSPECTS & OPPORTUNITIES FOR THE NEPALESE YOUTH

- Opportunities for meaningful participation in democratic, federal governance system and development,
- Increasing access to economic means and resources through the expanding network of Banks, Cooperatives, and microfinance,

- Quality employment resultant from the development of entrepreneurship and service sector due to progress of quality and professional education,
- Establishment of Conscious Youth and National Youth Council and infrastructure,
- Prospects of increasing foreign investment in Nepal placed in the middle of two big neighboring economies of the world (GoN, 2015).

2.5 YOUTH BULGE

Regardless of how "youth" is defined, most nations, particularly developing and least developed nations, are experiencing what is described as a "youth-bulge." When the proportion of young people in the population is highest on the demographic pyramid, it is a phenomenon. When compared to other age groups, it is when youth are most numerous (Shrestha, 2015).

The youth bulge is a common phenomenon in many developing countries, and, in the least developed countries. It is often due to a stage of development where a country achieves success in reducing infant mortality, but mothers still have a high fertility rate (Inayatullah, 2016).

2.6 YOUTH DEVELOPMENT

A nation with a youth bulge will see a drop in its dependency ratio—that is, the proportion of people who are not working age to those who are—as the young adults reach working age. Other things being equal, the average income per capita should rise if the increase in the number of people of working age can be fully utilized in productive activities. The growing young population presents both benefits and challenges. Therefore, countries have been concentrating more on giving youngsters with enabling environments where they can obtain skills, information, and prepare for their lives to protect a country from social turmoil and produce capable and responsible citizens. The phrase "youth development" was coined in reference to this phenomenon (Shrestha, 2015).

Youth development means purposefully seeking to meet the needs of youths and build competencies that enable them to become successful adults. It means growing and developing skills and attitudes young people need to take part in society, now and in future. It is about young people gaining a:

- Sense of contributing something valuable to society.
- Feeling of connectedness to other and to society.
- Belief that they have choices about their future.
- Feeling of being positive and comfortable with their own identity (Shrestha, 2015).

Every child has talents, strengths, and interests that offer the child potential for a bright future. The field of positive youth development focuses on each child's unique talent, strengths, interests, and future potential (DAMON, 2001).

Understanding adolescent development and the factors contributing to the healthy development of all young people is critical to the design and implementation of programs

for youth. Consequently, the committee began its work by identifying a set of personal and social assets that increase the healthy development and well-being of adolescents and facilitate a successful transition from childhood, through adolescence, and into adulthood. We can group these assets into four broad developmental domains:

- physical
- intellectual
- psychological
- emotional and social development (Council & Institute, 2001).

2.7   HISTORY OF YOUTH HUB

After the Second World War youth workers and educators became worried about the negative influence of the leisure industry on the moral development of young people. A so-called third educational environment (along with the family and school) was designed to protect youth in their leisure time. The emerging generation were thought to need protection from a mentality of consumption and a commercialized leisure industry. Different uniformed organizations were formed to protect youth which led to the youth movements. The number in the youth member rise rapidly during the two world wars. Only members of the youth movement were presented to add value to the youths and others not. Thus, all other organizations were considered under category of unorganized.

Nevertheless, new youth work forms were intended to reach the so-called "intangible young people". In the 1950s and early 1960s, youth center work was championed. It was considered as "youth work par excellence" for the unorganized in Flanders. The first youth center was founded by the Young Women's Christian Association (YWCA) in Antwerp.

This new form of youth work could soon count on official recognition and support in Flanders. In 1958, the National Youth Council drew up an inventory of all youth center initiatives and formulated criteria for the support of youth centers. The National Youth Council organized study visits to youth centers in France, the Netherlands and Germany. In 1960, the first youth centers were supported by the Ministry of Public Education (Faché).

Youth professionals argued in favor of comprehensive youth information centers in numerous nations in the late 1960s to address young people's information needs because of the following scenario:

Our complex society provides a wide range of options and opportunities. To grasp what is accessible and how to use the services that are available in contemporary society, young people need information and support. We occupy an era of information. Even though there is a ton of information available, it is typically prepared or presented in a way that this is challenging to comprehend and not always useful to new members, visitors, or participants in the society. Additionally, the information is very dispersed among several organizations and services (Faché).

The local youth department built a youth information center based on this rationale in Hilversum (Netherlands), *Jongeren informatie centrum*, as well as Munich (Germany), The Center for Youth Information. On the same principle, in Paris was also founded in 1969. It was the initial. A hub of a network of 25 centers spread across France. The

French Ministry of Foreign Affair's initiative in Youth and Sports responded to the revelation made in a 1967 national study of youths that there a requirement for a thorough information hub where children "can find information" on any aspect of their lives that may be relevant (Faché).

AFTER 2ND WORLD WAR
- Third educational environment
- Youth movement
- Only youth movement members adding value

1950S AND EARLY 1960S
- youth work par excellence for the unorganized

1960
- the first youth centers were supported by the Ministry of Public Education in France, the Netherlands and Germany

1967
- The local youth department built a youth information center in Netherlands and Germany

1969
- On the same principle, in Paris was also founded

1969
- A hub of a network of 25 centers spread across France

Figure 2 History of Youth Centers Around The World

2.8   HISTORY OF YOUTH WORKS IN NEPAL

Along with a lack of economic possibilities, political unrest, and globalization, more than 1500 teenagers seek employment abroad every day. More than 90% of people who seek employment abroad are unskilled or only somewhat skilled. When you consider the difficult situations facing young people in Nepal, you can see that the government is making some steps to help. Below are some of these initiatives:

- National Youth Policy 2010
- Youth and Small Enterprise Self-Employment Fund (YSESEF)
- Yuwa Sajhedari Karyakram
- Government training
- Pratibha Samman Puraskar

2.9   THIRD SOCIAL ENVIRONMENT

According to the Dutch youth sociologist Van Hessen (1964) as cited by Willy Fache, family, school, and work are domains in which a major part of youth life takes place. Next to, if not exactly opposed to these domains, the young person maintains and cultivates a proper domain, designated by Van Hessen as the "third" social environment. Inform young people about the global, national, and local issues and concerns that affects their everyday living. Empower young people by organizing them into a group of critical mass, increasing their access and control over resources (Faché).

The youth center may, for some young people, fulfil the function of an environment in which they have the possibility to "be young together". This environment is the place par

excellence "to be young together". There is no dominance of older people as there is in the family or school. A youth center is predisposed to have various functions, but the staff, the interest shown by young people, the infrastructural possibilities and so on determine to what extent this predisposition can develop (Faché).

- initiation in leisure activities and qualified assistance in deepening of certain activities.
- mastery of certain skills and knowledge as required by many leisure activities (for example, photography, nature exploration, playing the guitar, recreational sports, and so on). A youth center may offer the possibility to acquire these necessary skills and knowledge under qualified supervision.
- space and material facilities for entrepreneurial young people.
- the possibility, for instance, to repair a moped, to construct a radio or a go-cart, to develop and enlarge self-made photographs, to exhibit paintings or sculptures, etc.
- provision of information and assistance to young people (Faché).
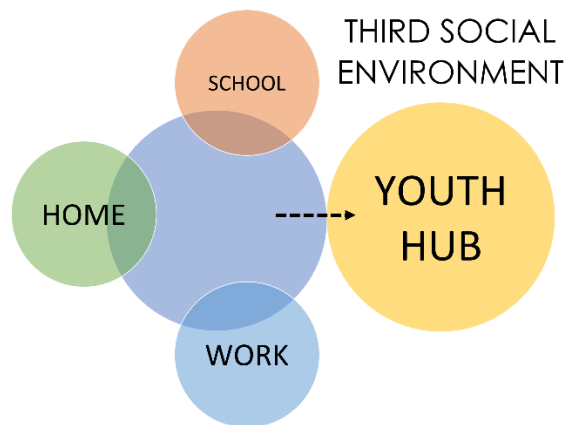
Figure 3 Youth hub as Third Social Environment

2.10 YOUTH HUB

2.10.1 USER GROUP

The user of the project can be categorized under three categories based on nature of the users which can be shown in the figure below.
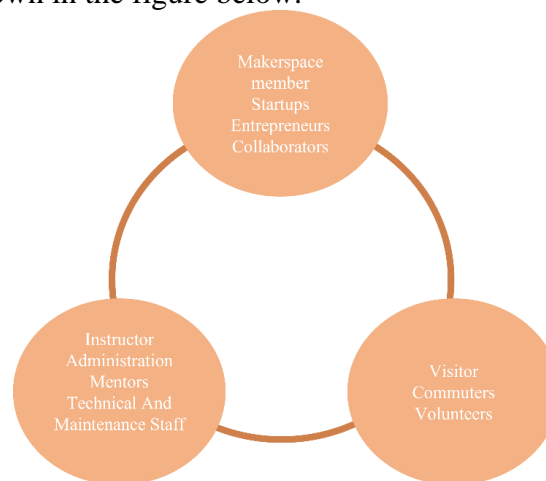
Figure 4 User Group

2.10.2 DESIGN COMPONENTS
The components of this project can be seen from the chart below:
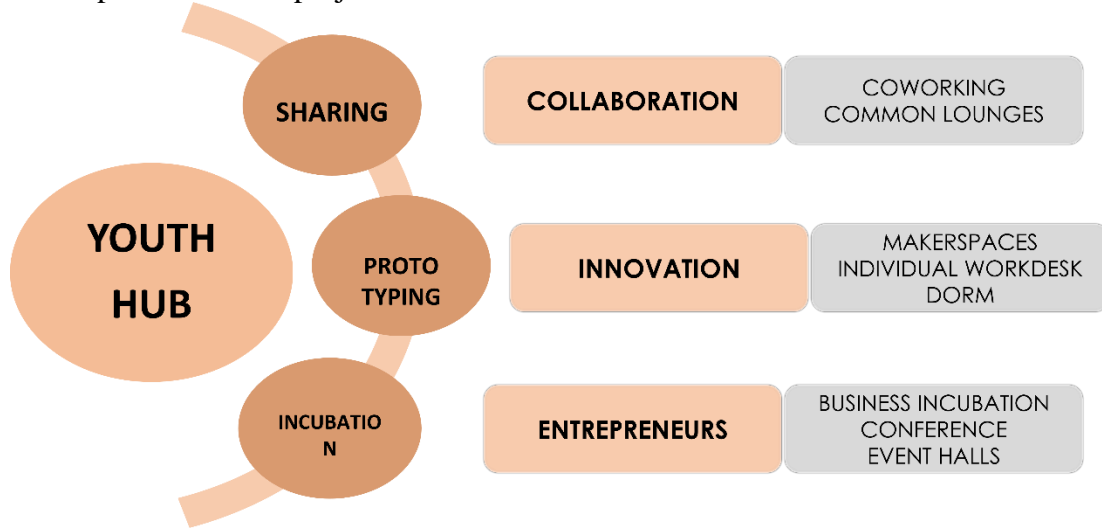
Figure 5 Design Components

2.10.3 USER DISCIPLINE
The users will focus mainly on these fields and the design has been done accordingly.
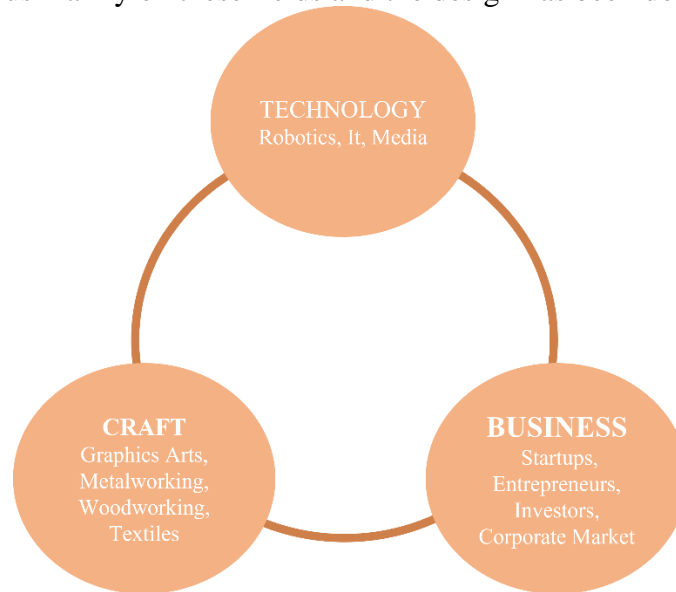
Figure 6 User Group

Technology: Robotics, It, Media
Craft: Graphics Arts, Metalworking, Woodworking, Textiles
Business: Startups, Entrepreneurs, Investors, Corporate Market

2.11 INNOVATION

Innovation is a process by which a domain, a product, or a service is renewed and brought up to date by applying new processes, introducing new techniques, or establishing successful ideas to create new value. The creation of value is a defining characteristic of innovation (AG, n.d.). 'Innovation' is a concept filled with tension and

one that has various applications. Innovation is considered a key factor for growth, which implies an expectancy of deliverance within the use of the term. Innovation is argued to not just coming up with something new (that is invention); it also involves the introduction of the new (Schaeffer, 2014). The practical implementation of ideas that result in the introduction of new goods, services, or the method by which those goods and services are offered (bond collective, n.d.).

2.11.1 INNOVATION SPACES

Innovation Spaces are considered "spaces that strengthen interactions, communication, and collaboration; and spaces that are open, transparent and contextually responsive." As stated by an architect: "Innovative spaces do not dictate or restrict process and creativity, but instead open new ways of communication and sharing and lead to new and exciting ideas". The changing nature of innovation is transforming spaces into open, flexible spaces where separate professions and disciplines easily converge (Carrese, 2020).

2.11.2 FIVE STEPS TO INNOVATION
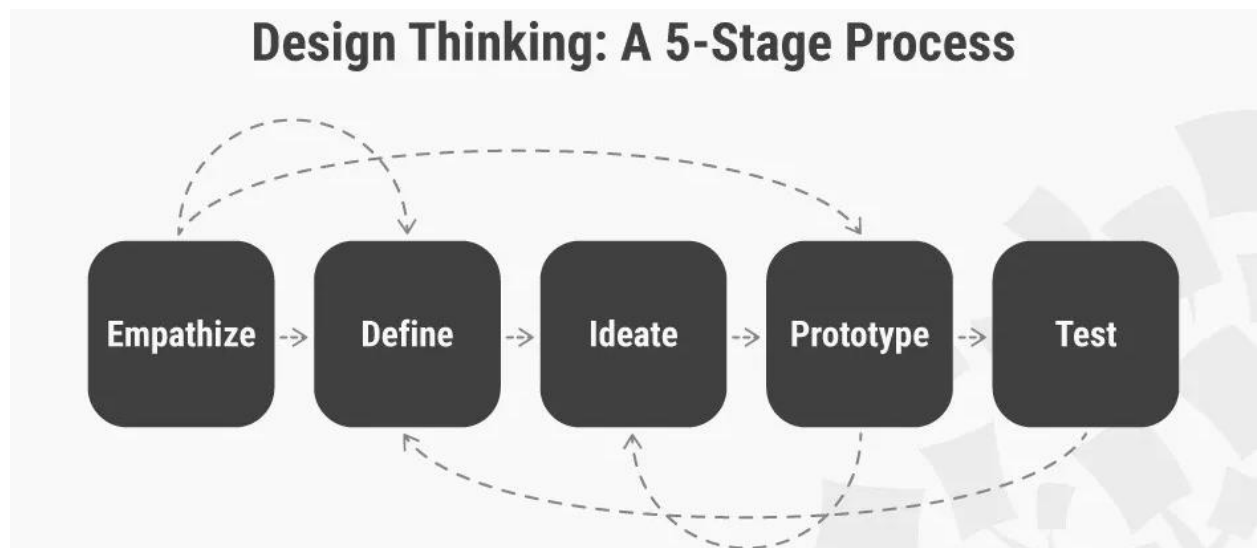
Figure 7 Design Thinking (Siang, n.d.)

Figure 8 5 Stages of Design Thinking (Siang, n.d.)

2.11.2.1 STAGE 1: EMPATHIZE—RESEARCH YOUR USERS' NEED

User-centric research is the focus of the first stage of the design thinking process. It's important to develop an empathic grasp of the issue you're trying to resolve. Since it enables design thinkers to put aside their personal viewpoints and obtain genuine insight into users and their requirements, empathy is essential to problem solving and a human-centered design process.

2.11.2.2 STAGE 2: DEFINE—STATE YOUR USERS' NEEDS AND PROBLEMS

You will arrange the data you gathered during the Empathize step in the Define stage. To characterize the main issues that you and your team have so far found, you will analyze your observations. The Define stage will assist the design team in gathering excellent ideas to establish features, functions, and other elements to address the current problem—or, at the very least, make it as simple as possible for actual users to solve problems on their own.

2.11.2.3 STAGE 3: IDEATE—CHALLENGE ASSUMPTIONS AND CREATE IDEAS

Designers are prepared to come up with ideas at the third stage of the design thinking process. In the Empathize stage, you developed an understanding of your users and their needs. Then, in the Define step, you examined your observations to produce a user-centric problem statement. With this strong foundation, you and your team may begin to consider the issue from several perspectives and come up with creative solutions to your problem statement.
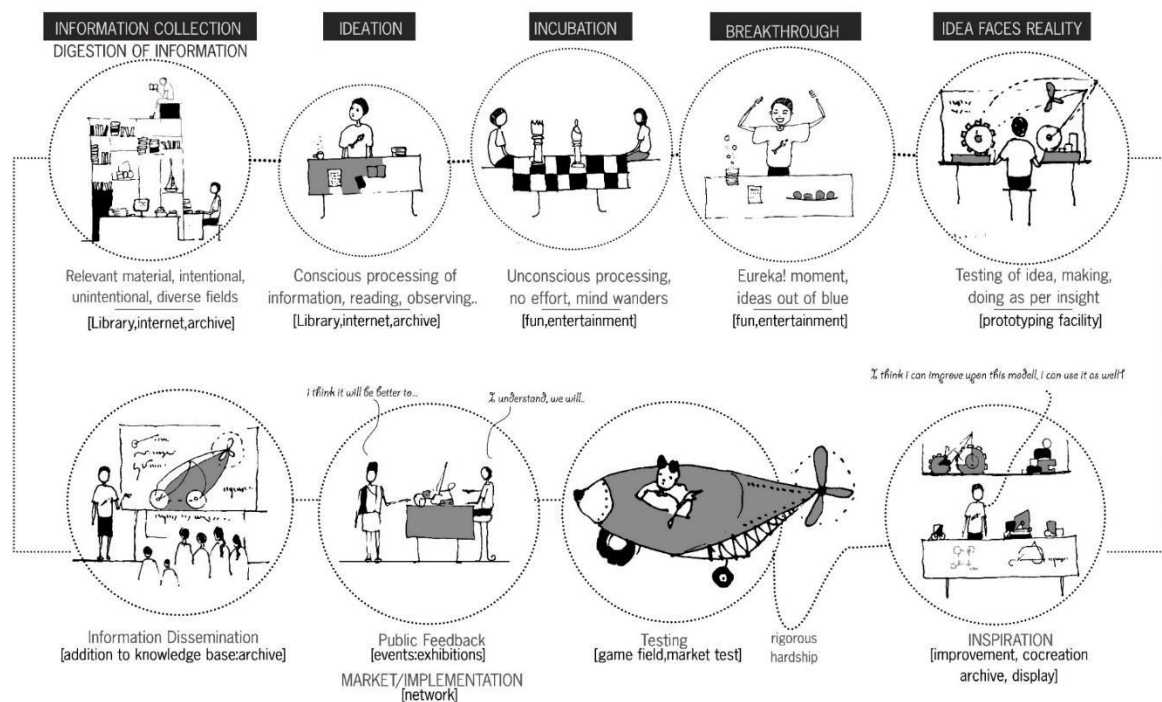
Figure 9 ILLUSTRATION OF YOUNG'S 5-STEP IDEATION PROCESS

2.11.2.4 STAGE 4: PROTOTYPE—START TO CREATE SOLUTIONS

Now, the design team will create several low-cost, scaled-down iterations of the product (or aspects present in the product) to research the primary solutions conceived during the ideation stage. In this experimental stage, which follows the first three, the goal is to find the best solution for each of the issues that were discovered.

2.11.2.5 STAGE 5: TEST—TRY YOUR SOLUTIONS OUT

Using the greatest options found in the Prototype stage, designers or evaluators thoroughly evaluate the entire product. The five-stage model's final stage, although in an iterative process like design thinking, the outcomes are frequently utilized to redefine one or more additional challenges. This deeper degree of comprehension might enable you to investigate the circumstances of use and how users interact with the product. It might even prompt you to go back to an earlier step in the design thinking process (Siang, n.d.).

2.12 COLLABORATION

The situation of two or more people working together to create or achieve the same thing. Collaboration working together, rather than alone interests an increasing number of people in human services, government, and community organizations. Collaboration results in easier, faster, and more coherent access to services and benefits and in greater effects on systems. Working together is not a substitute for adequate funding, although the synergistic efforts of the collaborating partners often result in creative ways to overcome obstacles. Collaboration is a mutually beneficial and well-defined relationship entered by two or more organizations to achieve common goals (PRESS, 2002).

2.12.1 FACTORS AFFECTING COLLABORATION
2.12.1.1 ENVIRONMENT
- History of collaboration or cooperation in the community
- Collaborative group seen as a leader in the community.
- Political/social climate favorable

2.12.1.2 MEMBERSHIP
- Mutual respect, understanding, and trust.
- Appropriate cross-section of members
- Members collaboration as in their self-interest
- Ability to compromise.

2.12.1.3 PROCESS/STRUCTURE
- Members share a stake for both process and outcome.
- Multiple layers of decision-making
- Flexibility
- Development of clear roles and policy guidelines
- Adaptability

2.12.1.4 COMMUNICATIONS
- Open and frequent communication
- Established informal and formal communication links.

2.12.1.5 PURPOSE
- Shared vision
- Unique purpose

2.12.1.6 RESOURCES
- Sufficient funds
- Skilled convener (PRESS, 2002)

2.13 DIMENSIONS OF INNOVATION SPACES

There is little research on how physical space facilitates creativity and innovation. This relationship is clarified by Oksanen and Sthle's (2013) study, which identifies aspects of physical environment that encourage innovation as cited by Lavinia Carrese.

In fact, a physical place not only supports innovation but also reflects its evolving characteristics, such as openness, collaboration, sustainability, and wellbeing. There are five traits of innovative spaces that support innovation: Collaboration and Communication Enabling spaces, Modifiable space, Intellectual spaces, attracting spaces and Value reflecting spaces. (Carrese, 2020)

2.13.1 COLLABORATION AND COMMUNICATION ENABLING SPACES

For what regards collaboration and communication enabling spaces, innovation is viewed as a social process consisting in an ideal working environment that enables fruitful interaction between different actors.

2.13.1.1 MAKING COLLABORATION AND COMMUNICATION ENABLING SPACES

When we consider the kinds of interactions, and the language we use, in large spaces versus in small, intimate ones, we notice that large spaces don't typically promote intimate conversations where people take turns talking in a relatively equal relationship. Large, indoor spaces are usually places where one person or group actively "communicates" and others, the "audience," listen and respond at certain predictable, well-known, socially sanctioned points—these spaces can become more for performing than for conversation.

Contrast the communication fostered, expected, or encouraged in large spaces with the experience of communication in a small, intimate space, where communication is reciprocal (Ronch).

One of the challenges for companies as they seek to encourage collaboration is how to balance "me" vs. "we" space in the workplace, said Tom Price, principal architect at Strada Architecture in Pittsburgh. His firm has created innovation spaces for a variety of companies, including Google's Pittsburgh office. Although increasing collaboration has become a ubiquitous goal among forward-thinking companies, he said companies must be careful not to be overly invasive in encouraging it (Coester, 2017).

Collision — These are well-placed public areas where people can get food and drinks and mingle when they cross paths. According to Price, these kinds of places help people get through their days by enabling them to unwind, recharge, and connect whenever it suits their schedules. Additionally, these spaces for creativity should offer a setting that is unique from the rest of the workplace (Coester, 2017).

Mixed-use — Users can approach their work in a creative way thanks to furniture clusters and rooms that are mixed-use, mixed-scale, and mixed-personality. Living rooms with a homey feel or "maker" spaces that resemble workshops "inspire nontraditional modes of meeting, sharing, breaking and testing," according to Price. These adaptable spaces give users the ability to change the environment to suit their specific needs (Coester, 2017).

Huddle — Despite the fact that collision spaces are frequently the main forces behind the culture of collaboration, Price noted that these spaces "rarely provide the distraction-free focus space critical for thinking through problems and innovating." Small huddle spaces with a variety of screens, whiteboards, and flexible seating options support both solo "me time" tasks and small group brainstorming sessions (Coester, 2017).

2.13.2 MODIFIABLE SPACE

Modifiable spaces imply that innovation requires flexibility in carrying out activities that allows that same space to change and serve very diverse purposes at different times. It should be designed to fulfil and respond to varying needs of users.

2.13.2.1 THINK AHEAD

Make sure to design new school buildings with a purpose in mind and with multiple uses of the space in mind. For instance, when lunch isn't being served, can a cafeteria also serve as an auditorium? Could a foyer double as a classroom in a school?

Texas' Eugene Kranz Junior High School has a library that is in the school's foyer. Along the main hallway of the school, bookcases are arranged in tidy rows. Students can relax in soft seating with built-in electrical outlets while reading or just hanging out and chatting. It's not unusual to see students seated at tables in café-style settings working on computers or on group projects.

This multipurpose design makes the library a key focal point of the school in addition to saving space. Students are more likely to stop by and use the resources of this interactive space because they pass it on their way to class (Highland, 2022).

2.13.2.2 USE OPEN, COLLABORATIVE SPACES

Limit the use of interior walls in school spaces to encourage maximum flexibility. Large, open areas are simpler to change or reorganize for various uses.

Instead of using walls to delineate interior spaces, think about using partitions, panel systems, acoustic dividers, sliding or retractable walls, or mobile furniture. Acoustic walls or partitions can be used to quickly create the various configurations you need in a room while also providing privacy and aiding in sound absorption (Highland, 2022).

2.13.2.3 CHOOSE MODULAR AND MOVABLE FURNITURE

Moveable furniture, such as the Classroom Select Neo Shape Markerboard Desk and Classroom Select NeoRok Active Wobble Stool, can be quickly reconfigured to support various group sizes or activities. Other furniture, such as the Classroom Select NeoRok Active Wobble Stool, is designed to slide on any surface. Even a large space, like a media center, can be divided into smaller spaces by removing built-in casework. It also reduces the cost of construction (Highland, 2022).

2.13.2.4 CONSIDER PORTABILITY AND VERSATILITY

Not just tables, desks, and chairs should be simple to move. Greater flexibility is possible thanks to portable visual aids like this Classroom Select Mobile Markerboard, which can quickly transform hallways and common areas into engaging learning environments. These can be applied in a versatile learning environment both inside and outside. Consider ideas outside of the classroom's confines.

The adaptability of school spaces is further increased by multipurpose furnishings like tables with built-in storage and writeable desktop surfaces (Highland, 2022).

2.13.2.5 THINK ABOUT TECHNOLOGY INFRASTRUCTURE

Today's designers and K–12 leaders must think about how to provide power to students (and teachers) wherever they may need it to support flexible learning environments.

For instance, you could order furniture with electrical outlets built into the tabletops, underneath the desks, or inside the seats. Alternatively, you could use portable power strips or outlets to instantly bring power wherever it's needed. By using this Classroom Select Clamp-On Power Module, K–12 administrators can affordably add power to already-existing tabletops (Highland, 2022).

2.13.3 INTELLECTUAL SPACES

Intellectual spaces are supposed to be connected to specific key technologies, according to this theory. Smart objects can cooperate in these intelligent environments to facilitate user interaction. The technology of visual and radio sensing systems or augmented reality are two examples (Schaeffer, 2014).

2.13.4 ATTRACTING SPACES

Moreover, this space should be Attracting since interesting spaces attract interesting people. Innovation Spaces must make people feel comfortable and willing to stay there (Helleman, 2017).

2.13.4.1 ACTIVITIES

There are several ways to transform a place into a destination. That starts with the simple rule that there is something to do. People go somewhere because there is an activity. Because there is something to experience. These collective forms of use can be of a structural nature, such as shops, restaurants, cafes, bowling/pétanque track, sports field, play and climbing attributes (Helleman, 2017).

2.13.4.2 ARCHITECTURE

It is important that there is a good interaction between the buildings, the outdoor space, and the users. The design of the surrounding buildings can play an important role in determining the attractiveness of the space (Helleman, 2017).

2.13.4.3 ACCESSIBILITY

A space that is not easy to reach is already in a disadvantage. Accessibility is also about the pass ability for people with physical disabilities. People with a walker or wheelchair must also be able to reach the spot easily. The same goes for parents with prams and baby buggies (Helleman, 2017).

2.13.4.4 COMFORTABLE

The perception of comfort is subjective. Nevertheless, there are some things that can affect this positively. Comfort is for example influenced by the things you see around you, by the diversity in colors, whether it's clean, safe and secure and whether there is enough seating. Here it is about people feeling welcome. Feeling pleasant in both the public space and the way to it (Helleman, 2017).

2.13.4.5 DIVERSITY

Monotonous and monofunctional places are a lot less attractive than places where you can do a lot of different things. A business park is often extinct after working hours. And on the street in a residential area, it is quiet during office hours. Mixed use has a positive impact on the diversity of users and the times of the day and week in which the

public space is used. Diversity can also be achieved by offering sufficient activities, diversity in color (Helleman, 2017).

2.13.5 VALUE REFLECTING SPACES

Lastly, Value Reflecting spaces suggest that Innovation Spaces can be viewed as a continuation of one's identity, providing a message or story about the organization. It should support the firm's values and company culture to inspire people (Carrese, 2020).

2.13.5.1 SHOWCASE YOUR COMPANY CULTURE IN DESIGN

Let the culture of your business inform your interior design. If you have a small, close-knit team that enjoys nerdy hobbies, don't be afraid to set up a gaming area where they can hang out and talk. If your workplace is a retreat for creatives and artists, adorn it with works of art and inspirational sculptures (Rabin, 2019).

2.13.5.2 MAKE A GRAND GESTURE

Every space needs a center of attention that will draw people in and pique interest in everyone who enters. Just look at Google or Epic, both of which have large slides and themed hallways that are representative of their brands and corporate cultures. For instance, you could hang posters of your core principles in the hallways, set up a screen to show success stories, or greet each person who enters with a carefully crafted message. You'll increase loyalty and draw in new employees if you have inspired employees and delighted clients (Rabin, 2019).

2.13.5.3 SHOW OFF YOUR BRAND VALUES

This has to do with what your brand stands for. If you value a sense of community and family, think about incorporating family-friendly architecture and parent-only spaces. However, if you value fun and variety, you might consider adding game rooms and community spaces. No matter what you do, always remember to put your words into action. Don't claim to value your clients and staff while offering them no benefits; this creates a terrible impression (Rabin, 2019).

2.13.5.4 IMPROVE OFFICE EXPERIENCE

Do not separate your space into cubicles and closed offices if you want to convey a feeling of collaboration and unity. Instead, opt for an open design with movable partitions that promote collaboration while still ensuring the necessary discretion for some tasks. Consider what will make it possible for your staff and customers to feel at ease and content when they enter your establishment (Rabin, 2019).

2.13.6 ENTREPRENEURSHIP

Entrepreneurship is the act of creating a business or businesses while building and scaling it to generate a profit. But as a basic entrepreneurship definition, that one is a bit limiting. The more modern entrepreneurship definition is also about transforming the world by solving big problems. Like bringing about social change or creating an innovative product that challenges the status quo of how we live our lives daily. Entrepreneurship is what people do to take their career and dreams into their hands and lead it in the direction they want. It's about building a life on your own terms. No bosses. No restricting schedules. And no one holding you back. Entrepreneurs can take the first step into making the world a better place – for everyone in it, including themselves (Ferreira, 2021).

2.13.6.1 CHARACTERISTICS OF ENTREPRENEURSHIP:

Not all entrepreneurs are successful; there are definite characteristics that make entrepreneurship successful. A few of them are mentioned below:

- Ability to take a risk.
- Innovation
- Visionary and Leadership quality
- Open-Minded
- Flexible
- Know your Product (byjus, n.d.)

2.13.6.2 ENTREPRENEURS

An entrepreneur is a person who sets up a business with the aim to make a profit (Ferreira, 2021).

2.13.6.3 STARTUP

A startup company, or more commonly referred to as startup, is an entrepreneurial venture generally considered to be a newly emerged, but fast-growing business. The primary trait of startups is that their business plans are made to quickly transform into scalable company plans. Its status as a startup is therefore just a passing one. Scalability is the ability to grow and produce revenue growth while keeping operating costs to a minimum. It could seem straightforward to reduce costs while growing in the setting of immaterial production, such as social services and internet innovation. However, as startups attempt to expand swiftly, the increased hiring of knowledge employees in a growing business result in growth expenditures. As the phrase gained international traction during the dot.com bubble, startups are nowadays frequently associated with cutting-edge technology, including the internet, communication, robotics, etc. (Commons, n.d.)

2.13.6.4 STARTUP DEVELOPMENT PHASE
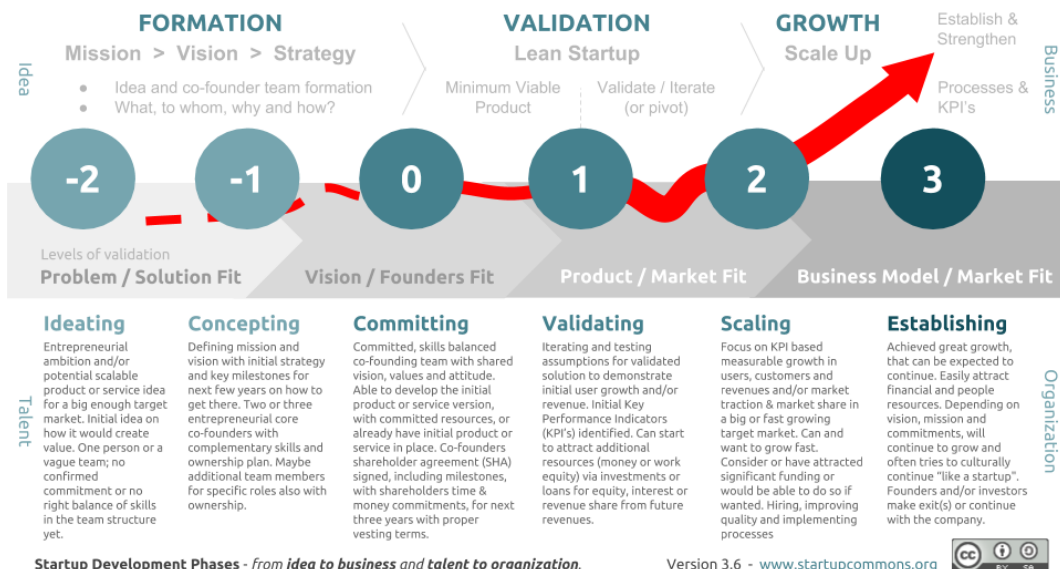
Figure 10 STARTUP DEVELOPMENT PHASE (Commons, n.d.)

2.14 SPACES TO CONSIDER DESIGNING FOR STARTUP

2.14.1 OFFICE LAYOUT

The layout of an office for a young company may differ from that of a corporate office depending on the organizational structure. Most start-ups have a flat structure. Offices with an open floor plan are ideal for startups with no organizational hierarchies. The office will have a mix of private and open workspaces, and employees will be able to work from whichever area/corner they prefer (Pass, n.d.).

While chalking out a layout, the designer needs to consider the shape and size of the office space, with flexibility being the key to success. Open offices have taken the front seat as more and more companies, both startups and traditional, prefer a horizontal structure. Common spaces today are the core of any startup office. A few dedicated areas, demarcated as distraction-free zones, help during those crucial early stages of the business (Rao, 2016).

2.14.2 COLLABORATIVE SPACES

Collaboration is key to the success and growth of both young and mature companies. Start-ups, on the other hand, benefit from an office space that promotes collaboration, such as shared offices. In addition to workstations and meeting rooms, coworking spaces typically have common areas, lounges, kitchens, and breakout zone where members can socialize. Such a collaborative environment enables young companies to build their social capital and form fruitful partnerships.

2.14.3 FURNITURE

Startups undergo rapid changes in terms of their furniture and space. If the workforce is mobile, then it is advisable to go for the concept of flexi-seating, which helps in getting rid of unwanted square feet. Keeping the young workforce in mind, the mantra should be to devote less space to bulky desks, and more to collaborative or breakout areas. Use versatile and multipurpose furniture, as space is often an issue in startup offices (Rao, 2016).

2.14.4 COLORS

Startups are usually a young, vibrant, and innovative places to work. Colors act like an important missing piece, which, when found, can complete the puzzle. The right shade and hue can be used as a powerful element to reflect the energy of the workforce. opt more for primary colors, graphics, and art murals – they make the place vibrant and livelier. The color on the walls should enhance the brand image of the organization (Rao, 2016).

2.14.5 LIGHT, VENTILATION, AND SUSTAINABLE ELEMENTS

Light and ventilation are often ignored while designing a space. Proper air circulation and maximum use of natural light will make the space look brighter and boost employee productivity. It has been scientifically proven that proper light and ventilation benefits our psychology, thus enhancing human performance. Along with proper light and air circulation, going green is something that every startup should consider (Rao, 2016).

2.15 MAKER MOVEMENT

The maker movement is a cultural trend that values an individual's ability to be both a creator and a consumer of things. Individuals who create things are referred to as "makers" in this culture. Makers come from all walks of life and have a wide range of skill sets and interests. They all share creativity, an interest in design, and access to tools and raw materials that enable production. The rise of makerspaces – community centers where makers can go to access tools that would otherwise be inaccessible or unaffordable – is often credited with the growth of the maker movement. Peer education and collaboration opportunities are important maker tools, as is access to digital fabrication tools such as 3D printers, laser cutters, CAD software, and CNC milling machines. The definition of the maker movement focuses on the overlap between four main fields of activity as shown in the figure 11.
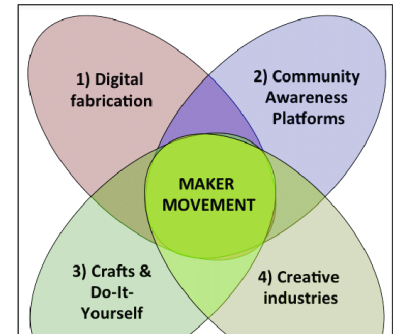
Figure 11 ELEMENTS OF MAKER MOVEMENT (Millard, Deljanin, Sorivelle, Unterfrauner, & Voigt, 2018)

2.16 MAKER SPACES

A makerspace is an overreaching concept understood as "a creative, uniquely adaptable learning environment with tools and materials, which can be physical and/or virtual, where students have an opportunity to explore, design, play, tinker, collaborate, inquire, experiment, solve problems and invent". Makerspaces are built environments utilized for interdisciplinary applications and research, helping users to coordinate between different disciplines to develop complex engineering designs. (Sohail Ahmed Soomro, 2022)

It is a workshop built for individuals to create physical objects on their own. These workshops are frequently furnished with computer-controlled machinery like laser cutters, milling machines with multiple axes, and 3D printers. (Colegrove, 2013)

Fabrication laboratories (Fab Labs) are like or are a type of makerspace. However, in Fab Labs stronger emphasis is laid on the use of an often-predefined equipment (e.g., 3D printers, laser cutters, or electronic workbenches) and on the scope of related training. The technology used in makerspaces and Fab Labs are referred to as digital fabrication or digital manufacturing. (Sohail Ahmed Soomro, 2022)

2.17 ELEMENTS OF MAKERSPACES:

The makerspace elements can be categorized under different points which is listed as belows.
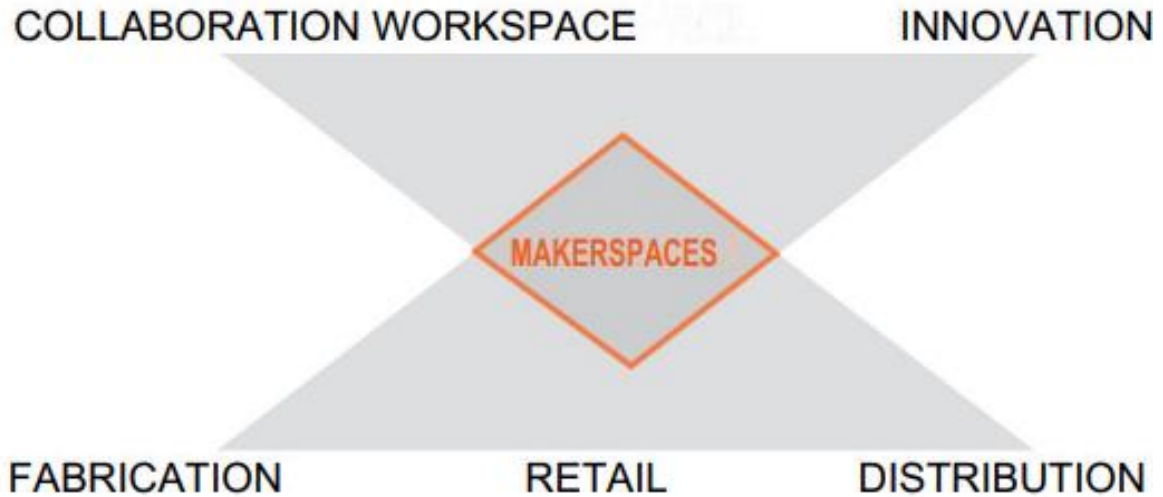
Figure 12 ELEMENTS OF MAKERSPACE (Smith, et al., 2016)

2.17.1 COLLABORATION
Revolve largely around the notion that great innovation comes through collaboration - that Ideas aren't always discovered alone but through the discourse with peers.

2.17.2 WORKSPACE
Many people have ideas or concepts but have no place to work through or prototype and now they have a place designated for that exploration as an individual or small business start-up.

2.17.3 INNOVATION
The world is an ever-evolving web of knowledge and research, and development cannot just belong to companies willing to front the costs - now innovation districts are emerging bringing people together to create new models for the future.

2.17.4 FABRICATION
Often things can be imagined but not produced but now fabrication of almost anything is no longer a dream but a possibility and a probability that can be executed in designated spaces.

2.17.5 RETAIL
Not every invention is one intended to save the world but a product someone saw the need for and can now explore through their own means and methods simply by having access and opportunity.

2.17.6 DISTRIBUTION
All elements being created have the possibility and probability of being shared globally whether digitally or physically and small businesses can use a shared space to have the technology of being their own distributer of a product. (Smith, et al., 2016).

2.18 THE MAKERSPACE INGREDIENTS

2.18.1 A MAKERSPACE IS A PLACE OF TOOLS.
The makerspace should have the tools and resources necessary for making because that is its foundation. Specific categories of making may be the focus of a given makerspace, leading to a more specialized toolkit. However, the majority of makerspaces aim to offer makers a wide range of opportunities to make virtually anything, so they also offer a wide

selection of tools. A woodshop, a metal shop, and digital production tools like 3D printers, CNC machines, and laser cutters are common features in American makerspaces. Numerous makerspaces also offer more specialized workshops, including those for electronics, robotics, jewelry, and textiles, to name a few.

2.18.1.1 TOOLS INVENTORY

CNC MACHINES
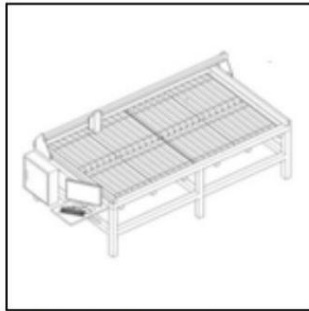
CNC PLASMACUTTER
A type of CNC (Computer Controlled Cutting Machine) that cuts through electrically conductive materials by means of an accelerated jet of hot plasma.
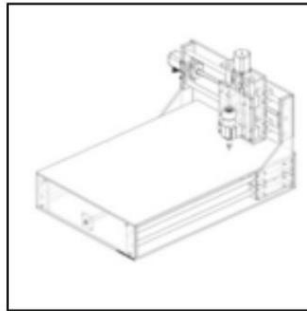
CNC ROUTER
A computer-controlled cutting machine used for cutting various hard materials. The machine follows a G-code created from CAD/CAM software.

ELECTRONICS AND ROBOTIC TOOLS

CIRCULAR MAGNIFIERS
To magnify and provide light.
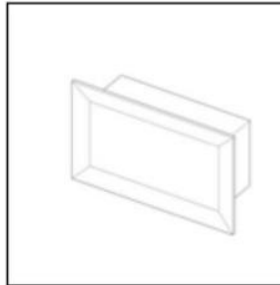
DVM
A digital voltmeter used to measure voltage.
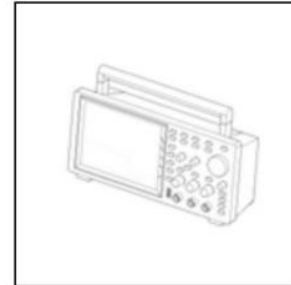
OSCILLOSCOPE
A device for viewing oscillations, as of electrical voltage or current, by a display on the screen of a cathode ray tube.
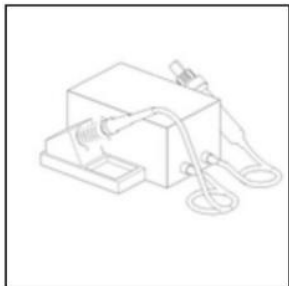
SOLDERING STATION
A device that supplies heat to melt solder so that it can flow into the joint between two workpieces.

STEREO MICROSCOPE
Low magnification observation of a sample.

MACHINE SHOP TOOLS

DRILL PRESS
A machine used to drill or enlarge a cylindrical hole in a workpiece or part.
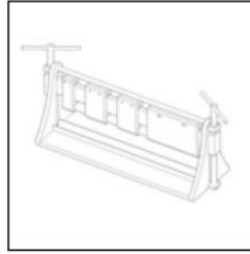
FINGER BRAKE
A metalworking machine that allows the bending of sheet metal.
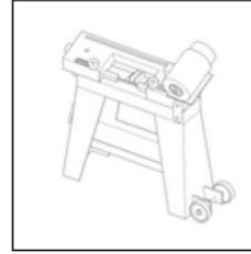
HORIZONTAL BANDSAW
An endless saw, consisting of a steel band with a serrated edge running over wheels, which runs horizontally.
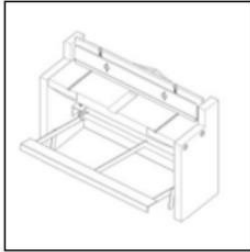
METAL SHEAR
A machine used for cutting rough shapes out of medium-sized pieces of sheet metal, but cannot do delicate work.
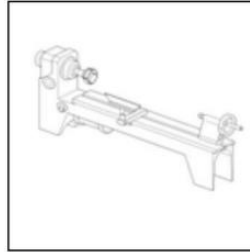
LATHE
A machine for shaping wood, metal, or other material by means of a rotating drive that turns the piece being worked on against changeable cutting tools
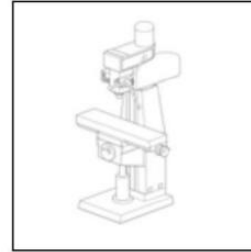
MILL
a machine tool for rotating a cutter (milling cutter) to produce plane or formed surfaces on a workpiece, usually by moving the work past the cutter.
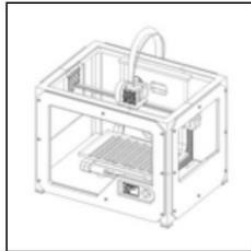
3D PRINTER
A machine for making a physical object from a 3D digital model, typically by laying down many successive thin layers of a material
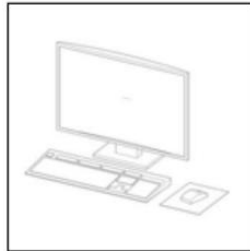
CAD/CAM/DESIGN SOFTWARE
Computer-aided design and computer-aided manufacturing that is used to both design and manufacture products.
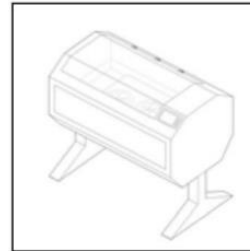
LASER CUTTER
A machine that uses a laser to cut materials with a motion control system following a G-code of the pattern to be cut onto the material.
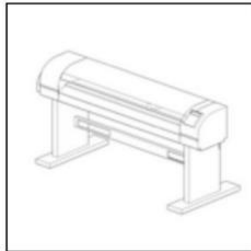
VINYL CUTTER
A computer-controlled plotting device with a blade instead of a pen used to cut shapes out of sheets of vinyl.

WELDING TOOLS
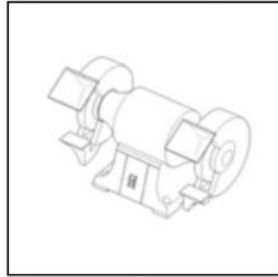
BENCH GRINDER
A type of machining using an abrasive wheel as the cutting tool.
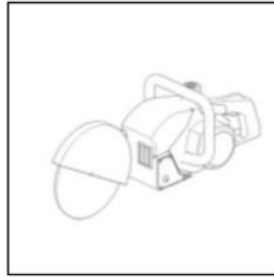
CUT-OFF SAW
An abrasive saw, typically used to cut hard materials, such as metals or ceramics.
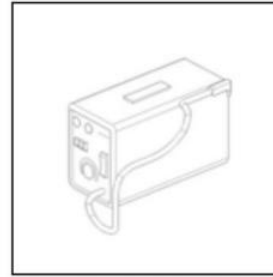
HAND-HELD PLASMA CUTTER
A tool for quickly cutting through sheet metal, metal plates, straps, bolts, pipes, etc.

MIG WELDERS
Metal inert gas welding: a welding process where the filler metal wire supplies the electric current, which is shielded from the access of air by an inert gas
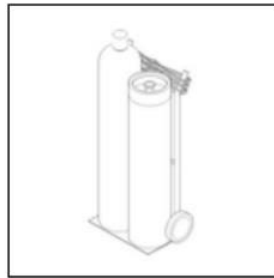
OXY-ACETYLENE RIG
A welding process in which coalescence is produced by a flame of oxygen and acetylene gases mixed together at the point of ignition.
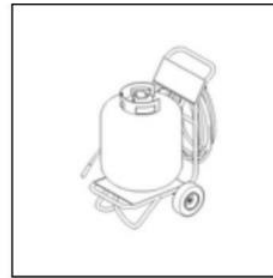
SAND BLASTER
A blast of air or steam carrying sand at high velocity to clean metal surfaces.

MIG WELDERS
Metal inert gas welding: a welding process where the filler metal wire supplies the electric current, which is shielded from the access of air by an inert gas

OXY-ACETYLENE RIG
A welding process in which coalescence is produced by a flame of oxygen and acetylene gases mixed together at the point of ignition.

SAND BLASTER
A blast of air or steam carrying sand at high velocity to clean metal surfaces.

WOODWORKING TOOLS
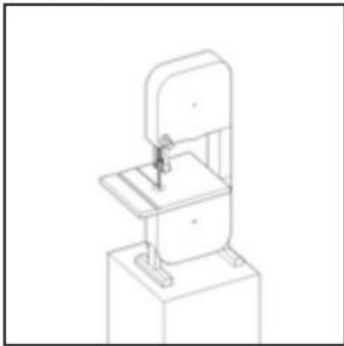
BAND SAW
An endless saw, consisting of a steel band with a serrated edge running over wheels.

BENCHTOP DRILL PRESS
A machine used to drill or enlarge a cylindrical hole in a workpiece or part.
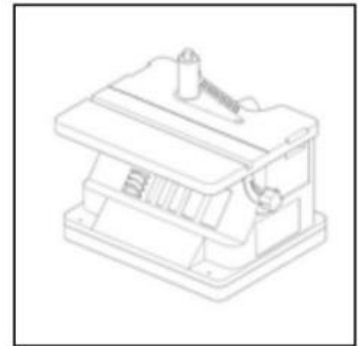
BENCHTOP SANDER
A sander used in shaping and finishing wood and other materials.
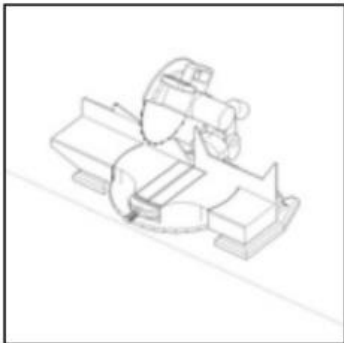
COMPOUND MITER SAW
A specialized tool that lets you make cuts at a variety of angles.
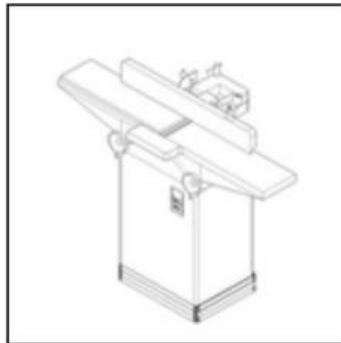
JOINTER
A plane used for preparing a wooden edge for fixing or joining to another.
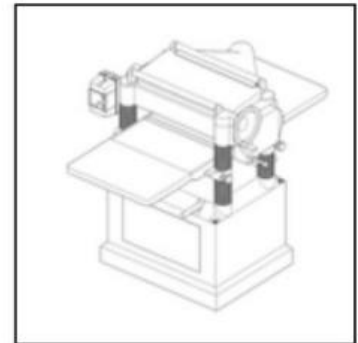
PLANER
A tool used to produce flat surfaces by shaving the surface of the wood.
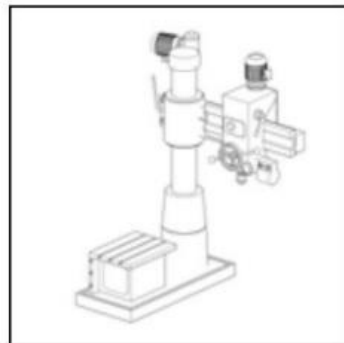
RADIAL ARM PRESS
A large geared head drill press in which the head can be moved along an arm that radiates from the machine's column

SCROLL SAW
A narrow-bladed saw for cutting decorative spiral lines or patterns.

TABLE SAW
A circular saw mounted under a table or bench so that the blade projects up through a slot.

Figure 13 TOOLS INVENTORY (Smith, et al., 2016)

2.18.1.2 SETTING UP A WORKSHOP

The typical woodworking shop requires a lumber storage area, a workbench, tool storage, stationary machine area, and a finishing area. Ample space should be provided to move between the bench and walls, and to provide the necessary clearance to be able to use long, wide boards and panels (Woodskills, n.d.).

Efficient dust collection is a major consideration in a workshop design. Unless you are using only hand tools, most power tools and powered sanding operations create large amounts of airborne dust which is easily inhaled. The addition of dust collection at the source will eliminate most airborne dust (Woodskills, n.d.).

Dust Collection
Dust collection is becoming increasingly important in the workshop. Airborne dust generated when wood is machined or cut has been proven to be a contributing factor in lung ailments, etc. The best method to prevent airborne dust from being generated is to collect it at the source or right at the woodworking machine (Woodskills, n.d.).

Workshop Access and Lighting
Another consideration is the ease or difficulty in transporting materials into and out of the workshop. Large doors or windows can facilitate the movement of lumber and finished goods into and out of the workshop. When designing a workshop, it is important to consider the dimensions of doors and windows of the workshop (Woodskills, n.d.).
Ventilation is also important, and sometimes a common household fan placed in a window of the shop or in the vicinity can satisfy the ventilation requirement. Safety considerations include a non-slip floor, adequate lighting, and room to maneuvers around equipment (Woodskills, n.d.).
Fluorescent lighting provides more light than incandescent lighting and is less expensive to operate. Some fixtures come with wires to plug into a receptacle, other fixtures need to be permanently wired (Woodskills, n.d.).

Workshop Storage
Storage is an essential requirement in a workshop. Without storage, tools would need to be left on workbenches and other work surfaces. Compartmentalizing and arranging your tools for quick access is an excellent strategy for a workshop design. Tool cabinets can be located along the surfaces of walls. Tool cabinets are typically designed with a low profile, so they do not extend out into the workshop excessively. Workshop cabinets also serve to keep dust away from metal tools. Dust on tools can stick to the metal if the air moisture in a workshop environment is high. Dust attracts moisture and causes rust and tarnishing to occur (Woodskills, n.d.).

Shop Size and Layout

If the shop is to be used primarily for woodworking, the minimum recommended area for the workshop is 75 square feet. An ideal shop would measure 125 square feet, to this area would be added a lumber storage area. The size of the shop is determined by the number of stationary power tools that it will hold.

The main workbench in the shop should be designed for both sitting with access to a stool, and for standing. The workbench should be located approximately 4 feet from stationary machines.

The machines should be spaced a minimum of 3 feet apart. If space is limited, install rolling bases on the equipment. Machines should be placed as to not impede traffic flow. Material, both raw lumber and finished goods, needs to be moved into and out of the shop. Provide a large door or a window for this. Machines used in a sequence should be placed close together. Allow ample clearance for doorways. Tools can be placed on pegboards mounted to walls, or in separate freestanding tool cabinets (Woodskills, n.d.).
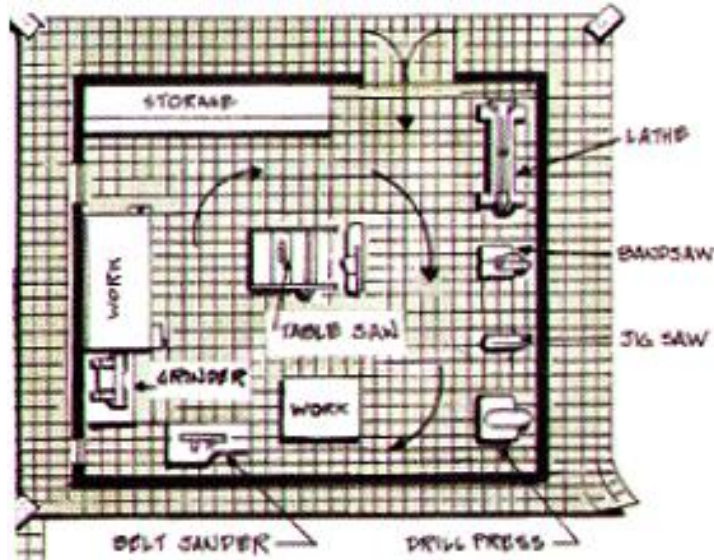
Figure 14 TYPICAL WOOD WORKSHOP LAYOUT (Woodskills, n.d.)

2.18.2 A MAKERSPACE IS A PLACE OF EDUCATION

Access to knowledge and resources is one of a makerspace's essential components. Two methods of instruction are used in makerspaces: formal and informal. Formal education takes place in structured classrooms. Typically, these courses are designed especially for the makerspace community and concentrate on instructing makers about the functions and safety precautions of the tools at
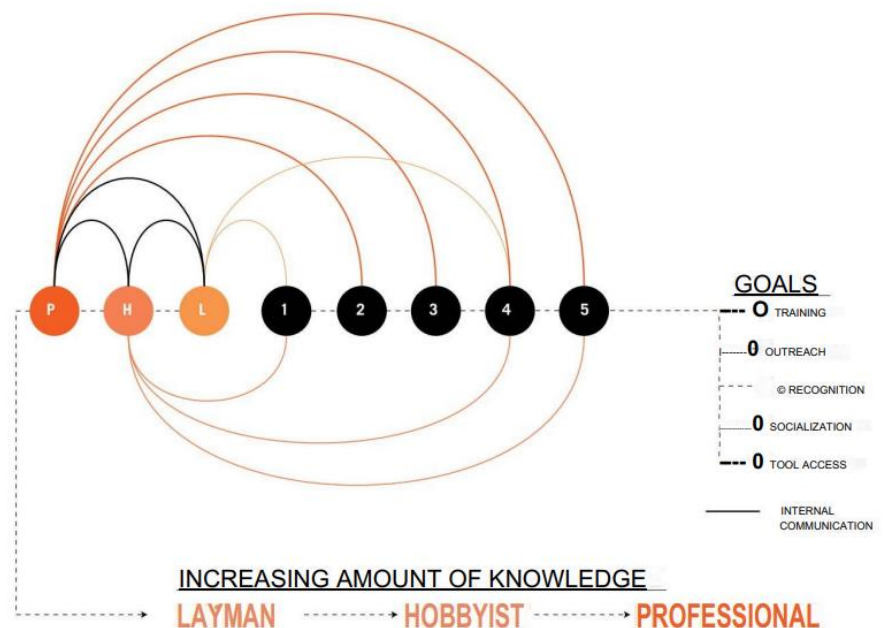
Figure 15 ILLUSTRATION OF MAKERSPACE AS EDUCATION (Smith, et al., 2016)

their disposal. The makerspace's paid staff or volunteers with subject-matter expertise teach the classes.

Informal education develops naturally because of neighbor makers exchanging ideas and knowledge. Users inevitably transfer knowledge and ideas through proximity and daily activity when they are in the same physical space, which encourages creativity. This constant source of inspiration via proximity is one reason even seasoned makers are attracted to make spaces.

2.18.3 A MAKERSPACE IS A PLACE OF COMMUNITY

Makerspaces primarily serve three types of communities: corporate, innovation, and local. A makerspace typically serves and is located close to a particular community type, but the majority deploy some a mixture of all these components. The local makerspace community is publicly engaged. focused. They provide services to the local community and are primarily concerned with empowering people through education. Makerspaces of this type are typically nonprofit institutions. The makerspace innovation community is inward-looking and places a strong emphasis on teamwork and communication increase local innovation. The makerspaces of this type either for-profit or charitable purposes. The corporate makerspace typically does not generate income on its own, but instead makes money off or generates advertising through the concepts and techniques developed within the community it supports.

Neighborhood Community
Makerspace provides empowerment through education
Non-Profit

Innovation Community
Makerspace focusing on innovation through collaboration
Non-Profit or For-Profit

Corporate R+D
Makerspace focusing on the innovation for the benefit of the umbrella company
For-Profit
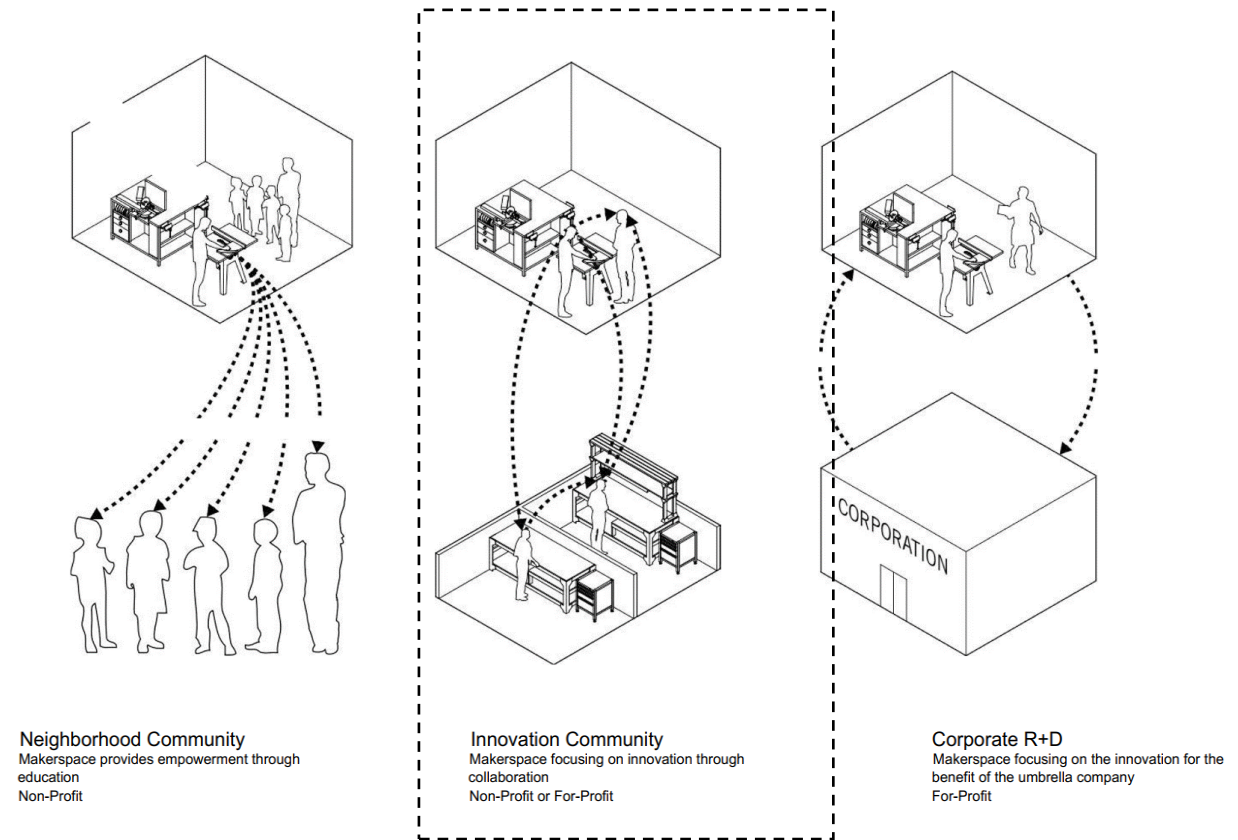
Figure 16 ILLUSTRATION DIAGRAM OF MAKERSPACE AS COMMUNITY (Smith, et al., 2016)

2.18.4 ATTRIBUTES OF MAKERSPACE

By looking at these two and other examples we can sum up key attributes for the Makerspaces:

2.18.4.1 GREAT DEGREE OF FLEXIBILITY

In order to adjust changing spatial demands, as equipment may fluctuate, as well as intermediate uses of the space, for example, a workshop area can be momentarily used as event space, as it brings in more revenue, and so on.

2.18.4.2 FRAMEWORK FOR GROWTH/DE-GROWTH

Ability for spaces to be developed gradually, where, for example, with an increased demand more square meters of space can be added or the other way around.

Most of the Makerspaces are part of the network of other groups. **Connectivity** to networks of information and people and also to physical networks of supply and demand.

2.18.4.3 COMMUNITY

Powered (with management practices that are close to the co-operatives and not-for-profit, Makerspaces are about diversity and innovation, not about selling square meters first.

2.18.4.4 LOW SET UP AND RUNNING COSTS.

Culture of 'making' reflected in the design of the environment, e.g., reuse of empty buildings at low rent, or crowd-funded self-build spaces, use of accessible materials. Production of energy can also become a critical theme for the building design.

2.18.4.5 LIVE AND WORK.

Maker Culture entails a specific life- style, including flexible working hours. Some form accommodation, permanent or temporary, would be an interesting option for the project (Porohina, 2016).
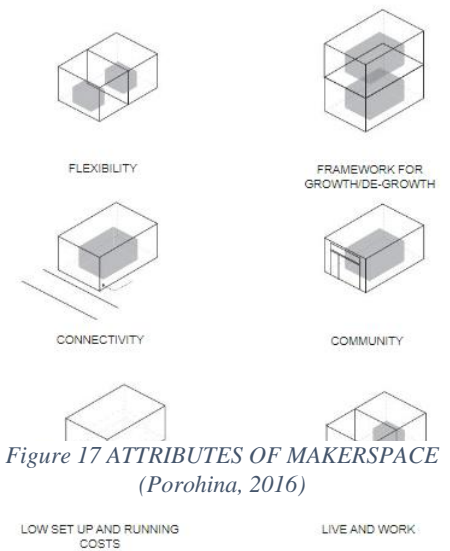
Figure 17 ATTRIBUTES OF MAKERSPACE (Porohina, 2016)

2.19 FAB LAB

The term "Fab Lab" is short for Fabrication Laboratory, or a small-scale workshop offering digital fabrication tools like 3D printers, laser cutters, milling machines, routers, and more. Created by MIT's Center Bits and Atoms (CBA), Fab Labs are designed as a "platform for learning and innovation: a place to play, to create, to learn, to mentor, to invent," according to the Fab Lab Foundation (Mantick, 2019).

Students are eager to develop their original ideas since they are budding designers with big imaginations and lots of curiosities. Fabrication Laboratories (Fab Labs) have sprung up all over the world in less than ten years to fulfill these expanding needs and advance our developing technology (Kieckhafer).

2.19.1 FAB LAB REQUIREMENTS

Different from a standard laboratory, Fab Labs are defined by meeting the following essential requirements:

- Public access

- Supporting and subscribing to The Fab Charter
- Common set of tools and processes
- Interact globally within the Fab Lab network (Kieckhafer)

2.19.2 A TYPICAL FAB LAB

Full Fab Lab Space
18 meters wide X 20 meters long

Molding and Casting/Silkscreen Space
5.2 X 2.5 meters

Laser Area
6 meters X 8 meters

Shopbot
Space
6X4.5 meters

Central Work Space
With Storage for Projects
5 meters X 6 meters

Conference/Learning Space
6 meters X 6 meters

3D Printing Space
3.5 X 5

Electronics area
5.2 X 4.3 meters

Office, Materials Storage and Exhibition Space
18 meters wide X 4 meters high

Figure 18 FAB LAB SPACE DESIGN (Kieckhafer)

The essential equipment and procedures, in addition to several workbenches and workstations, are typically included in Fab Labs. A Fab Lab should be built with flexibility and cooperation in mind. Workbenches on wheels make it simple for Fab Labs to adopt a variety of shapes as projects develop, compete, and expand in scope. Students can think independently at their seats or push the benches together to discuss new information collectively. Separation between the design and manufacturing phases is achieved by placing workstations around the room's perimeter. Students and other Fab Lab users can walk physically from their work bench to the workstations as ideas develop to improve the finished creation. The 3D printers, vinyl cutters, and laser cutters are positioned among the PCs to give immediate access to the finished product as it is being created. If errors are found from the beginning, jobs can then be swiftly terminated. It's

crucial to construct a separate enclosure when placing the CNC router in order to reduce noise the device makes. Another advantage of situating the router in a closed space is the ability to contain the dust and particles generated. A Fab Lab's instruction area should be separated from the design and production areas by partitions. To keep students focused on the lecture, the technology provided in the instructional area should be limited to a projector and projection screen. Following these guidelines will help to create a work-friendly and efficient environment for all Fab Lab users (Kieckhafer).

2.20 INCUBATOR

Generally, an incubator can be viewed as "a support environment for start-up and fledgling companies" (Bergek & Norrman, 2008). An incubator is an environment that fosters the development of early-stage companies and startups by providing various services and resources to such companies (Galbraith, McAdam, & Cross, 2019). Four components have particular attention:

- shared office space, which is rented under favorable conditions to incubates,
- a pool of shared support services to reduce overhead costs,
- professional business support or advice (coaching) and
- network provision, internal and/or external. (Bergek & Norrman, 2008)

2.20.1 EVOLUTION OF INCUBATORS

The origin of incubators is often traced back to the 1950s, first, with the opening of Stanford Research Park that helped seed the Silicon Valley and the Industrial Center of Batavia, New York, in 1959. Around the same time, both the MIT Instrumentation Laboratory and MIT Lincoln Laboratory, having undertaken substantial defense technological innovations and space technologies, were major source organizations for new high technology enterprises. Faculty entrepreneurship in the MIT labs developed organically, with many MIT researchers electing to moonlight on a part-time basis, whilst retaining full time faculty positions. Both, the subsequent high-tech clusters of Silicon Valley and Boston-Route 128 were exemplar environments for the growth of high technology start-ups and successful university and corporate spin-offs. An interesting variation was that the Boston-Route 128 model stood out with a much higher degree of regional entrepreneurial dependence upon one major academic institution, namely, MIT. In comparison, an early study found that only eight out of 243 technical firms in the Palo Alto area had their origins with Stanford University. Since the 1960s, the Palo Alto area was home to some of the most impactful corporate incubators such as Fairchild Semiconductor and Ampex (Galbraith, McAdam, & Cross, 2019).

Modern business incubators add new services to the ones they already provide, including:

- paid services, including entrepreneurship courses and services for large businesses.
- expanding the range of technological services: video conferencing, crowdfunding platform services, software testing,
- creation of a multifunctional center for business
- provision of coworking services

- provision of licensed types of educational services
- assistance in organizing and optimizing the production process,
- Presentation art
- Meetings with successful entrepreneurs and industry professionals In addition to the main activities in the framework of work with residents (M.A.)

2.20.2 INCUBATOR SERVICES

Since startup companies lack resources, experiences, and networks, incubators provide services which helps them get through initial hurdles in starting up a business. Incubators can bring substantial benefits to startups. Some of the services provided by incubator can be listed below as:

- Management training
- Advisory services
- Access to capital sources (loans, grants, network of potential investors)
- Assistance with core business operations (accounting, market research, marketing, legal compliance)
- Access to office space and other operating resources (necessary software, hardware, etc.)
- Intellectual property management
- Help with basics business
- Networking activities
- Links to strategic partners
- Advisory boards and mentors (CFI, 2020)

2.21 CO WORKING SPACES

Coworking spaces are shared workplaces utilized by different sorts of knowledge professionals, mostly freelancers, working in various degrees of specialization in the vast domain of the knowledge industry. Practically conceived as office-renting facilities where workers hire a desk and a wi-fi connection these are, more importantly, places where independent professionals live their daily routines side-by-side with professional peers, largely working in the same sector – a circumstance which has huge implications on the nature of their job, the relevance of social relations across their own professional networks and – ultimately – their existence as productive workers in the knowledge economy (Paula Bialski, 2015).

Starting a business is challenging. Most businesspeople begin by thinking independently and facing issues on their own. Entrepreneurs require networks because not everyone can finish the job without assistance. When a start-up is anticipated to grow quickly, it is also financially challenging to support each individual expenditure of a tiny company, such as buildings and computers. There are numerous challenges for business owners. Co-working spaces were developed in the US and are now found in many different nations to assist people in organizing their thoughts and gain from a collaborative and creative environment (Gupta, 2009).

Independent professionals and those with workplace flexibility who work better together than alone consider coworking spaces to be preferable alternatives to home working or semi-public "Third Spaces." Originally formed to alleviate the isolation of working from home or the distracting effects of simple coffee shops, they are gradually evolving to meet the needs of the day as the sharing economy grows in popularity. In the first half of the decade, studies defined coworker types as self-employed or extended workers, entrepreneurs, freelancers, SMEs, students, and employees of large firms. Coworking spaces promote creativity, diversity, and innovation, three key concepts that serve as the foundation of entrepreneurial activity. They also offer a broad and diverse knowledge base, well-developed business and social networks, and the ability to identify opportunities, all of which contribute to successful entrepreneurial behavior. Coworking spaces, using this hybrid approach, can help to strengthen entrepreneurial activities in towns or regions with weaker entrepreneurial environments (SAKA, 2020).

2.21.1 SPACES IN CO-WORKING

Creating the ideal coworking space is challenging. A wide range of occupants' demand workspaces that complement their individual aesthetics. Marketing to numerous industries is necessary to draw in members or occasional users. One coworking space layout does not suit all needs in the coworking world. Thankfully, flexibility is a major benefit of coworking spaces. Contrary to traditional office settings, coworking businesses favor flexible, cutting-edge layouts. In a typical office, a desk to person ratio of one to one is uncommon. Instead, a successful shared space design enables each worker to customize the space to meet their specific requirements. Look at these five coworking space layouts to learn how to make any space welcoming, regardless of the user or the nature of their work.

2.21.1.1 OPEN-AIR BENCHING

Open-air benching is the epitome of modern workspaces. There's no assigned seating or special considerations. It's just a table and chair, waiting for someone to occupy them.

It may seem utilitarian, but open-air benching is all most people need to work. In the age of laptops, tablets, and smartphones, there's little use for full-sized desks or offices. Even the most utilitarian area becomes a veritable workspace when there's room for a laptop and a few documents (Clifton, 2022).

Figure 19 Open Air Benching

2.21.1.2 PODS AND NEIGHBORHOODS

Pods are a more consolidated form of benching. In true shared space design, these workspaces limit the number of people—usually between three and six—to create a sense of closeness. Small groups foster networking and collaboration, and they're great for social workers.

Pods also bring the advantage of controlled seating. Coworking facilities can delineate pod assignments in numerous ways to foster a great

Figure 20 Pods & Neighborhoods

work environment: a graphic design pod for artistic professionals; a programming pod for software engineers; pods for people who love jazz music. The options are limitless and bring people together on common ground (Clifton, 2022)

2.21.1.3 PRIVATE COLLABORATIVE SPACES

Though they demand larger swaths of dedicated square footage, private collaborative spaces are the standard for groups. Startup companies, small businesses, and study groups need private space to collaborate uninterrupted. In coworking spaces, that can mean a room away from the main work areas.

A coworking space may only need one or two of these types of spaces to support groups. Or, they may have larger spaces set up for groups that can be used by individuals when not booked. Offering these spaces by request only is a smart way to prompt bookings and get a sense of utilization rates (Clifton, 2022).
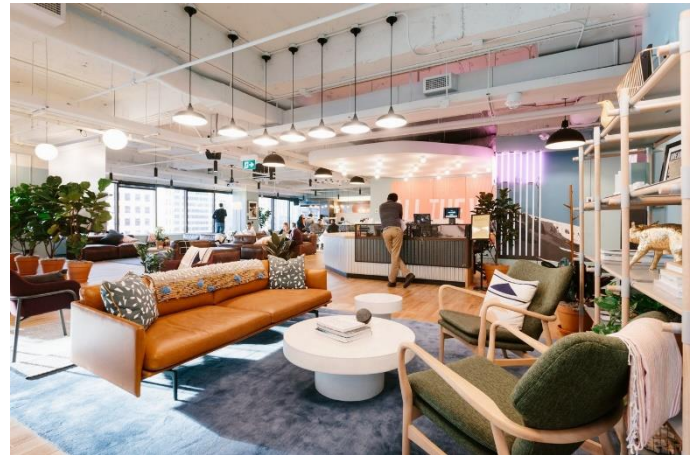
Figure 21 Private Collaborative Spaces

2.21.1.4 WORKSPACE ZONES

Splitting coworking facilities into zones helps operators better manage them. Zones can create a sense of belonging among frequent guests.

Figure 22 Workspaces Zones

- Colors are a great way to delineate areas:
- Blue Zone: Quiet workspaces
- Green Zone: Open-air benching
- Purple Zone: Individual desks

It's easy to say, "Find a seat anywhere in the Green Zone" or "You'll be at Desk Two in the Purple Zone." It's also easy to charge more for different types of workspaces and track utilization of each zone to better understand of facility usage (Clifton, 2022).

2.21.1.5 BREAKOUT SPACES

The most basic definition is any area without a clearly defined use. A table with three or four chairs might suffice, or it might be more elaborate, like an experiential space that staff members can move in and out of.

Breakout spaces are a quick fix to an immediate need. A conference ends, but A meeting of three people is required to discuss a subtask. They "break out" into a space for 15 to 20 minutes rather than congregating around someone's desk. On the fourth floor, an employee has two meetings with a 30-minute break in between. To prepare between meetings, they flex into a breakout area rather than

Figure 23 Breakout Spaces

returning to their office on the first floor.The epitome of agility in a fast-paced workplace is a breakout space. They are rarely occupied for longer than 30 to 45 minutes, and because they are unstructured, they provide the perfect environment for whoever uses them.

Although break-out areas are the most adaptable in the office, they shouldn't be treated as an afterthought or a filler space in your floor plan. Dedicated breakout areas should be strategically placed in spots where it's simple for people to change between various activities. Regardless of whether they are conducting one-on-one meetings or head-down work, staff members should feel at ease in a breakout area. Most importantly, it must increase workplace concepts of agility and flexibility to promote productivity. (Clifton, 2022).

2.21.2 ELEMENTS OF GOOD COWORKING SPACE
WHAT MAKES COWORKING SPACES SUCCESSFUL?

Coworking is a community space with the objective to work alongside others. Designing socialization spaces where users can mingle and share ideas is key for peak performance. What shared spaces allow for is true freedom and mobility. The culture is conducive to the truly organic collaboration and conversations that are struck up. However, privacy is still an important point to be taken into consideration when designing coworking spaces. Instead of system partition as the traditional office, we separate the space, by using obstructive objects like bookshelves, plants, and decorations while keeping the space's layout fluid and programmatically connected. A common theme as we research the many

benefits of coworking is how the change of scenery can enhance creativity and performance in general. Different area with design mood and feeling are created such as open hot-desk area, meeting booth, phone booth, community table, for instance (Chouxlab, 2018).

Table 2 DESIGN CHOICES OF COWORKING

Design Choices for Coworking Spaces.

Design choice	Options	Why important	Select descriptive evidence from the Coworker.com data
Space			
Size of space	Square footage	Small spaces often have a more tight-knit community, whereas large spaces offer a wider network of opportunities.	Average space has 7,308 square feet.*
Composition of space	Open space vs. private offices	The ratio of hot desks vs. dedicated desks vs. private offices can affect the frequency of interaction among community members and determine what type of culture prevails in the space.	92% of spaces include hot desks, 65% of spaces include dedica 54% of spaces include private offices.
Ambiance	Startup culture vs. traditional corporate office	Spaces designed to represent a "Silicon Valley" startup culture that appeals more to entrepreneurs and other nontraditional workers who value a more creative and individualistic environment.	37% of spaces report having stereotypical startup features such as ping pong tables, beanbag chairs, hammocks, etc. (see Table 5)

To put it mildly, creating the ideal coworking space is challenging. A wide range of users demand workspaces that complement their individual aesthetics. Marketing to numerous industries is necessary to draw in members or occasional users. One coworking space plan does not suit all needs in the coworking industry. However, flexibility is a major benefit of coworking spaces. Contrary to traditional office settings with 1-to-1 desk ratio, coworking organizations favor flexible, cutting-edge layouts.

2.21.2.1 FLEXIBILITY

A wide range of needs must be satisfied by coworking spaces. Some people might like quiet, private workstations, while others might do best in a bustling setting that encourages collaboration. With a huge, versatile area, you may conduct events or conferences and make use of every square inch daily. Start with retractable partitions, stackable chairs, and tables with wheels. The creation of this open area might also increase productivity among employees because the absence of walls leads to an open mind where creativity can grow and thrive.

Figure 24: Flexible spaces in coworking space

Flexible seating options are one of the best coworking space design concepts. Some people are not most productive at a desk or in an office chair. People may perform at their best in one location one day and in another the next. When designing a coworking space, it is important to have a range of adjustable seating options so that employees may choose the ideal setting for their requirements, whether they are working alone or with others.

2.21.2.2 GOING GREEN

This means two things: living plants and being green-certified. The first has consistently been shown to lessen stress. In addition to purifying the air, plants enhance the aesthetics and tranquility of a coworking office environment. They promote a friendly atmosphere where imagination and creativity are allowed to flourish. By fostering a natural atmosphere that helps to relax our subconscious, plants can increase productivity.

Figure 25 Use of green plants in the interior

The second refers to an area that promotes sustainability and well-being. This is quite important, as evidenced by the high levels of stress and anxiety associated to the workplace. According to studies, "green" buildings improve cognition by 26% and reduce absences due to illness by 30% (Forbes).

2.21.2.3 LIGHTING

Studies have shown that natural light, especially a lot of it, can greatly improve mood and increase productivity. Adequate lighting is one of the most crucial elements of any workplace. A distinctive lamp or fixture can make the difference between a dim, gloomy setting and one that is exciting and motivating.

There must be artificial lighting in every working space, but when it is appropriate, ample natural light should be allowed to flow in. After all, there

Figure 26 NATURAL LIGHTING IN WORKSPACE

is nothing worse than feeling trapped inside. Where natural light is not feasible, choosing cooler bulbs will help imitate that natural sensation and assist you to do stuff without having to strain your eyes causing headache and pain.

One way to make people happier to return to your coworking space day after day and feel like they are getting more done is by opening the windows and allowing more natural light into the space. According to the functional requirements, a range of lighting is required, including warm ambient light, task lighting, and large windows for natural light to meet the functional requirements of the space.

2.21.2.4 INTENTIONAL FLOW

Additionally, coworking spaces owe their coworkers simple, intuitive wayfinding. In other words, it should be simple for coworkers to travel from one zone to another, from private to shared space, with the least amount of disruption and inconvenience.

Coworking spaces can take advantage of occasions to pause the "flow" of a space.
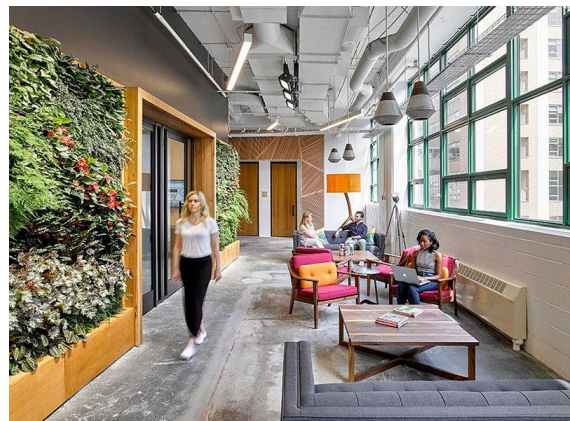
Figure 27 INTENTIONAL FLOW INSIDE COWORKING SPACE

Like a rest area on a highway, flow interruptions don't affect traffic generally but provide colleagues a chance to "pull over" and have productive interactions with potential partners.

2.21.2.5 CREATE A NEIGHBORHOOD FEEL WITH DIFFERENT AREAS

Try not to make just one big open space. You want people to feel like they're in neighborhoods. Create areas with library rules and others where people can be noisier; create designated break areas; create designated kitchen areas. These things all add variety and work options for members. People are in a coworking center because they want vibrancy and connection, so avoid designing a space with long, dark hallways.

Figure 28 WORK ENVIRONMENT IN COWORKING SPACE

2.21.3 DESIGN PRINCIPLES OF CO-WORKING SPACE
2.21.3.1 PROXIMITY

The Oxford Dictionary defines proximity as the state of being close to someone, either physically or temporally. Users can also benefit from being close to people who can impart their skills and knowledge. Co-workspaces should be aware of the power of physical proximity given that a big part of the appeal of co-working is socializing and exchanging ideas with other participants. According to Allen's Curve from 1977, which is depicted in the figure, communication frequency declines as interpersonal distance rises. In the graph, employees had a much higher propensity to converse with coworkers when they were within a horizontal distance of 30 meters of each other. The probability for people to communicate effectively dissipates beyond 10m, beyond 50m is impossible. On the other hand, vertical proximity is always seen as major separation. Being in a different office, different hallways, separate building is a liability. Team members are not able to function together effectively and sometimes not at all. Therefore, single story or same floor locations are preferred over multiple stories as vertical separation has more severe effect on communication and collaboration. Although study suggests that close physical proximity, for example, sharing neighboring office at the same floor, increases collaboration but as technology accelerates, coworker can stay connected digitally 20% more likely. To sum up, proximity in a co-working space is considered as a resource that is needed for coworkers to develop knowledge through face-to-face interactions (Yin, 2018).
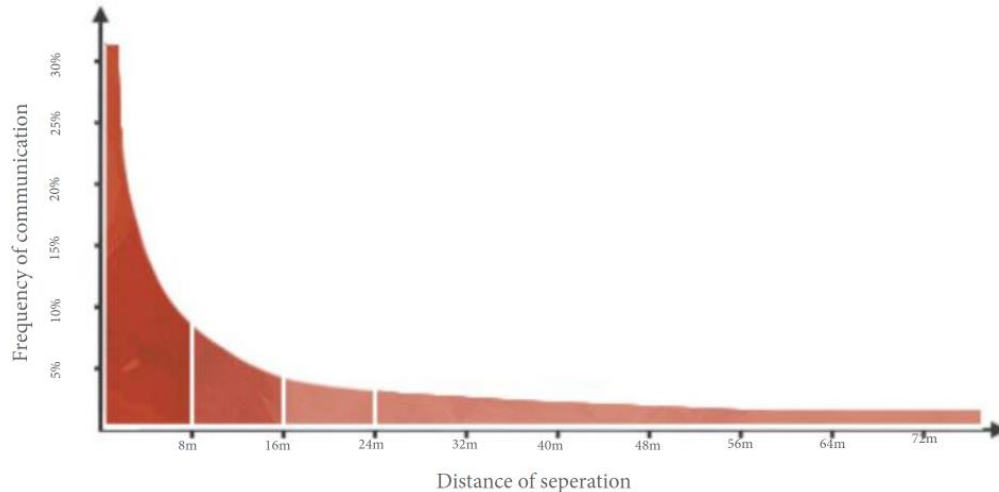
Figure 29 ALLEN'S CURVE

2.21.3.2 PRIVACY:

Privacy is the perception of visual and auditory seclusion. Openness and interaction are not for everyone because co-working spaces cater to coworkers with various personality types. Since there is more room for interaction in an open-plan coworking office, there is also more opportunity for interruption and noise-related distraction. Therefore, the task of creating an office design that not only welcomes employees with diverse personalities by creating spaces that displace, reduce, and avoid distractions, but also contains a variety of interactions and collaborations, falls to the designer. In the paradox of co-working, open-plan offices promote greater interaction but also increase distraction due to noise and interruption. Hybrid office design allow zoning based on chart above where active zone should be located away from quiet zone, at the same time maintaining their proximity (Yin, 2018).

2.21.3.3 FUNCTIONALITY:

Workplace functionality refers to the suitability of the area, which is influenced by the arrangement and design of the furniture, the tools and services offered, the surrounding conditions, and the space's capacity. Co-working spaces are very busy, with many activities going on at once. Schein (2010) observed how user behavior changed interactions over time and space. As a result, it's critical for designers to comprehend how employees interact with one another at work when creating a productive workspace. Herman Miller's qualitative research identifies nine behavior types in the workplace, as depicted in the figure (Yin, 2018).

2.21.3.4 LEGITIMACY

Legitimacy explains that a good reason must be given for occupying the area. Workers must have a legitimate reason for entering the area where activities are taking place. To put it another way, a variety of spaces should be made available to employees to support their activities, foster their relationships with coworkers, and assist them in achieving their specific goals. Spaces are catalysts for interaction, creativity, and innovation as well as for solitude, concentration, and contemplation as the nature of work changes. The ability to respond to coworkers' work behaviors by offering a variety of work settings to

support tasks with different environmental preferences is essential to designing a functional coworking space. Herman Miller went on to describe 10 settings with specific purposes that correspond to 10 different work modes as listed in table (Yin, 2018).

2.21.3.5 ACCESSIBILITY:

Finally, accessibility refers to the simplicity of access and the visibility of social spaces. Unplanned meeting places should be conveniently situated with good visibility and be simple to get to. Oseland (2009) emphasized the value of societal space, which should be available at work so that people can interact socially, celebrate, and share without disturbing others. Setting is not the only factor that makes it easier for people to collaborate. The area for circulation is what moves people. Planned circulation areas improve user experience and have the potential to develop into active connective areas (Yin, 2018).

2.22 REFRESHMENT:

The learning process in entrepreneurship education is different from the normal classroom teaching, in that it should involve a more flexible, as well as a more active, experienced-based approach. Supported their argument by stating that both experience and the practical skills required by entrepreneurs are almost impossible to be taught via traditional teaching ways and that Fiet (2000) believes that it is necessary to incorporate theory-based activities in entrepreneurship classrooms to develop entrepreneurial cognitive skills. games may perhaps be significant pedagogical instruments to nurture entrepreneurial cognition in our undergraduates. educating for entrepreneurship involves flexibility. Educating for entrepreneurship involves flexibility. Using activities and games in class encourages active learning, as well as collaboration, and interactivity. Games provide structure for interactions, reward students for collaborating and problem solving (Schwartzman, 1997), and promote cooperative learning, "individual accountability, positive interdependence, and the need for group processing and feedback,"

Games provide structure for interactions, reward students for collaborating and problem solving (Schwartzman, 1997), and promote cooperative learning, "individual accountability, positive interdependence, and the need for group processing and feedback," A survey of current business simulation game users, former users, and never-users among business faculty across disciplines concludes that the number of never-users (52.3%) is higher than that of the current users and former users combined (Faria & Wellington, 2005). This is surprising, given the long history of the use of games as an instructional tool in the discipline of business. Despite the potential benefits for memory, performance, social competence, and transfer of learning, the use of games and other experience-based activities continues to provoke debate. Throughout the research literature, games are identified as sites for 'playful' learning, albeit not widely accepted as tools in our classrooms. This 'cold' reception is mainly attributed to the time taken for both the student and teacher to familiarize themselves with the game. "Games are…the most ancient and time-honored [sic] vehicle for education. They are the original educational technology, the natural one, having received the seal of approval of natural selection.

Games have been played for amusement for thousands of years. In the 1970s the popularity of games as an educational tool has spread to other disciplines as well, including the science and technology courses.

2.23 DESIGNING YOUTH HUB INTERIOR

2.23.1 COLOR

When it comes to workplace design, there is more to a good work environment than a comfortable chair and fast internet. The color of our workplace can also impact how we work, and color psychology is a growing area of interest for designers (Orr, 2020). The impact of "color" in the workplace is of particular interest. Color is a visual experience that influences the brain and, as a result, how we work. Choosing a color scheme for your workspace design requires careful consideration to encourage the right kind of productivity from your employees (Workspacedesign, n.d.).

Colors in the workplace not only promote productivity, but they also influence moods, attitudes, and emotions. Choosing colors that can increase happiness, productivity, and well-being can help ensure that we are providing an enjoyable and effective place to get work done (Orr, 2020).

Here are a few things to consider about color when selecting everything from the paint for walls to accent furniture:

2.23.1.1 COOL COLORS: BLUES, GREENS, PURPLES

Shorter wavelength cool colors are excellent choices for workspaces.
Blue is a calming color that can be used widely throughout an office space. It can bring about feelings of security and stability and is a favorite to support productivity as a result. Often underrated purple, with its close relationship to blue, is similarly soothing, but also luxurious.
As the most abundant color in nature, green is a good choice for spaces where people spend long hours as it is easy on the eyes and promotes feelings of balance. In one study, even brief glimpses of green were shown to enhance the creative performance of workers (Orr, 2020).

2.23.1.2 WARM COLORS: REDS, YELLOWS, AND ORANGES

Feelings of optimism, energy, and intensity are most associated with longer wavelength warm colors. Vibrant shades of these colors are attention getting, but that can also be distracting in a workspace over long periods of time. Yellows and reds are beneficial in spaces that are designed for bursts of creativity but should be used sparingly where calm collaboration is needed, such as in conference rooms. (Orr, 2020)

Figure 30 COLOR PSYCHOLOGY (SYNOPSIS, n.d.)

2.23.1.3 TINT, TONE, AND SHADE

Variations in the intensity of a color can also change its effect on a space. Pure hues, those that aren't mixed with any others, are bright and cheerful, but can be too vibrant for most workplace activities. Similarly, blue that would otherwise elicit feelings of tranquility can become chilly and somber in a different shade. It's also important to pay attention to the tint, tone, and shade of a color.

- Tint refers to how much white is added to a hue like green, red, or blue.
- Shade refers to the addition of black, creating deeper and darker colors.
- Adding gray adjusts the tone, making a hue less vibrant. (Orr, 2020)

2.23.2 LIGHTING DESIGN

How can lighting impact productivity or energy level in a home office?
A dim or improperly lit office can make you sleepy. You'll get eye fatigue if there's poor light when you're looking at a computer screen. To avoid this, be sure to layer in corrective light, such as a task light behind the computer screen (Lumens, n.d.).

The best type of lighting is always natural. Indeed, surveys have shown that natural light, especially a lot of it, can be excellent for mood improvement and productivity-boosting. Great lighting goes beyond the ideal selfie. There must be artificial lighting in every office space, but where it is necessary, ample natural light should be allowed to stream in. After all, there is nothing worse than feeling trapped inside (Coofiz, 2022).

There is more than one good option for lighting work areas, especially when talking about the flexibility of these spaces. However, a good strategy may be to light up circulation areas and work areas, separately to create a hierarchy of spaces, while trying to ensure uniformity and visual comfort in work areas (Lighting, n.d.).

2.23.2.1 ILLUMINANCE LEVELS

Table 3 ILLUMINANCE LEVEL (TOOLBOX, n.d.)

Normal office work, PC work, study library, groceries, show rooms, laboratories, check-out areas, kitchens, auditoriums	500
Supermarkets, mechanical workshops, office landscapes	750
Normal drawing work, detailed mechanical workshops, operation theaters	1000

2.23.2.2 TWO TYPES OF LIGHTING
a) NATURAL

Natural light has been proven to have the most positive effect on workers in any capacity. So, when it comes to office design it's crucial that this natural lighting is taken advantage of using windows and sky lights, and if budget permits, floor to ceiling glass paneling should be incorporated throughout the office building. The sun is free, so we must make use of it. There are several ways that you can increase natural light in office designs. Here are some of the easiest and most efficient.

i.   Use transom windows.
ii.   Use mirrors in your office design.
iii. Consider color schemes for the office.

iv.   Think about the commercial flooring.

v.   Remove obstructions.

b) ARTIFICIAL

Types of Artificial Lighting
Ambient lighting

This is the general artificial lighting and overall illumination in a room (see fig. 31 It can provide an even spread of light to give a comfortable level of brightness for most people to be able to see reasonably well and navigate safely around the room. Typically, it can be provided by a pendant fitting or ceiling downlights (Wiki, 2021).
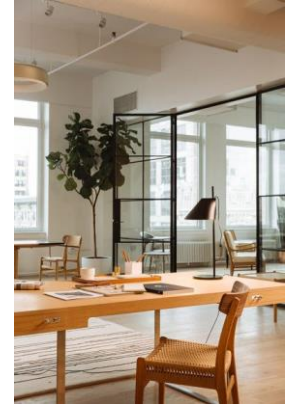
Figure 31 AMBIENT LIGHTING (Office, n.d.)

Task lighting

This allows the completion of tasks such as reading, studying and wayfinding. It is used where ambient light levels are insufficient for the task in hand. A reading lamp is an example, as are under-cabinet lights (Wiki, 2021).
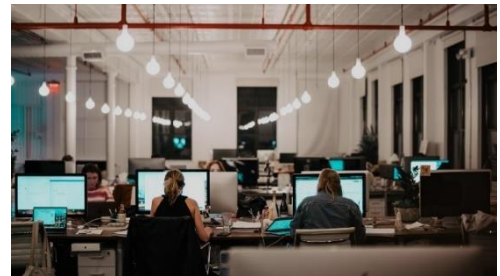
Figure 32 TASK LIGHTING (Guestpostonblogs, 2021)

Accent lighting

This type of lighting imparts drama and character and allows certain features regarded of interest to be highlighted (Refer fig. 33). The idea is to draw the viewer's attention to the item that is lit, whether a feature wall, an ornamental pool or an expensive vase (Wiki, 2021).

Figure 33 ACCENT LIGHTING (Saini, 2021)

2.23.3 PASSIVE DAYLIGHTING STRATEGIES

Because each building is unique, architects tailor passive daylighting strategies based on the building's location and intended use. The goal of daylighting is to collect enough daylight in the summer to turn off electric lights and as much as possible in the winter to assist in heating the building. Architects use the following design elements to bring in as much natural light as possible: (Architects, 2019).

Building orientation: Light direction is important. Light that comes from the south is usually best for daylighting as sunlight is consistent throughout the day and year. This orientation can also be used for solar heat gain. Light that comes from the north is the next best, as the sunlight is as consistent as the south, just in a lower quantity.

Windows: To bring as much light into the building as possible, architects use windows with tall head heights. They can also use uniform windows (horizontal ribbon windows) across the entire façade to light the space evenly.

Skylights: Skylights allow daylight to enter from above, which is useful in spaces at the center of the building where light from windows can't reach. Architects can also place skylights high above the floor, allowing the light to diffuse before it reaches the ground.

Clerestories: Windows that are high above eye level, or clerestories, can light up an entire room.

External Shading Systems: At certain times of the day at each orientation, the light will be too bright and may produce a strong glare inside the building. To prevent this, architects design custom external shading systems to protect windows and other transparent openings. These systems usually include a combination of horizontal and vertical elements, but vary depending on the geographical location, climate, and building orientation.

Light shelves: A reflective horizontal shelf placed above windows reduces glare and directs light deeper into the space.

Solar tubes: These channel sunlight from the roof through a narrow opening. During the day, they look like ordinary ceiling lamps, but they are powered by the sun rather than electricity. These work well when placed directly above desks, where people need plenty of light.

Light wall colors: Light, reflective paint helps light to bounce around the room and makes the space feel brighter (Architects, 2019).

2.23.4 THERMAL COMFORT

It is required to achieve is a thermal environment which satisfies most people in the workplace, or put more simply, 'reasonable comfort'.
These factors need to be considered for a thermal environment in a workplace.

- Building design and layout
- Heating
- Air movement
- Air-conditioning

- Evaporative cooling
- Thermal insulation

2.23.4.1 OPTIMUM TEMPERATURE FOR THERMAL COMFORT

- Summer conditions: optimum temperature of 24.5°C with an acceptable range of 23-26°C
- Winter conditions: optimum temperature of 22°C with an acceptable range of 20-23.5°C

2.23.4.2 OPTIMUM HUMIDITY FOR THERMAL COMFORT

Relative humidity levels below 20% can cause discomfort through drying of the eyes and mucous membranes and skin. Low relative humidity levels may also cause static electricity build-up and negatively affect the operations of some office equipment such as printers and computers. Relative humidity levels above 70% may lead to the development of condensation on surfaces and within the interior of equipment and building structures. Left alone, these areas may develop mold and fungi. Higher humidity also makes the area feel stuffy.

The Health and Safety Executive (UK) states that a relative humidity between 40% and 70% does not have a major impact on thermal comfort.

2.24 COMPONENT STUDY

2.24.1 LIBRARY

Areas where bound paper documents, film, or magnetic media are kept are classified as library space types. Suitable for file rooms and other areas with dense material storage in climate-controlled office settings, a library space type may include both open and closed storage systems as well as movable shelving systems. According to the desired level of access to the stored materials, libraries may include reading, meeting, and electronic workstations in addition to display areas.

There are seven broad types of library space:

- Collection space
- Public electronic workstation space
- User seating space
- Staff workspace
- Meeting space
- Special use space
- Non-assignable space (including mechanical space)
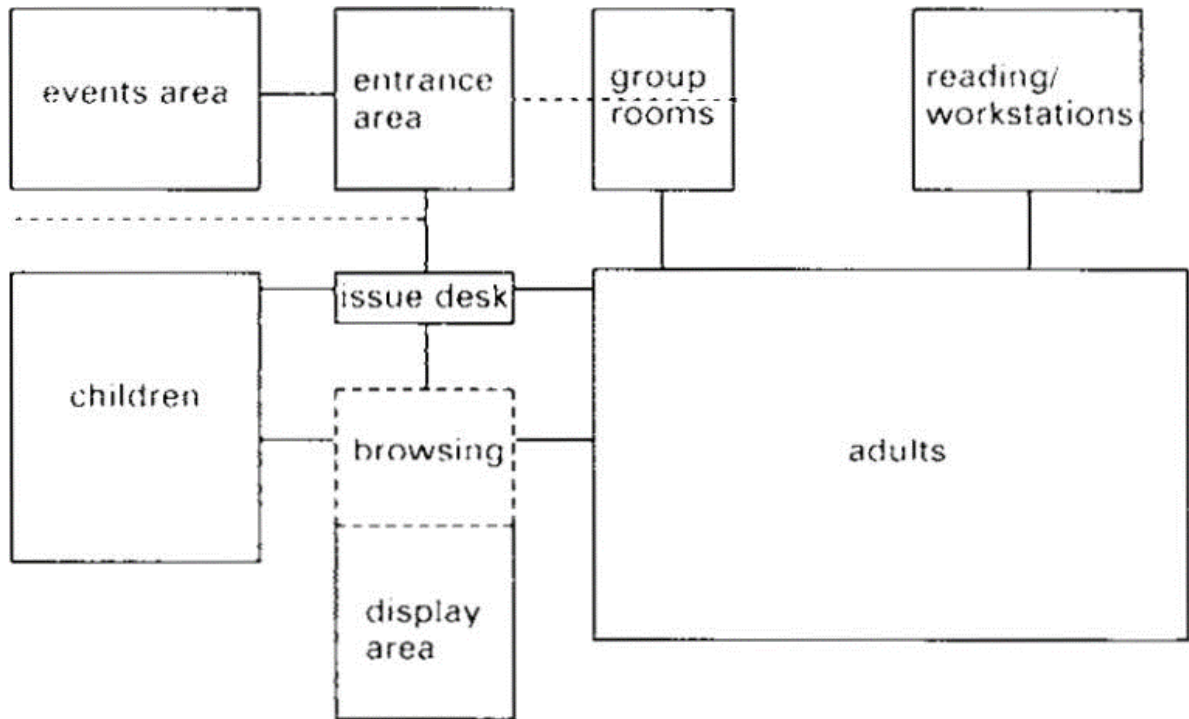
Figure 34 FUNCTIONAL DIAGRAM OF MEDIUM SIZED LIBRARY (Neufert, 2000)

2.24.2 MULTIPURPOSE HALL

The multipurpose room will be used for a variety of social activities. To create a pleasant and comfortable environment that promotes social interaction, the area should be visually appealing. A multipurpose area may need to handle a wide range of activities, such as eating, watching plays or movies, attending assemblies or community events, teaching big groups of people, and more. Acoustics, lighting, air conditioning, support and storage space, as well as mobile or movable amenities like seating, food presentation equipment, and self-serve refreshment stations, must all be balanced for each activity. Additionally, the places next to these spaces need to be considered (Butin, 2010).
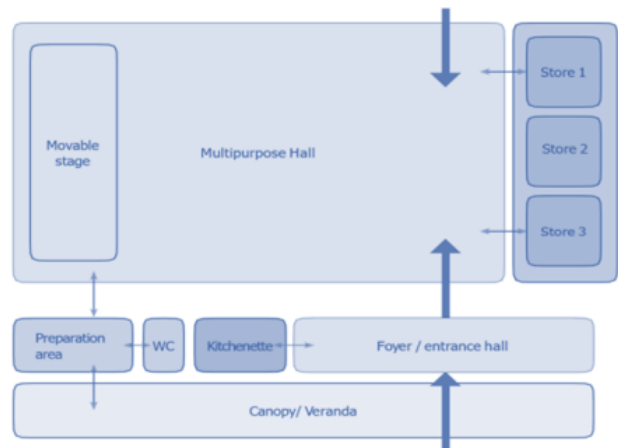
Figure 35 General plan of Multipurpose Hall

Space requirement: If the multipurpose space will be used as both a theater and a cafeteria, allow 10-14 square feet per person for dining and 7.5 square feet per person for performance seating.

Following is further discussion on balancing sometimes-conflicting factors for optimal performance across multiple use needs:

a) **Location:** The multipurpose space should be located next to other public spaces and be acoustically separated from instructional areas.
b) **Integrating technology:** The multipurpose space should be able to handle several forms of technology. Video, data, and electrical outlets should be spaced along the perimeter of the space, as well as at the edge of the stage.
c) **Finishes:** Flooring can be done using resilient sheets, resilient foam-backed sheets, wall finishing can be done using a variety of finishes to give acoustic variation i.e., painted plasterboard, timber paneling, timber slats with acoustic absorbent backing, plywood.
d) **Acoustics:** As just indicated, acoustic treatment can be one of the most difficult balancing acts for multipurpose spaces. Walls and ceilings should incorporate proper acoustical treatment. Room configuration is also important, such as a multi-tiered ceiling that can enhance acoustics.
e) **Lighting:** More than one lighting system may be required in the multipurpose space. In addition to serving meetings and dining events, the lighting system may be required to handle performances and multimedia presentations. Performance lighting might require spotlights, light controls, and a dimmer system. Plus, windows and skylights should have shades so that the space can be darkened adequately.
f) **Seating:** Requirements for seating in a cafeteria is drastically different from both performance and lecture hall uses. Seating for sports events and dramatic presentations can be handled with built-in bleachers that pull out from alcoves along the walls. Moveable tables and chairs can accommodate cafeteria and large-scale teaching/testing use in that same space, preferably with a podium from which the teacher or rector can be readily seen. Plan also for adequate chair and table storage.
g) **Ventilation:** For all uses, clean air and circulation of outside air are vital elements of a healthful indoor environment (Butin, 2010).

2.24.3 CAFÉ DESIGN

A type of restaurant in which customers service themselves from a counter and pay before eating either indoor or outdoor.

It is well to plan space allowances according to functions that the facility is to perform. Calculate area requirements in terms of:

- volume and type of service,
- amount and size of equipment to be used,
- number of workers required,
- space for needed supplies, and
- suitable traffic area.

The dining area location and space allowance are usually determined first, the production areas next in terms of specific relationship to the dining area, and the other sections a required to these. Planners should be careful in accepting general apace recommendations. There are many variations.

2.24.3.1 COMPONENTS OF A CAFÉ

c) Dining Area

Space for dining areas is usually based on the number of square feet per person seated times the number of persons seated at one time.

d) Production Area

A frequently used rule for allotting space for the kitchen is that it should be one-third to one-half the area of the dining room. It has been found unsatisfactory, however, to go by a set space allowance for this area. Detailed study of space allocations leads to the conclusion that percentages in relation to the dining area are "completely unrealistic and unreliable." An analysis of specific needs is required. Many factors influence space requirements, such as:

- Type of preparation and service
- Amount of the total production done in the unit
- Volume in terms of the number of meals served.
- Variety of foods offered in the menu
- Elaborateness of preparation and service
- Amount of individual service given, as in a hospital trey service
- Seating and service plan, whether on one floor or many

e) Serving Area

Space allowance of serving areas should be adapted to the needs of the specific facility. The menu, organization of work, and number served will influence size. The type of service will also be influential in dictating space needed. In cafeterias the counter length should be regulated by the variety and volume. Excess space partially filled is unattractive, but crowding is also undesirable. An estimate that may be used for allotting width is 14 ft. This allows for 4 ft as patron lane space, 1 ft tray elide, 2 ft counter width, 4 and half ft for workers, and 2 and half ft for back bar. The size of the tray should dictate the width of the tray slide. The average length of counters is usually 20 ft.

f) Receiving and Store Area

g) Sanitation Area
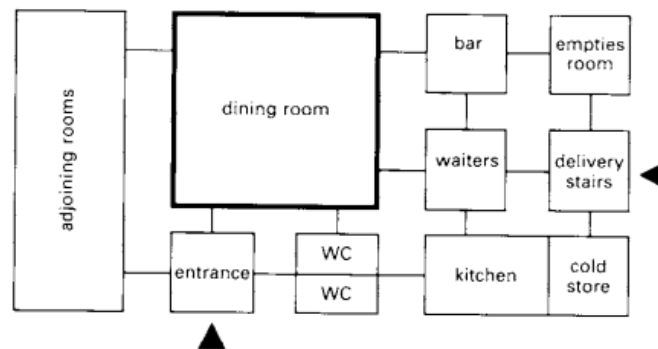
Figure 36 FUNCTIONAL LAYOUT FOR A SMALL RESTAURANT (Neufert, 2000)

2.24.3.2 AREA PER PERSON STANDARDS

- **Dining**: 1.6-1.8 sq.m/person
- **Kitchen**: 0.6-0.8 sq.m/person
- **Store**: 0.25-0.31 sq.m/person

- **Sanitation Area**: 0.1-0.12 sq.m/person

2.24.4 PARKING

The type, size and shape of a turning place in a road depend on the road use in that particular area. The interests of the fire and refuse collection services have to be taken into account in deciding on road turning places. Turning circles and loops are preferable, as motor vehicles can drive straight round them without having to stop.

Parking spaces are usually outlined by 12-20mm wide yellow or white painted lines. When parking is facing a wall, these lines are often painted at a height of up to 1 m for better visibility. Guide rails in the floor along the side have also proved popular for demarcation of parking limits, and can be about 50-60cm long, 20cm wide and 10 cm high (Neufert, 2000).

2.24.5 SPECIAL POPULATION DESIGN

2.24.5.1 STEPS

Steps are provided on a footpath to accommodate level differences. Steps with proper design and features should help Differently abled person to overcome obstacles in transition of spaces.

The following parameter should be considered:

- The external steps should be between 3 steps in a flight and not exceeding 10 steps in a flight.
- The steps should be uniform in size along its flight. (Settlement)

2.24.5.2 RAMP

The following parameters should be considered for design of ramp:

- Recommended slope of ramp is 1:20. Steeper slopes may be allowed in special cases depending on the length to be covered (refer figure 126).
- 1,800mm is the preferred width of ramp. 1,500mm is the minimum to be provided with an unobstructed path of minimum 900mm.
- Landing of size of equal or greater than width should be provided after every 14m of horizontal run for a 5% slope (Settlement).

Table 4 Relationship between slope of ramp and running length of the landing

Maximum slope	Maximum running length (m)
1:20 or 5%	-
1:16 or 6%	8
1:14 or 7%	5
1:12 or 8%	2
1:10 or 10%	1.25
1:08 or 12%	0.5

2.24.5.3 PARKING

When planning parking for a special population, the following factors should be taken into account:

- Outdoor parking should be maximum 50m away from accessible building entrance and indoor must be next to the accessible elevators or exit.
- If the parking space provided exceeds 50 parking bays, provide one accessible parking space for every additional 50 parking spaces.
- Provide at least 3,200mm wide drop-off zone with aisle of 1,500mm for ease of maneuvering.
- Use tactile flooring of at least 600mm wide at the edge of the pathway to warn pedestrians of the transition to vehicular space.
- Use proper signage for drop-off zone and parking for clarity and information.
- Do not locate parking space at the entrance to a building or a facility (Settlement).

2.24.5.4 ENTRANCE

All interior routes from accessible entrances to accessible exits should be safe and easy to use by differently abled persons. Such routes should be clearly identifiable and logical in layout.

The following parameters should be considered:

- The main entrance should be clearly identifiable and obstruction free.
- The footpath should lead from the drop-off zones or parking lot to the entrance to the building.
- The entrance to the building should be provided with tactile flooring.
- Both stairs and ramps should be provided to enter the building with handrails on both sides (Settlement).

2.24.5.5 TOILET DESIGN

The following parameters should be considered:

1) The ease of transferring from a wheelchair to a toilet seat or bidet depends on the approach. In general, there are four different approaches. The four approaches are:
   a) The parallel approach, the easiest,
   b) The diagonal approach, the difficult,
   c) The perpendicular approach, the difficult and,
   d) The frontal approach, which is the most difficult and need particular care.
2) At least one toilet accessible with a wheelchair for one user in institutional buildings or one toilet for every hundred users, should be allocated.
3) The distance between the centerline of the washbasin and the adjacent sidewall should be at least 450mm.
4) A full-length urinal is the most accessible (Settlement).

2.25 SUSTAINABILITY DEISGN APPROACH

Sustainability is defined by the World Commission on Environment and Development as development that satisfies current needs without jeopardizing the ability of future generations to satiate their own needs. When this intricate idea is applied to architecture, it then refers to planning for healthy living spaces while attempting to reduce adverse effects on the environment, energy use, and use of human resources.

A building's materials, construction techniques, resource usage, and overall design all exhibit sustainable architecture. Additionally, the design must enable sustainable operation throughout the entire building life cycle, including final demolition. Although it must be both aesthetically pleasing and functional, the space must be built with the goal of achieving long-term energy and resource efficiency (Merril, 2012).

2.25.1 ORIENTATION

Orientation is simply what compass direction the building faces. Along with massing, orientation can be the most important step in providing a building with passive thermal and visual comfort. Orientation should be decided together with massing early in the design process, as neither can be truly optimized without the other.

Successful orientation rotates the building to minimize energy loads and maximize free energy from the sun and wind. Successful orientation can also take advantage of other site conditions, such as rainwater harvesting driven by prevailing winds. It can even help the building contribute to the health and vitality of the surrounding social, and economic communities, by orienting courtyards or other social spaces to connect to street life (Venturewell, n.d.).
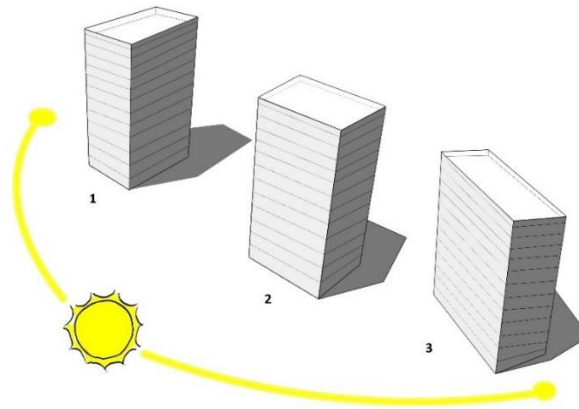
Figure 37 Orientation 1 is worst for daylighting, 3 is good, and 2 is best. (Venturewell, n.d.)
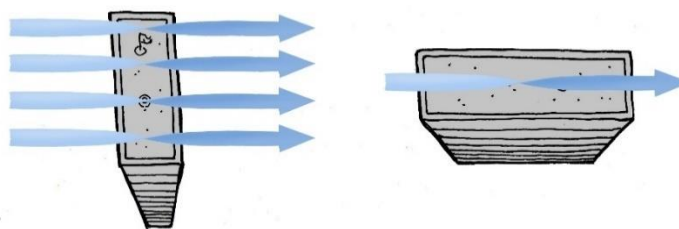
Figure 38Orientation for maximum passive ventilation (Venturewell, n.d.)

2.25.2 PASSIVE NOISE CONTROL

Designing the building and the spaces within it to benefit from noise control or mitigation. The impact of noise can be reduced through building layout and other design elements. This is known as passive noise control.

Where noise cannot be controlled at source, good design can help to reduce its impact. It is important to consider noise control from the beginning of the design project.

Consider all potential sources of noise from both outside and inside the home and consider all potential sound paths – including direct paths (for example, through doors and windows) and indirect paths (for example, when sound is deflected off walls, or passes through minor gaps in walls, or passes around obstructions such as fences). Also consider both airborne noise (such as noise from traffic and stereos) and impact noise (such as slamming doors or footsteps in a floor above), and the impacts of reverberation from hard surfaces.

2.25.2.1 NOISE IN THE BUILDING CAN BE CONTROL BY FOLLOWING METHODS

- Room arrangement
- Use of solid walls
- Planning for single story houses
- Proper arrangement of balconies
- Having courtyards (K, 2009-2021)
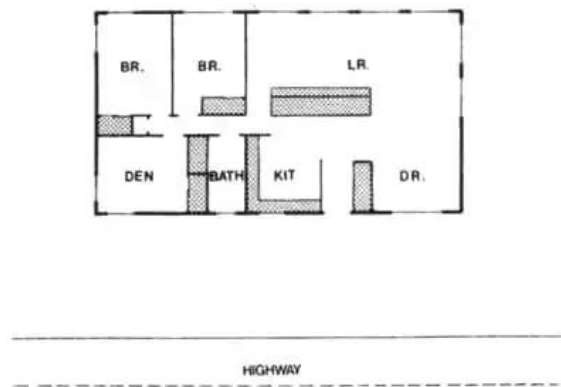
Figure 42 Room Arrangement in Buildings for Noise Control through Architectural Acoustic Design (K, 2009-2021)

Figure 41 Use of Single-Story Houses to Reduce Noise Impacts (K, 2009-2021)

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Figure 39 Use of Solid Walls in Buildings for Noise Control (K, 2009-2021)
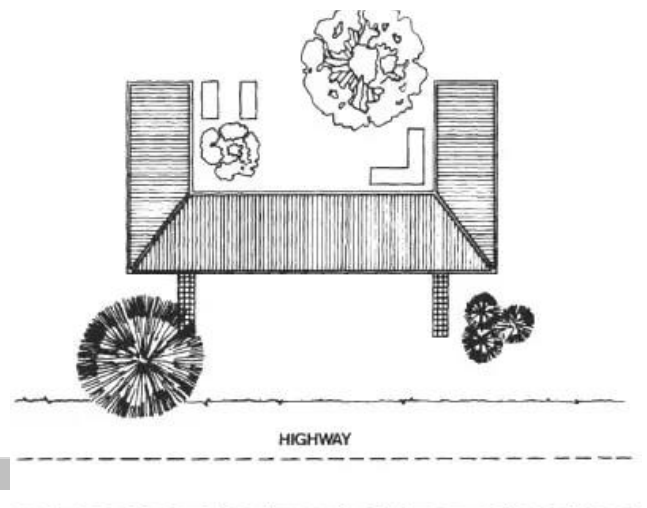
Figure 40 Courtyards for Noise Control in Buildings (K, 2009-2021)
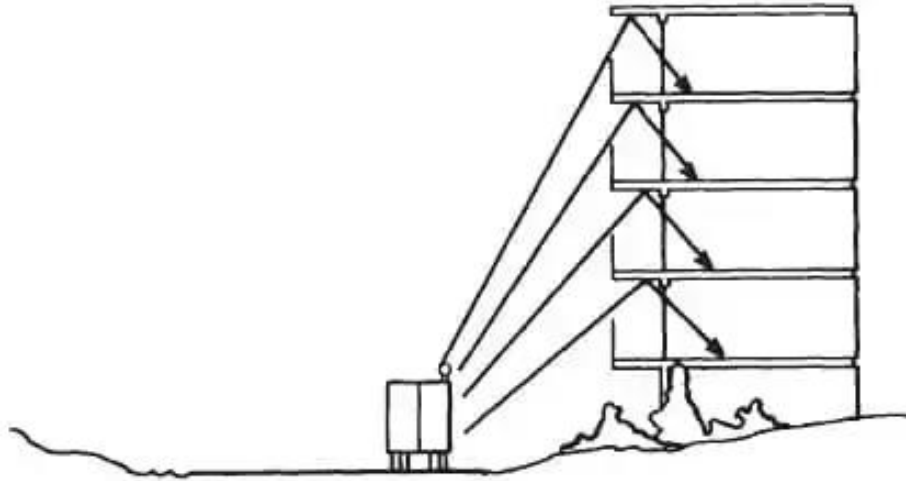
Figure 43 Balcony Facing the Road attracts Noise into the Building (K, 2009-2021)

2.25.3 GREEN ROOF

A vegetative layer cultivated on a rooftop is known as a "green roof" or "rooftop garden." Green roofs offer shade, absorb heat from the atmosphere, and lower air and roof surface temperatures. In urban areas or other constructed environments with little natural vegetation, using green roofs might reduce the heat island effect, especially during the day. Green roof temperatures can be 30–40°F lower than those of conventional roofs and can reduce city-wide ambient temperatures by up to 5°F. In addition, green roofs can reduce building energy use by 0.7% compared to conventional roofs.
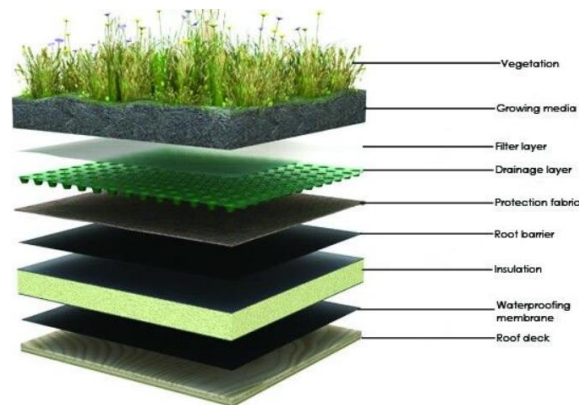
Figure 44 Components of green roof.

2.26 DESIGN INFERENCES DRAWN FROM LITERATURE REVIEW

The following design inferences were drawn from the literature review.

- Physical barriers should be avoided as much as possible in the spaces which requires interaction between various group of users.
- Interior deisgn planning is as much important as the exterior as the project manifests most of its user interaction within the interior spaces mostly depending on the nature of the activity performed by the users.
- The design of spaces should address the system of flexibility, adaptability and multifunctionality in its space which caters the changing space requirement of its user according to various use setting and environment.
- Various design strategies discussed in the literature review should be given due consideration while designing the project for effective planning and zoning of the activity spaces.
- International case studies carried for the project shows that the design hold vital importance in use of open spaces, shared spaces, breakout spaces and inside outside relationship for the evolution of collaborative and innovative user environment.

3   CASE STUDIES

Doing a case study will help you understand the various aspects that you have to consider while designing. The selected case studies discussed in this chapter are specifically chosen for their relevance to the key issues established in the previous sections. The studies have been deemed to be relevant because it serves as appropriate examples of architectural responses to the special needs of individuals with ASD. The analysis of these studies explores how the considered relationship between the built environment and the specialized needs of individuals with ASD creates positive environments. The analysis is based on the following criteria, where applicable:

- Guiding Principles and Research
- Entrance sequence & visual connection
- Layout & design components
- Zoning
- Acoustics
- Color
- Light and Ventilation
- Public access
- Special population friendly design

NATIONAL CASE STUDIES

3.1   IMPACT HUB

3.1.1   INTRODUCTION

- General Information Location: Pulchowk, Lalitpur
- Date of Establishment: 2015
- Site Context: Mixed
- Use Ownership: Impact Hub
- Site Area: 2.5 Ropanis
- Number of blocks: 4
- Number of floors: 2
- Site topography: Contour Land
- Site Orientation: South
- Construction Technology: RCC Frame Structure and Container Architecture
- Target Group: All ages, specially 16-35
- Objective: Establish a platform for the sharing of ideas and as a community resource center after the 2015 Earthquake.
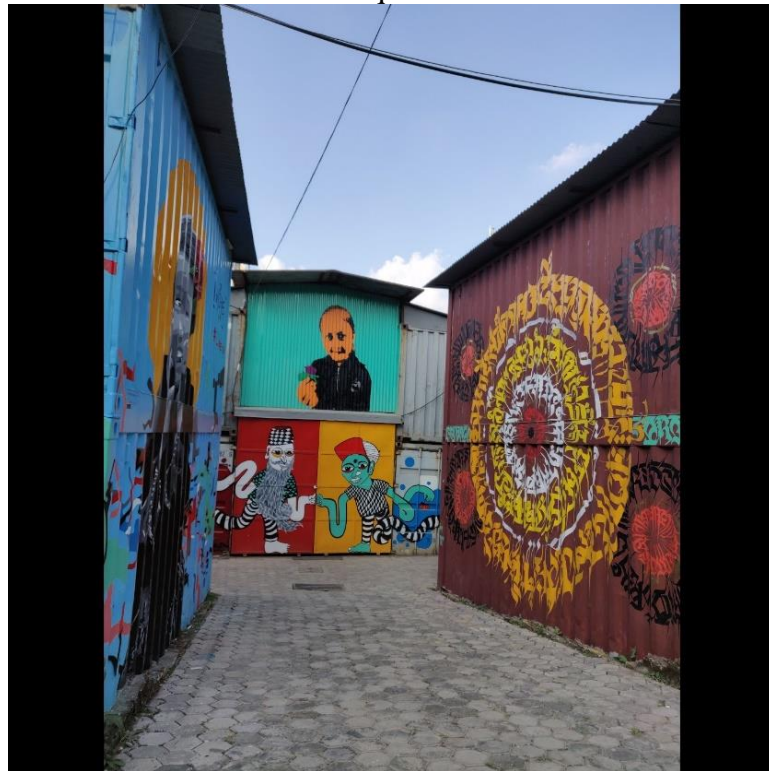
Figure 45 MAKERSPACE NEPAL COMMUNITERE

3.1.2   GUIDING PRINCIPLES AND RESEARCH

Previously Impact Hub was called Nepal Communitere. Nepal communitere was invited by the Impact Hub Global Network to become a member in June 2021 and now it is called Impact Hub. Nepal Communitere was founded in response to the 7.8 magnitude earthquake which struck Nepal on April 25th, 2015. Nepal Communitere is the Nepali

branch of Communitere International, an innovative non-profit, pioneering an effective international model for sustainable disaster recovery.

Nepal Communitere is an open and inclusive innovation hub for bold innovators and creative changemakers. It is a co-working space for the young entrepreneurs where they get resources and workspace for their business startups. The space has been developed in an already existing residential compound by using 16 donated shipping containers by UK aid.

It provides facilities such as business support, incubation, acceleration business coaching, consulting, coworking spaces, Training Hall, Fabrication lab, Makerspace. Most startups are youth. It has helped 60+ startups company to grow.

3.1.3 LAYOUT & DESIGN COMPONENTS
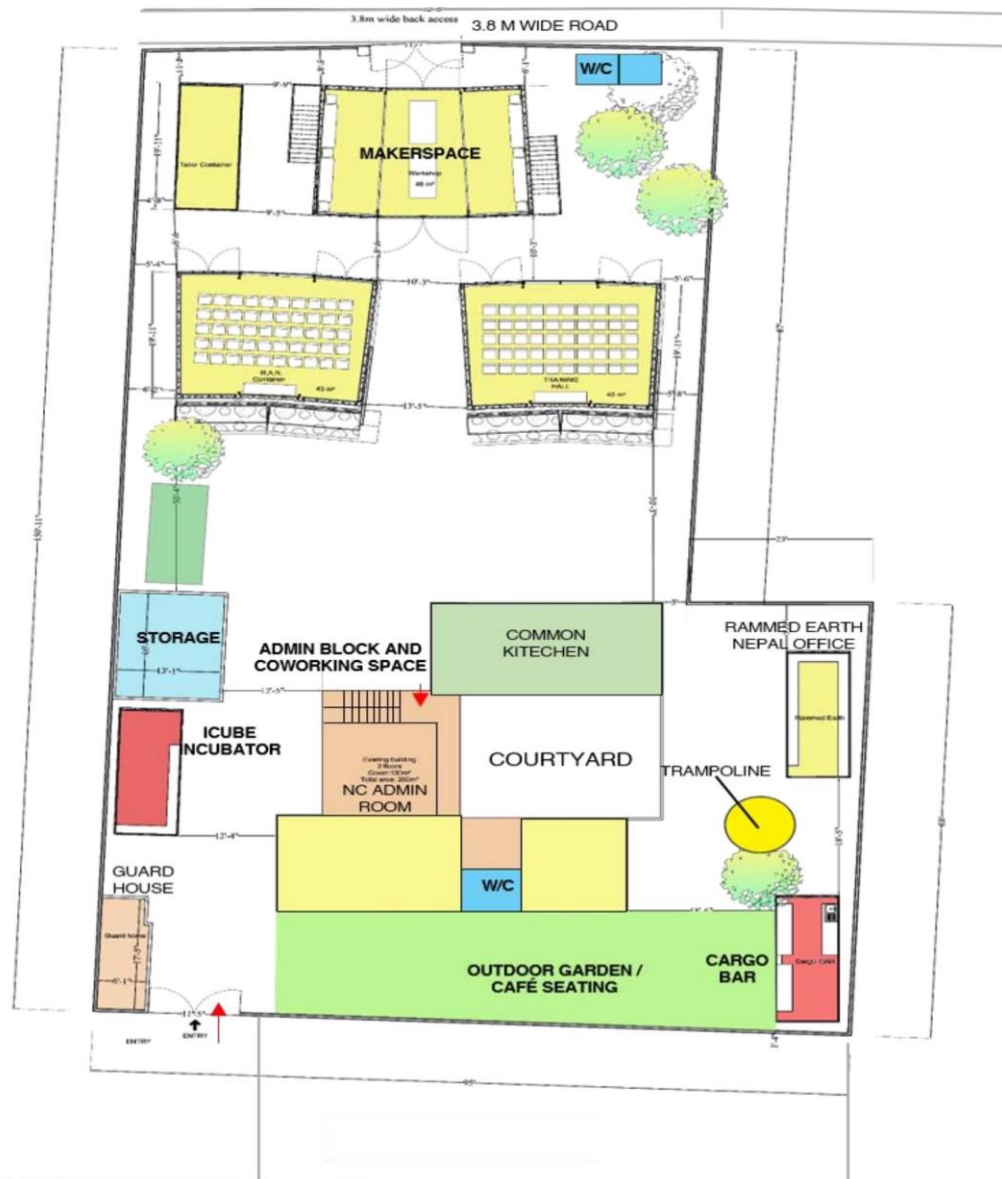
Figure 46 SCHEMATIC PLAN NEPAL COMMUNITERE

Impact Hub is in the heart of Pulchowk just a minute walk away. It is in a central point with similar spaces in walking distance. The site is surrounded by several cafes and restaurants by all sides that enhances the networking approaches for it. East: Labim Mall, Overhead Bridge, Sajha Petrol Pump, Lalitpur Mahanagarpalika West: CG Nxt, Suzuki Car Showroom, Sajha Pustak Prakashan, Bhutpurwa Sainik Sangh, Hardik Fitness Club, Restaurants, North: Harihar Bhawan South: Corporate and Commercial shops and Buildings.

Impact Hub has two major blocks. One block is a residential block adopted into workplace whereas the other are the blocks out of cargo containers.

3.1.3.1   PLANNING

The overall planning of Impact Hub is based on the existing building and the rest of the area where new construction has been done.

3.1.3.2   VENEER HOUSE

Veneer house is a 2 and half storied building. The planning of this building is courtyard planning with access to all the spaces throughout the balconies that allows interaction to the courtyard below. Veneer house houses the following spaces: NC office I cube Office Co-working space A design studio Courtyard Pantry Toilets in each floor This block has no architectural expression. The courtyard design allows the conversation and interaction flowing from one floor to the other. The courtyard is the common space for all. It is a place for meetings, gatherings, pitching sessions, performance, and informal and formal discussions.

3.1.3.3   CO-WORKING SPACE

The co-working space at Nepal Communitere consist of small start-up offices. All these enterprises along with their rental individual offices share the resources like makerspace, conference room and common kitchen. The spaces are rentable, and the shared resources are available whenever in need as per users.

3.1.3.4   NC OFFICE

The NC office is the one for Nepal Communitere which looks after the whole community resource center.

3.1.3.5   I CUBE OFFICE

I cube is the Incubation cube office that looks after the incubators and its participants, events, and sessions regarding the incubation of projects and ideas.

3.1.3.6   PANTRY

The Pantry of Nepal Communitere is an open pantry that feeds lunches to all working in the communitere. Moreover, anyone working there has access to it for drinks and snacks and has access to cook there on their own.

3.1.3.7   CARGO BLOCKS

The cargo containers have been placed all over the Communitere as small workplaces such as Fab lab, Training halls, maker space, store etc. The cargo blocks are designed in such a way that three containers are combined to form a floor with the middle container acting as the openings. Then the other floors are stacked on top to form the block. The murals and artworks in the cargo containers has given it the character of creativity and

free spiritedness. This block is also stacked as a two-storied building. Here, 3 different blocks exist housing the following spaces:

3.1.3.8 BLOCK 1: FAB LAB NEPAL

Fab Lab Nepal is a collaborative center for innovation, invention, education and humanitarian outreach and a fully equipped digital fabrication workshop. It provides access to knowledge, tools, and resources that bring ideas from heads to hands and champions 'making' as a means of empowering the people of Nepal regardless of their gender, social status, ability, or economic means.

All Fab Labs share common tools and processes, the program is building a global network, a distributed laboratory for research and innovation across over 1,700 Fab Labs around the world. The various equipment currently used in fab lab which can be listed below as:

- 3D Printers
- Milling Machine
- CNC Router
- Vinyl Cutter
- Sewing Machines
- Digital Embroidery Machine
- Laser Cutter
- Color Printer
- Power and Hand Tools (Makerspace)
- Electronics Components
- Molding and Casting
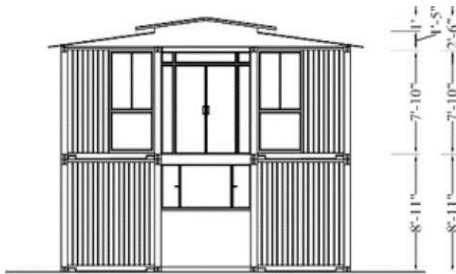
Figure 47 FAB LAB FRONT ELEVATION
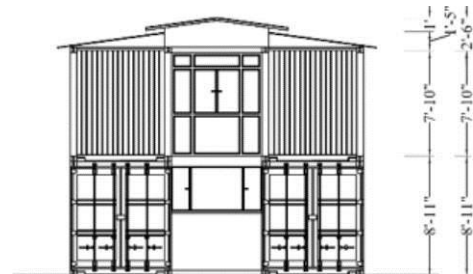
Figure 48 FAB LAB BACK ELEVATION

3.1.3.9 BLOCK 2: MEETING SPACE

The hall is a multipurpose space where events such as discussions, seminars, workshops are conducted. It has industrial design and since it is in one of the cargo containers, it has the containers doors as well.

3.1.3.10 BLOCK 3: MAKERSPACE

The makerspace covering an area of 45 m^2 is a space in this co-working space to co-create prototype various product ideas with the use of available tools, equipment, and

expert help. Although the space consists of basic woodworking and metal working tools it still plays an important role in this community to bring the idea of creating and collaborating into reality. The space has been utilized for fabrication of customized furniture, testing prototype of self-designed energy efficient vehicle and other efforts of creating from ideas.

Figure 49 NEPAL COMMUNITERE MAKERSPACE
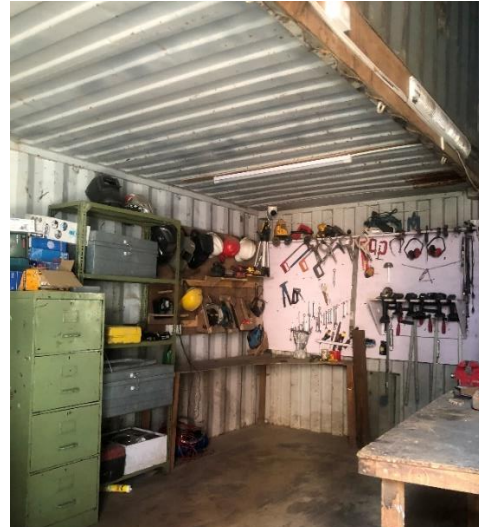
Figure 50 NEPAL COMMUNITERE MAKERSPACE INTERIOR

3.1.3.11 CARGO BAR

The Cargo bar is a place for networking. Here the people from anywhere can come and meet other people and discuss about their ideas.

3.1.3.12 LANDSCAPE

There is no specific landscape design in Impact Hub except for the Cargo Bar which is an outdoor café.

3.1.4 LIGHT AND VENTILATION

Use of container doors as door and windows in fab lab, and in veneer building use of normal windows for lighting. The Makerspaces and other workshops took light mostly from clerestories or dormer windows. Cross ventilation given in Fab lab.

3.1.5 PUBLIC ACCESS

The Impact Hub is always open for public. It has the motto no doors closed and is welcoming. Public can easily access the facility. The transformation of this space made a huge impact. A cold and closed space used as governmental offices and with an extreme security equipment was converted to an accessible, eco-friendly, creative, and recreational space. The intervention of this complex reactivated the neighborhood,

inviting people again to relocate their business in the zone, or even indoors the same project.

3.1.6 SPECIAL POPULATION FRIENDLY DESIGN

Special population friendly design has been done around the site. In the containers, stairs are changed into lift for special population. Though the Veneer block was a residential block and has not considered for those design presently back door is used for entrance for the special population.

3.1.7 SPACE ANALYSIS

Table 5 SPACE ALLOCATION OF NEPAL COMMUNITERE

SN	Spaces	Area	Capacity	Area/Person
1	Coworking	42m2	16	2.65m2
2	Makerspace	46m2	15	3.06m2
3	Hall	42m2	30	1.4m2
4	Courtyard	54m2	40	1.35m2
5	NC office	9m2	2	4.5m2
6	Cargo bar	135m2	30	4.5m2
7	Parking	117m2	15	7.8m2

3.2   KARKHANA

3.2.1   INTRODUCTION

- **Location**: Gyaneshwor
- **Date of Establishment**: 2013
- **Site Context**: Mixed Use
- **Site area**: 3 Ropanis
- **Ownership**: On Lease
- **Number of Blocks**: 3
- **Number of floors**: 2
- **Site topography**: Flat Land
- **Site Orientation**: South
- **Construction Technology**: Load Bearing
- **Target Group**: Children of ages 8-14
- **Building Usage**: Workspace, Makerspace, and Inventory Room etc.
- **Objective**: To develop a culture of making, collaborating, and learning from an early age
- **Activities**: Bee Creative Innovators Club

Figure 51 KARKHANA EXTERIOR VIEW

Karkhana is an educational company and makerspace with unique approach to learning. It is dedicated to instilling the design thinking in the children through innovative teaching methods. The classes are run by engineers, designers, artists, scientists, turning the classroom into lab for discovery. The institution wants the students to 'gain one key insight: the world is malleable'. The students compromise of learners from age 8 to 14. The courses compromise of cross-disciplinary co-curricular afterschool programs.

The building of Karkhana is repurposed old schoolhouse building run by Pudasaini Family.

Figure 52 KARKHANA EXTERIOR VIEW

3.2.2 SITE AND SURROUNDING

Karkhana is situated close to Gyaneshwor's main thoroughfare. Its surroundings include the following sites:

- East: Buildings, both residential and commercial
- West: USEF and commercial structures International School of Tourism
- North: and Hotel Management
- South: Residential structures and Galaxy Public School.

3.2.3   ARCHITECTURAL EXPRESSION

The architectural expression is a traditional institutional building as the building was previously a boarding school in the Rana regime. With the brick façade and with white bands and cornices, it brings out the traditional Newari as well as neo classical vibes.

3.2.4 PLANNING

Karkhana's layout is linear, with corridors serving as access points to the various spaces. The hallways on the upper floors have also been converted into open offices. The external staircase provides access to the upper floors. The makerspace and inventory room, which are located outside the main building, are additional spaces.

The building's entrance is on the first floor through the reception area, which was moved following the lockdown. There are three work environments in Karkhana, each with a different function, and no separate administration unit offices. In the same room, the CEO, founding members, and interns work and collaborate. There are 2 additional rooms adjacent to the main office space; one is for interaction and collaboration, and the other is a quiet room for tasks requiring a quiet environment.

The makerspace has a central table with all the tools and equipment, including soldering irons and welding equipment. There is a small 3D printer in the area that is intended for printing on acrylic and wood, and it pretty much takes up space. The room where mentors work has a raised stage with a capacity for about two people. The makerspace's storage unit has a cabinet with lots of equipment in it.
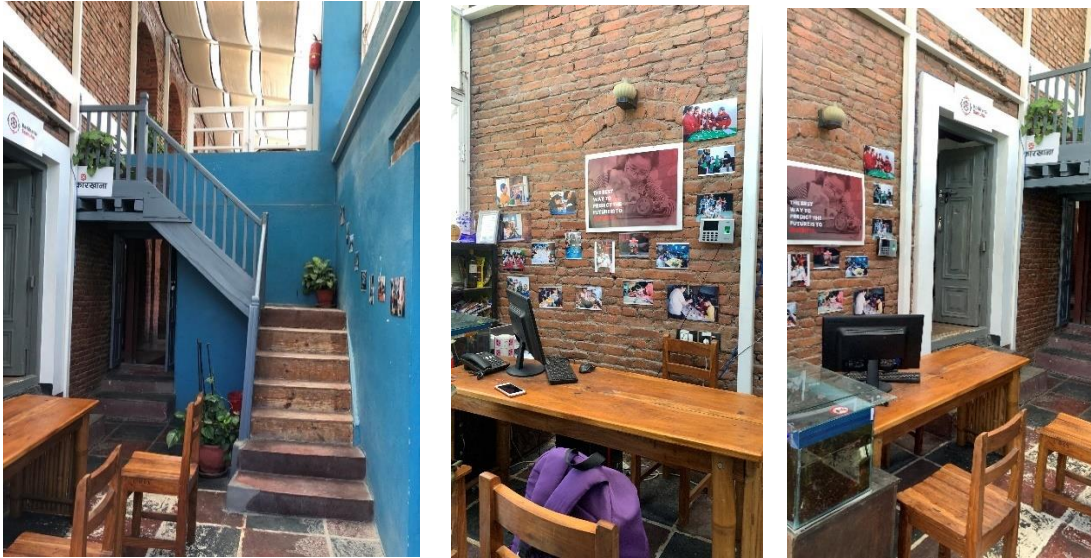
Figure 53 KARKHANA RECEPTION

Figure 54 KARKHANA DISCUSSION AREA

3.2.5   SPACE, ACTIVITY STUDY
 The space and activities that occur in karkhana are as follows:

Inventory Room
This room is meant for the storage of the materials requires in the teaching, learning, and creating process. These materials are properly organized in respective bags and tagged with names for easy access.

Makerspace
The makerspace is equipped with the necessary tools such as laser cutting machine, 3D printer, other saws, drills etc that are required in the creation process.

Office
The offices are the respective rooms for the respective teams of staff.

Figure 55 SALES AND MARKETING

Figure 56 KITCHEN AND DINING

Figure 57 KARKHANA MAKERSPACE & MULTIPURPOSE HALL

Figure 58 KARKHANA STORE

Figure 59 MAKERSPACE

Meeting Hall

Meeting Hall lies in the ground floor where the staffs of the karkhana gather together to discuss and decide on topics of work. The hall is of moderate size which has a space themed mural on the wall. The desks are easily movable, and the space also has white boards and background for projector enabling the space for multiple activities.

Multipurpose Hall

The multipurpose hall lies on the top floor where certain teams work during non-event days and even children work there on their projects.

Landscape

The landscape is very simple and not elaborate at all. The entrance is through an open area which is the major landscape element. The paving is stones and grass making it permeable.

3.2.6 SPACE ANALYSIS

Table 6 ALLOCATION OF SPACES OF KARKHANA

SN	Space	Area	Capacity	Area/Person
1	Inventory Room	33m2	6	5.5m2
2	Makerspace	28m2	4	7m2
3	Meeting Hall	46m2	28	1.64m2
4	Main Office	14m2	2	7m2
5	Multipurpose Hall	78m2	50	1.56m2
6	Parking	150m2	30	5m2

3.2.7 DESIGN INFERENCES

- The makerspace is positioned outside the main building creating less noise to the office spaces.
- Best learning environment can be created by just creating a open space where collaboration is given importance.

INTERNATIONAL CASE STUDIES

3.3   TECHNOLOGY HUB

- **Architects**: Carlos Villegas
- **Studio**: HADVD Arquitectos
- **Area**: 10662 m²
- **Year**: 2015
- **LOCATION**: Adolfo López Mateos, B.C.S., Mexico

Figure 60 TECHNOLOGY HUB (Arquitectos, 2015)

3.3.1   GUIDING PRINCIPLES AND RESEARCH

Technology Hub is an entrepreneurship and innovation park that promotes technologic development. It took place in a complex that previously operated as the American Consulate offices in Ciudad Juarez for about 25 years.
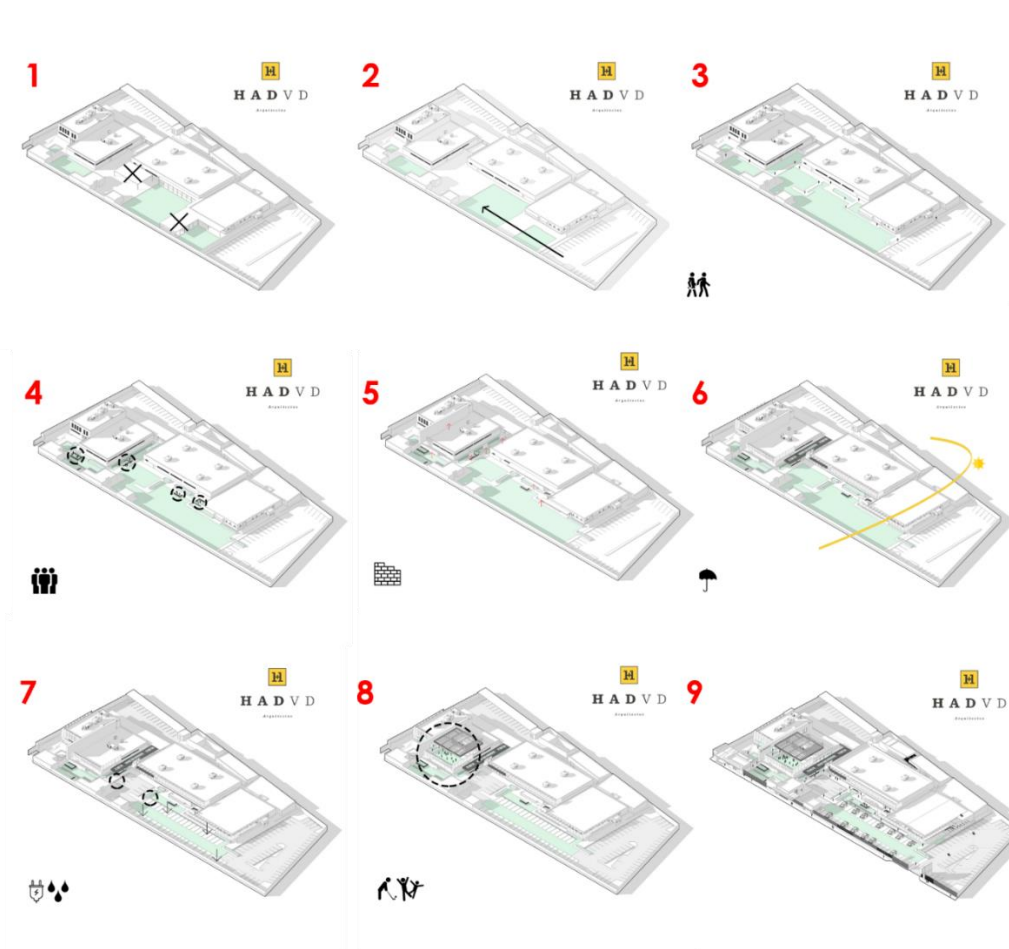
Figure 61 CONCEPTUAL DIAGRAM TECHNOLOGY HUB (Arquitectos, 2015)

3.3.2 ENTRANCE SEQUENCE & VISUAL CONNECTION

Opened on October 2015, Technology HUB is a one-of-a-kind innovation and entrepreneurship community without parallel in any of the binational metropolitan regions along the U.S.-Mexico Border. Located within a five-minute drive from the International Bridge of the Americas, across from El Paso, TX, it is a 1.8-acre complex housed within the buildings of what used to be the Consulate General of the United States in Ciudad Juárez, Mexico. Technology Hub has over 600 ft of frontage road facing Avenida Lopez Mateos, one of the busiest corridors in Ciudad Juarez.

Figure 62 MEGA BUILDING ENTRANCE (Arquitectos, 2015)

3.3.3 LAYOUT & DESIGN COMPONENTS

Its objective is the collective work within spaces that are designed with an ecologic and creative awareness, providing room for entertainment and distraction, green and open-air areas, and offices and meeting rooms with a recreational character as well.

With over 55,000 sq. ft. of built space and incorporating design elements commonly found in the global innovation hubs like Silicon Valley and Boston, Technology HUB is a beacon of the emerging innovation economy in Ciudad Juárez and a catalyst for its growth. Its three main buildings encompass a mix of spaces and functions designed to inspire collaboration and creativity. These include offices of varied sizes, meeting rooms, kitchens, a roof garden, a virtual reality demonstration facility, an auditorium, a green room, and a Fab Lab. In addition, more than 4,500 sq. ft. of coworking space help connect the community, freelancers, and entrepreneurs. The complex also includes two additional flexible spaces, including a bike & coffee shop, and a restaurant.
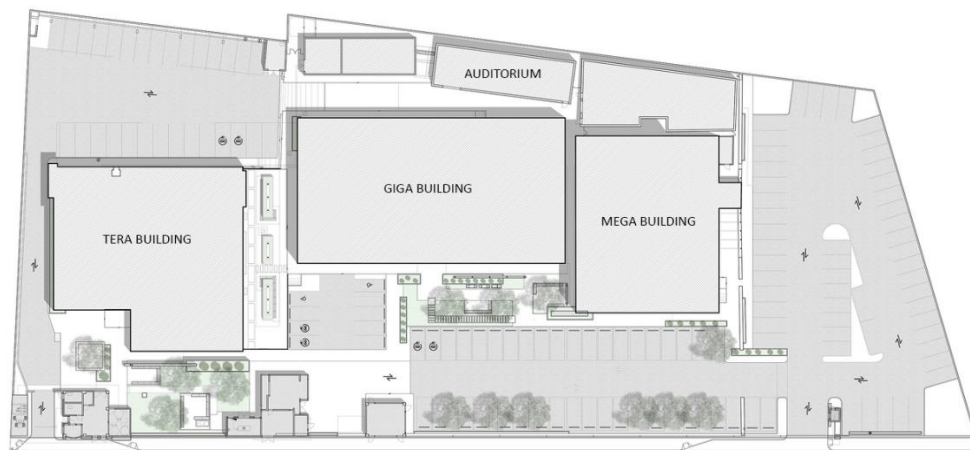
Figure 63 SITE PLAN (TECHNOLOGY HUB) (Arquitectos, 2015)

3.3.4 ZONING

The complex has multiple buildings: the main one "Tera Building" devoted to business support; "Giga Building" for offices for rent; and "Mega Building" project incubator and a prototypes workshop "Fab Lab". Besides, it also has an auditorium and a bike shop.

Figure 64 GROUND FLOOR PLAN(MEGA (Arquitectos, 2015))
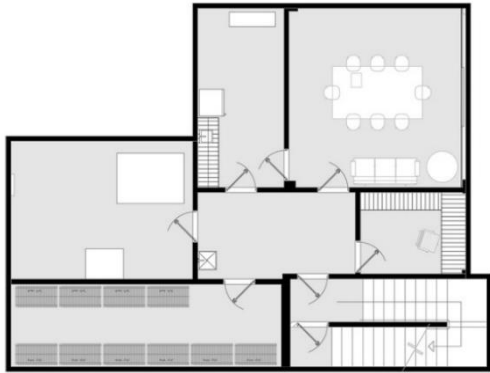
Figure 66 GROUND FLOOR PLAN (TERA) (Arquitectos, 2015)

Figure 65 BASEMENT PLAN (TERA) (Arquitectos, 2015)
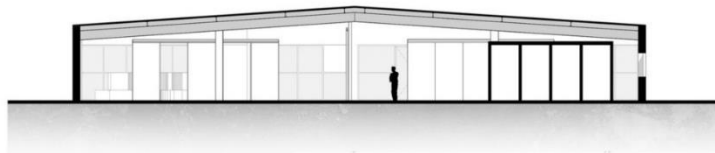
Figure 67 SECTION (MEGA) (Arquitectos, 2015)
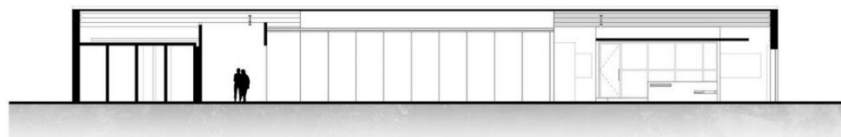
Figure 68 SECTION OF MEGA (Arquitectos, 2015)
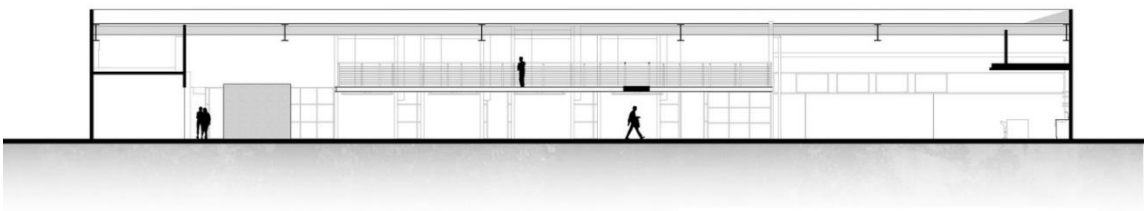
Figure 69 SECTION OF GIGA (Arquitectos, 2015)
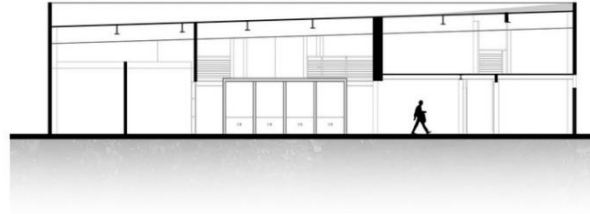
Figure 70 SECTION (GIGA) (Arquitectos, 2015)
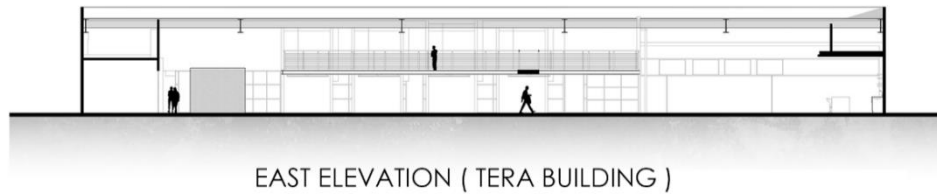
EAST ELEVATION (TERA BUILDING)
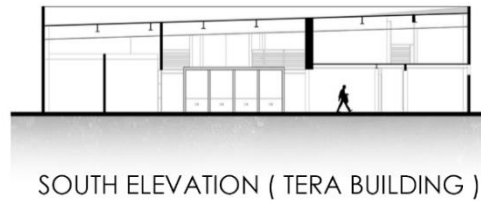
SOUTH ELEVATION (TERA BUILDING)

EAST ELEVATION (GIGA BUILDING)

EAST ELEVATION (MEGA BUILDING)
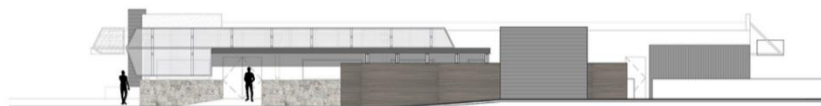
SOUTH ELEVATION (MEGA BUILDING)

Figure 71 ELEVATIONS OF TECHNOLOGY HUB (Arquitectos, 2015)
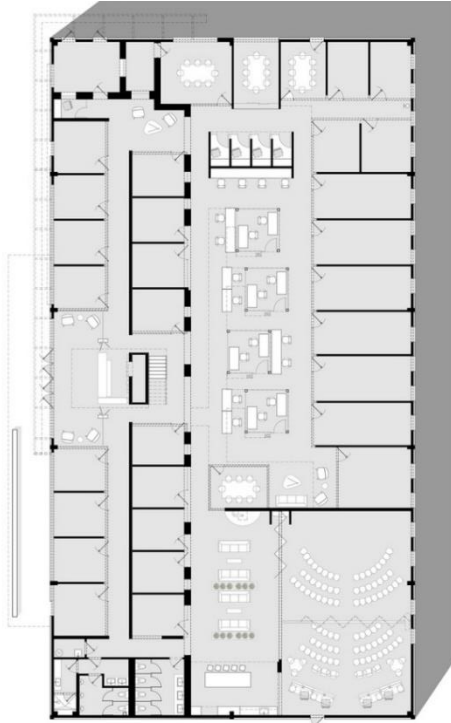
Figure 73 GROUND FLOOR PLAN (TERA)
(Arquitectos, 2015)
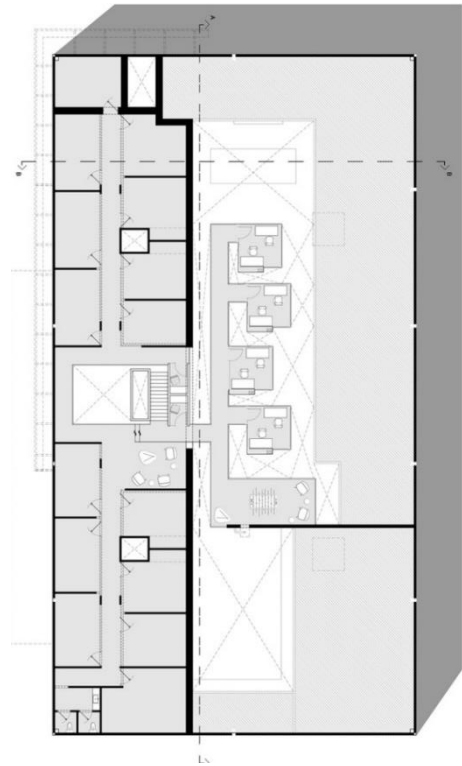
Figure 72 First Floor Plan (Tera)

3.3.5 FLEXIBILITY IN DESIGN

Flexibility is embedded throughout the space. The interiors accommodate events of all sizes, from small corporate meetings to large entrepreneurship summits. Offices are made with glass walls to create a sense of openness. The multiple leisure spaces and recreational zones in each building intend to foster creativity and boost productivity, including playful elements such as a slide and a fireman's pole. Retractable walls have been used for partition of a larger space as well as allowed for open layouts that visually enhance interiors.

An open and transparent design was chosen for the new building to symbolize innovation, flexibility, and openness, while promoting communication and creativity.

3.3.6 PUBLIC ACCESS

With its remarkable physical transformation and programming Technology HUB has become the go-to place for anyone seeking to turn ideas into reality. It houses over 60

businesses, events as wide-ranging as pitch competitions, art shows and hackathons, and has become a gathering space for the entrepreneurial energy that is transforming the local economy and breathing new life to an abandoned neighborhood.

3.3.7 SPECIAL POPULATION FRIENDLY DESIGN

Provisions for parking for wheelchair user are provided in the facility. Ramp has been used for proper access for the special population. Color blue has been used to separate the services or provisions provided for the special population.

Figure 74 TERA BUILDING ALONG WITH PARKING (Arquitectos, 2015)

Figure 75 STREET VIEW OF TERA BUILDING (Arquitectos, 2015)

Figure 76 EXTERIOR VIEW OF GIGA BUILDING (Arquitectos, 2015)

3.3.8 MATERIALS USED

Both in its interior and exterior, the repurposing of the building sought to preserve its legacy while reusing materials and existing elements of the old construction. In the interior, old concrete walls, and armored windows and doors, were preserved or repurposed in creative ways to create a more open and welcoming space. Organic materials such as wood, concrete, and ironwork can be found throughout. Its exterior façades, built with hammered concrete, gray stone and concrete walls were kept almost in their entirety, with a new, contemporary character added by enveloping structures of perforated sheet metal. More than 70% of the front metallic fence was repurposed from old fencing that was used to secure a section of the former Consulate.
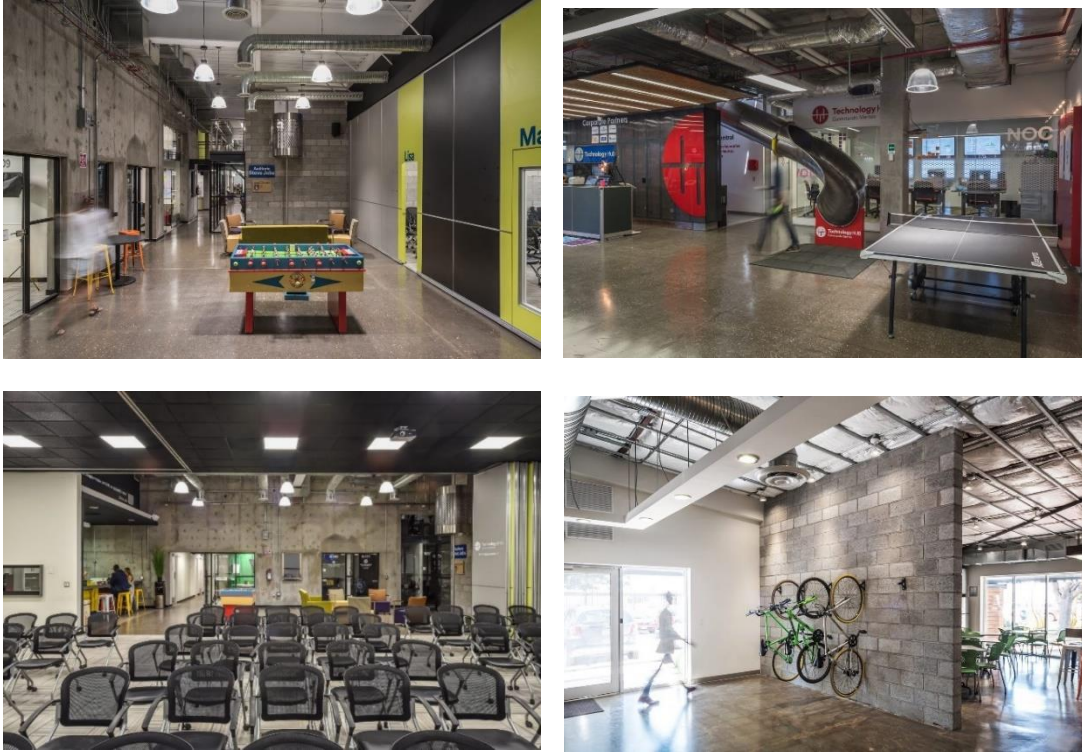
Figure 77 TECHNOLOGY HUB INTERIOR (Arquitectos, 2015)
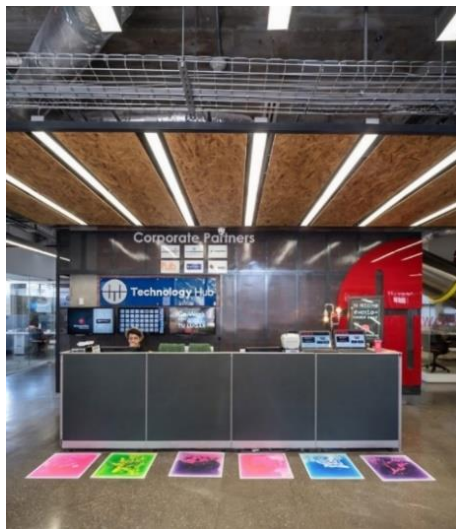
Figure 79 TECHNOLOGY HUB RECEPTION

Figure 78 TECHNOLOGY HUB OFFICE SPACE

3.4   MERCK INNOVATION CENTER

- **Architects**: HENN
- **Year**: 2018
- **Location**: Frankfurter Straße 250, 64293 Darmstadt, Germany
- **Area GFA:** 21 950 m²

Figure 80 MERCK INNOVATION CENTRE (HENN, 2018)

3.4.1   GUIDING PRINCIPLES AND RESEARCH

Merck's site in Darmstadt is progressively remodeled from a production works into a technology and science campus. The heart of this transformation is the Innovation Center with a new world of work. A dynamic spatial continuum singularizes the individual workplaces whilst connecting them to form a spatial network.

The orthogonal shape of the architectural volume is derived from the context of the neighboring buildings, simultaneously acting as a contrast to the animation of the building's inner workings. The interior is characterized by the unfolding of a continuously flowing spatial structure. Bridge-like connections diagonally span the space between the oval cores, linking the individual workspaces with each other. Steps, ramps and floor areas spiral upwards. The routes between one work group and another, from one level to the next, are accomplished almost imperceptibly and effortlessly.

The inter-crossing bridges, which densify the center point of the building and diminish the spatial height of 6 meters to 3 meters, appear to float. The strain of the loads is absorbed by supports along the facade and a mere four interior columns. Due to their highly polished stainless-steel coverings, the columns have a practically dematerialized presence.

3.4.2   ENTRANCE SEQUENCE & VISUAL CONNECTION

The building is set back facing Frankfurter Straße, thus generating the space for a public square – Emanuel Merck Platz.

3.4.3 LAYOUT & DESIGN COMPONENTS

The new center comprises five levels and occupies a total area of 21,950m² with 7,100m² floor space.

Every level has two work areas, positioned diagonally in relation to one another. Each workspace is designed to provide for a project group consisting of external and internal staff, cooperating on innovations either on a temporary or a project basis. Concentration and meeting rooms are arranged along the facade and on the mezzanines.

The ground floor contains a café, a lounge, and an auditorium.

The first floor consists of open, flexible and secluded workspaces in various spatial concepts. Secluded workspaces are available for phone calls and focused work, while informal and flexible spaces with retreat areas and bean bags are available for brief team meetings. A library is also available.

A three-level employee cafeteria building adjoins the main building, providing food court style offerings. The second floor of the cafeteria serves Asian, Mediterranean and vegan cuisine while the ground floor features bakery, beverage and promotion stores. Seating areas are located along a façade.

Floors two to four include open and transparent rooms to promote a casual and collaborative work environment. A workshop for the development of prototypes is available on the fifth floor alongside social spaces and cushioned seating areas are available.

The Innovation Center is connected to a staff restaurant via an open stairway, the restaurant adopting the curved and flowing architectural vocabulary of the Innovation Center. The staff canteen consists of a food court on the ground floor with the restaurant facilities on the two upper floors. Spiral staircases, oval counters, the condensed space in the center of the building and the amplified, open space at the corners all echo the Innovation   Center.

Both buildings are certified with the LEED's platinum standard.

All floors of the building are connected by ramps and stairs. Stage areas between the project areas of each floor are available for use as needed.

3.4.4 ACOUSTICS

On the ground floor, visitors are led to the reception area along the fecostruct curved glass wall of the large auditorium. The two-storied interior facade to the office landscape is designed with the fecoplan all-glass construction to prevent falls without vertical upright profiles. Frameless fecostruct flush glass walls create maximum transparency with high sound insulation.

3.4.5 FLEXIBILITY IN DESIGN

An open and transparent design was chosen for the new building to symbolize innovation, flexibility, and openness, while promoting communication and creativity.

3.4.6 LIGHT AND VENTILATION

The all-round story-high transparent facades and the highly sound-absorbent ceilings provide ideal working conditions in terms of daylight and acoustics. In addition, the Innovation Center features a whole series of new Merck products and technologies in the lighting, the finishings and the skylight. The latest OLED technology was applied in the Light Cloud art installation, as well as the Media Wall monitor installation.

3.4.7 BUILDING MATERIALS

By using a reinforced concrete composite construction with spans of up to 20 meters, the work areas can be laid out column-free. The facades are set behind open external slats that run at varying angles, in turn giving the exterior a dynamic appearance and making the double-story character of the interior spaces legible from the outside.

Figure 81 MERCK INNOVATION CENTRE MASTERPLAN (HENN, 2018)
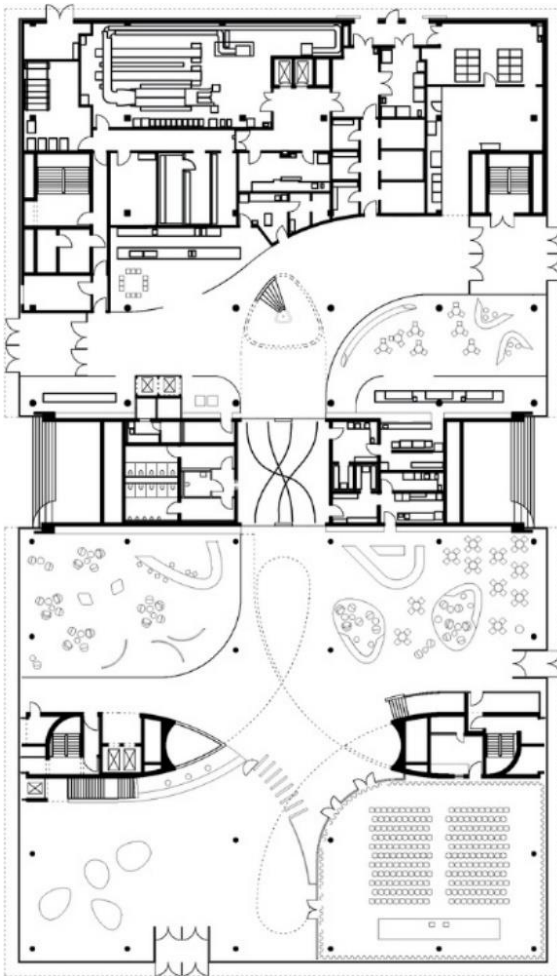
Figure 83 GROUND FLOOR PLAN (HENN, 2018)
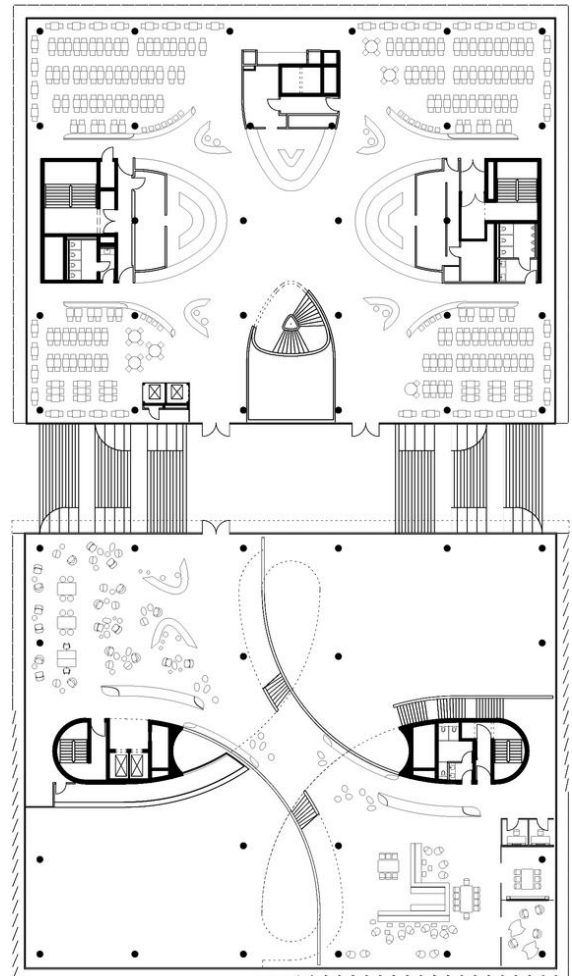
Figure 82 FIRST FLOOR PLAN (HENN, 2018)
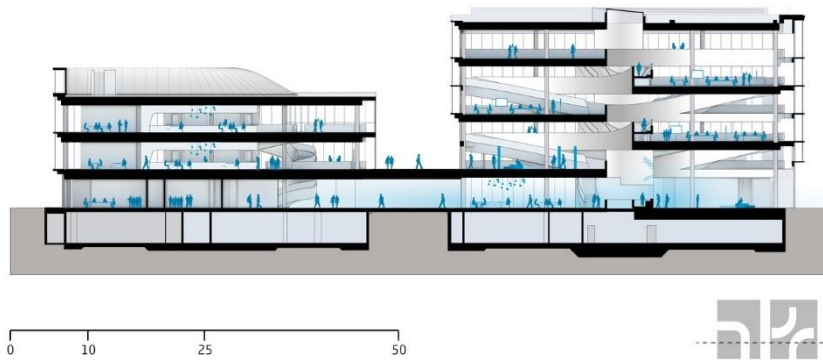
Figure 84 SECTIONAL VIEW
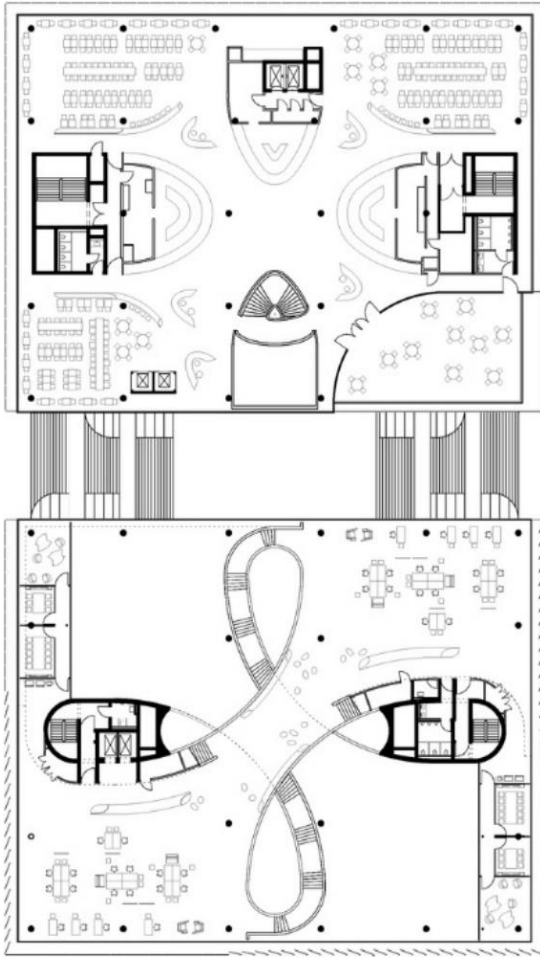
Figure 86 SECOND FLOOR PLAN (HENN, 2018)
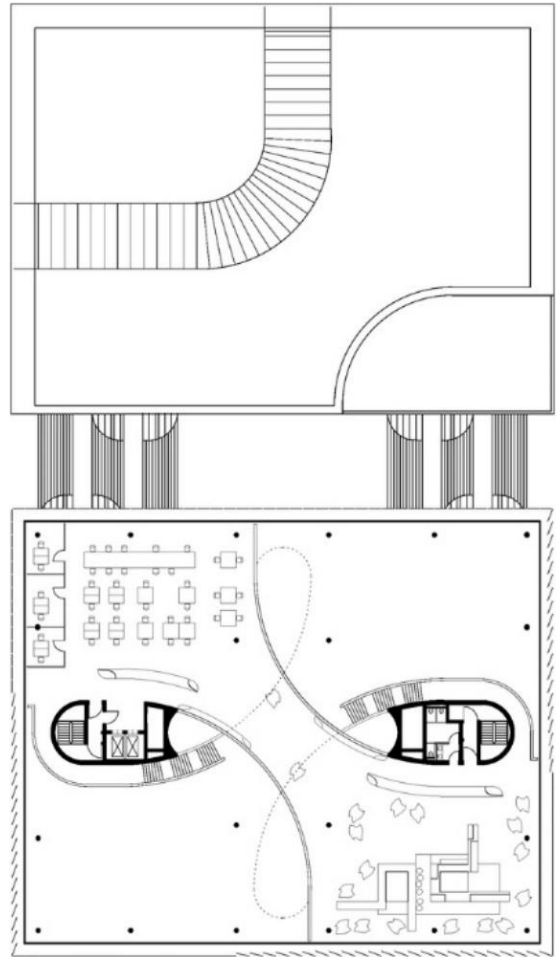
Figure 85 FIFTH FLOOR PLAN (HENN, 2018)
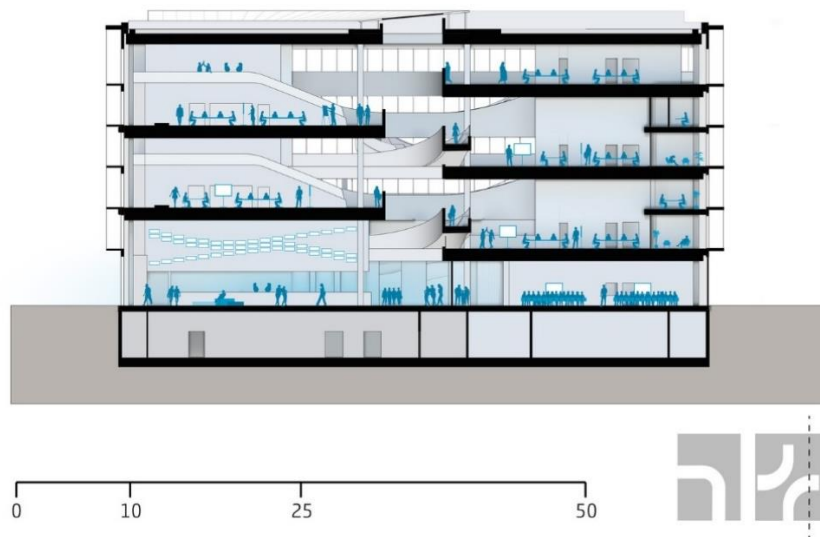
Figure 87 SECTIONAL VIEW (HENN, 2018)

Concentration   Communication
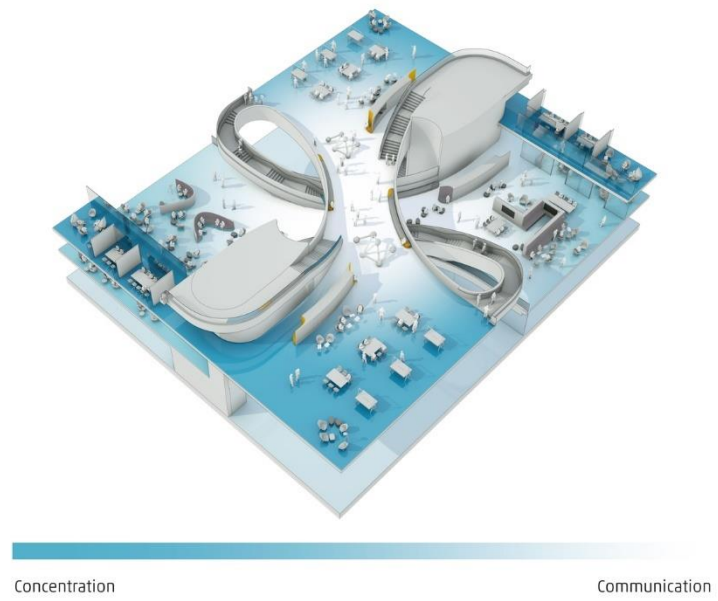
Figure 88 MERCK INNOVATION CENTRE ISOMETRIC VIEW (HENN, 2018)
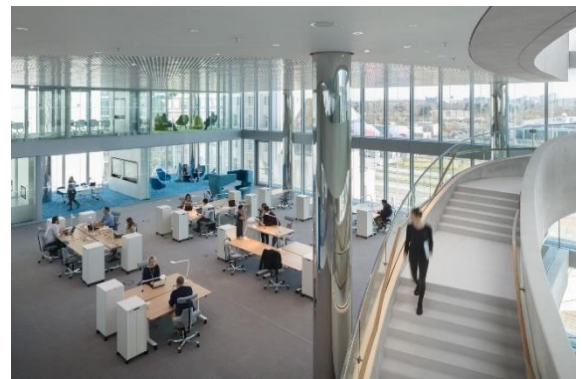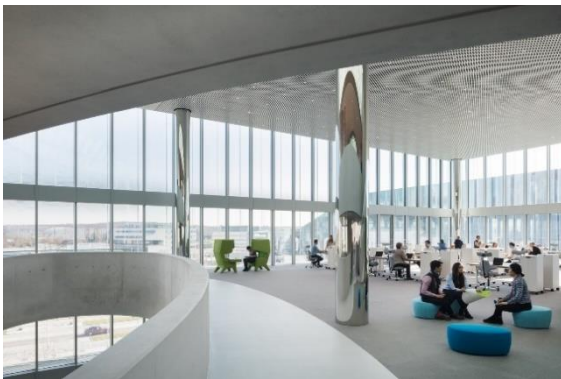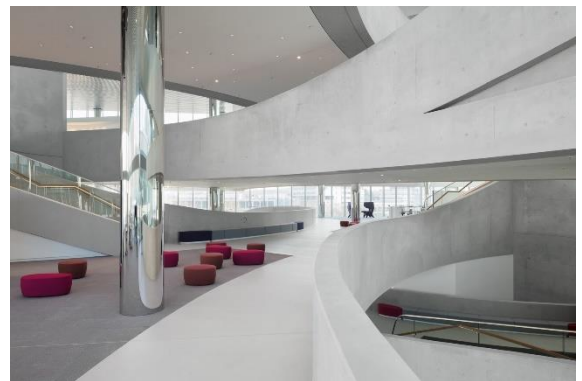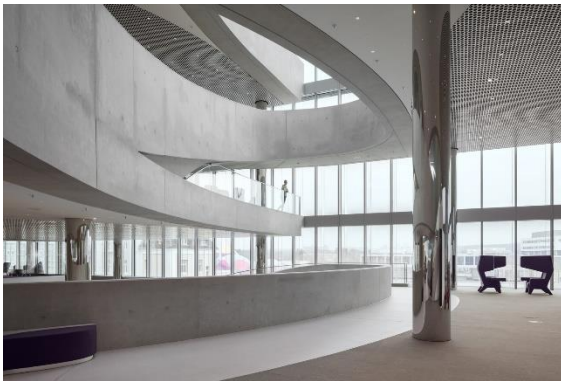
Figure 89 MERCK INNOVATION CENTRE INTERIOR VIEWS (HENN, 2018)

3.5   INCUBOXX THE BUSINESS INCUBATOR

3.5.1   INTRODUCTION
- **Architects**: Andreescu & Gaivoronschi
- **Area**: 6311 m²
- **Year**: 2014
- **Structural Engineering**: sc THM Plus srl ; ing. Mihnea Truta

Figure 90 INCUBOXX THE BUSINESS INCUBATOR (Gaivoronschi, 2014)

3.5.2   GUIDING PRINCIPLES AND RESEARCH

The IT&C business incubator will be part of a territorial network of similar equipment's and will serve as an urban landmark within a wider project that aims to change the use of an old industrial site.

INCUBOXX is a council building meant for young graduates who want to start a business within the IT&C sector. For this reason, the building is equipped to serve firms in two business stages: the incubation stage (3 years) and the consolidation-development stage (2 years).

The building's purpose is to improve the land it sits on both visually and functionally while containing its activity within a medium-sized volume (21070 cubic meters).

The design follows landscaping principles: the artificially folded land integrates the slope of the train track and rises the ground floor. The main office building's west facade faces the boulevard, offering a colorful background for urban activity. The blue translucent skin, which changes its color during the day and glows during the night is made from polycarbonate. Reminding of a circuit board, it is mounted on the horizontal structural grid which expresses itself through the horizontality of the windows. From the inside, these windows frame views of the city at eye level.
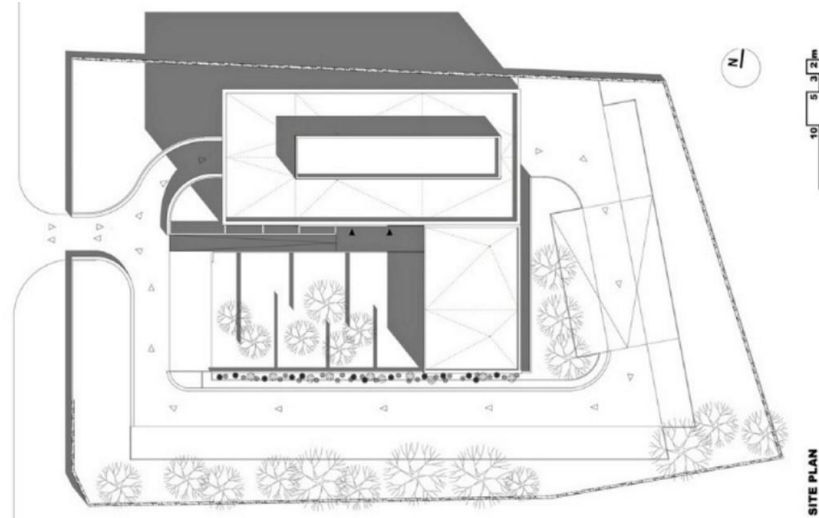
Figure 91 INCUBOXX MASTER PLAN WITH SCIAGRAPHY (Gaivoronschi, 2014)

3.5.3 LAYOUT & DESIGN COMPONENTS

Exhibition spaces, conference rooms, a cafeteria, a gym, a climbing wall and a terrace are all at any young businessman's disposal at INCUBOXX.

To enter INCUBOXX one must go up a gradual slope towards a lower transparent volume which contains auxiliary functions such as the cafeteria and the gym. From this level the parking spaces and service rooms become visible through the cracks and folds of the land below.

The ascent continues throughout the building. From the informal entrance one is greeted by the multi-story atrium which brings fresh air and light inside. One can literally climb up the light shaft on the climbing wall and arrive on the top of the building where the terrace is and where the cityscape unfolds.
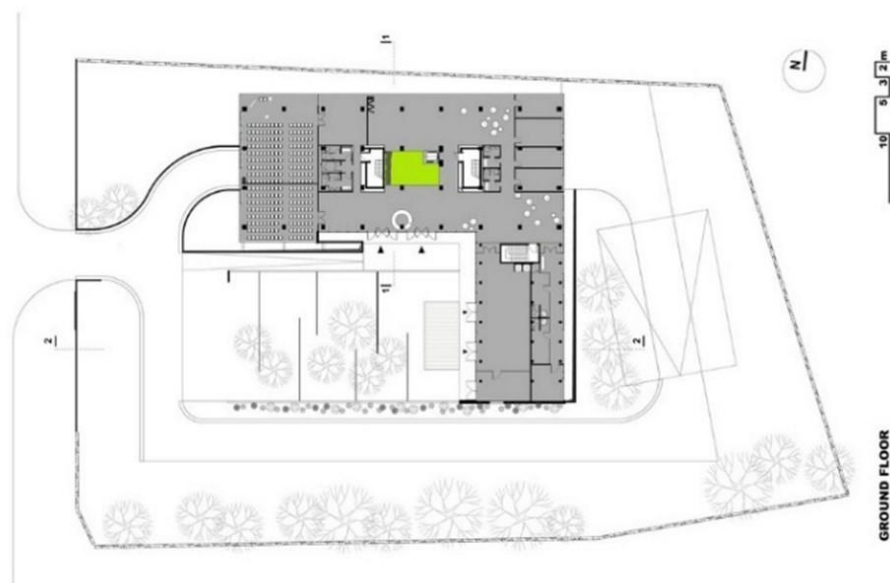
Figure 92 INCUBOXX GROUND FLOOR PLAN (Gaivoronschi, 2014)
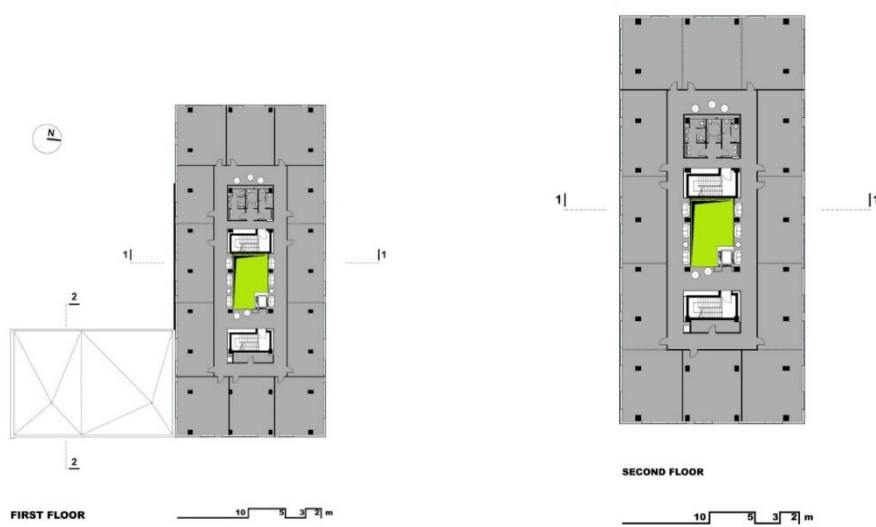
Figure 93 INCUBOXX FIRST FLOOR
Figure 94 PLAN (Gaivoronschi, 2014)   *INCUBOXX SECONF FLOOR PLAN (Gaivoronschi, 2014)*

3.5.4 ZONING
Located on a problematic site, between the slope of a train track and a busy boulevard crossing a derelict industrial area.

3.5.5 ACOUSTICS
Folded landscape and intensive planting create a microclimate in which the air movement is controlled to keep a stable temperature around the building during the summer while also protecting the interior space from traffic noise.

3.5.6 COLOR
The color and material selection for the design is inspired by two main concepts: youth and sustainability.

The main office building's west facade faces the boulevard, offering a colorful background for urban activity. The blue translucent skin, which changes its color during the day and glows during the night is made from polycarbonate.

Figure 95 INCUBOXX ENTRANCE AREA (Gaivoronschi, 2014)

3.5.7 LIGHT AND VENTILATION

Environmental strategy

One of the main features of the building is the fact that it is self-sustained through passive cooling and natural lighting. The interior atrium is the element that supplies light and ventilation to the core of the building. For the rentable office space, the windows provide both the optimum air exchange and natural lighting, while the translucent polycarbonate facade filters optimize the light levels. At ground level, the vertical systematization within the landscape allows for the car park to be hidden from view, covered by the land, and naturally ventilated. Additionally, the folded landscape and intensive planting creates a microclimate in which the air movement is controlled to keep a stable temperature around the building during the summer while also protecting the interior space from traffic noise.

To summarize, the light within the space, the atrium, the cafeteria dominating the entry sequence, the gym, the materials used and the support needed to develop the creativity and skills of young graduates from Timisoara

Figure 96 INCUBOXX EXTERIOR VIEW (Gaivoronschi, 2014)
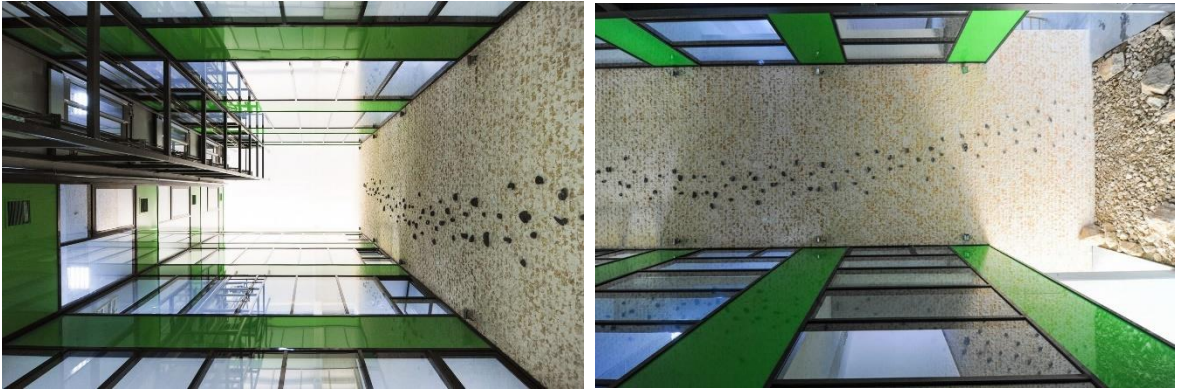
Figure 97 INCUBOXX COURTYARD FOR LIGHTING (Gaivoronschi, 2014)

Figure 98 INCUBOXX EXTERIOR VIEW (Gaivoronschi, 2014)

3.5.8   ECONOMICAL STRATEGY

INCUBOXX is a cost-effective building due to two main aspects: it was cheaper to build, and it has lower running costs than other office buildings in Timisoara. The construction budget was met through substituting the typical glass facade with a more efficient and cost-effective material: the multilayered heavily insulated polycarbonate. Moreover, because the running costs needed to be as low as possible for the newly graduate tenants, the design revolves around renewable energy principles. The atrium is a good example for the design's passive cooling strategy. Using the stack effect, it naturally ventilates the central area of the building while also bringing natural light in, eliminating the need for mechanical ventilation during the summer and artificial lighting during the day. Another good example is the office space, where the windows exclude the need for artificial ventilation, while the translucent polycarbonate provides filtered natural light.

Figure 99 INCUBOXX SECTION AT 1-1 (Gaivoronschi, 2014)

Figure 100 INCUBOXX SECTION AT 2-2 (Gaivoronschi, 2014)
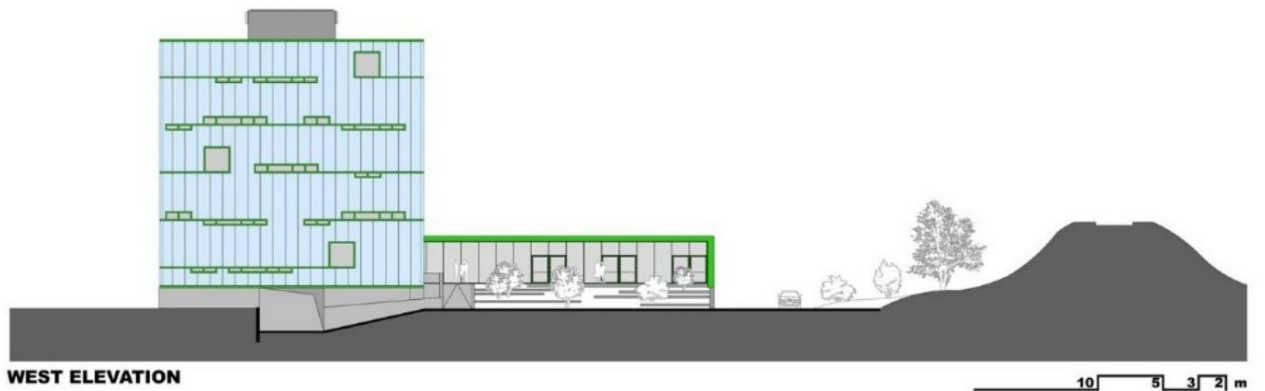
Figure 101 INCUBOXX WEST ELEVATION (Gaivoronschi, 2014)

4 SITE ANALYSIS

4.1 SITE OVERVIEW

The location is in New Baneshwor, where a heavy machinery department is currently housed close to the Trolley Bus Park. One of the main intersections and the Kathmandu Valley's center is New Baneshwor. Major hospitals, educational institutions, shopping centers, and the nation's BICC Hall, the country's constitutional assembly, are all located on the site. It is therefore safe to say that New Baneshwor is one of the busiest locations and the Valley's community center.

Figure 102 SITE LOCATION

The site analysis primarily focuses on the present condition of the amenities and facilities on the property. By addressing issues like the site's location and context, the various geographical features present on the site, the vegetative cover, and even the site's climatic

conditions, the analysis provides information about the site. This is accomplished primarily using data collected at the site.

4.2   SITE INFORMATION

Location: Baneshwor, Kathmandu
Ward no: 34
Plot Area: 17,570 sq.m (34-8-2-1)
Zone: Commercial sub-zone
Topography: Slightly contour with a difference of 4m.
Climate: Warm and Temperate
GEOGRAPHICAL LOCATION
Latitude: 27°41'15.06" N
Longitude: 85°20'26.95" E
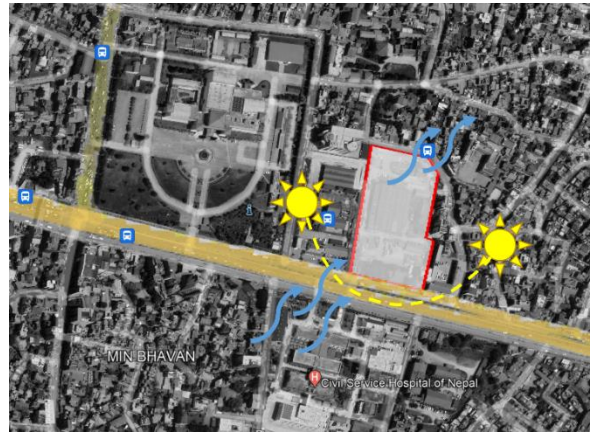
Figure 103 SOLAR PATH DIAGRAM

4.3   SITE CONSIDERATION FACTORS

- **CONNECTIVITY** with the core commercial and institutional zone.
- **ACCESSIBILITY** with public transport routes and private vehicular mediums.
- **PROXIMITY** of local enterprise and businesses.
- **REDUCTION** of crowd on the streets.

4.4   BYE LAWS (KATHMANDU VALLEY BYELAWS)

F.A.R: 3
Ground Coverage: 40%
Parking: 15% of site

4.5   SURROUNDING BUILDINGS

Baneshwor has expanded as a commercial area throughout time. When one thinks about Baneshwor, they see a thriving business area with lots of contemporary buildings and a busy roundabout. There are buildings with various building expressions across the Baneshwor alley. In Baneshwor, you may find everything from traditional to neo-classical to modern contemporary architecture. In the Baneshwor neighborhood, structures of various shapes, sizes, expressions, façade treatments, and uses have been adapted.

- Bricks being locally available traditional material was used in façade of government buildings. Many buildings in this area are masterpiece. Years later with the trend of brick façade was dominated using Aluminum Composite Panels, claddings and glass glazing and glass glazing are widely used as it gives modern look to the buildings. E.g., Survey Department, Kathmandu District Court.
- ACP Cladding has been a popular choice for buildings intended for commercial use. Since these are produced in a wide range of colors as well as patterns that imitate other materials, they offer flexibility in design.

- Beside these also the façade has various design elements, steel pipes acting as structural support.
- Along with the variety use in materials, various building forms can be seen in this area. From rigid rectangular building form to irregular, semicircular modern building forms can be seen in this area.
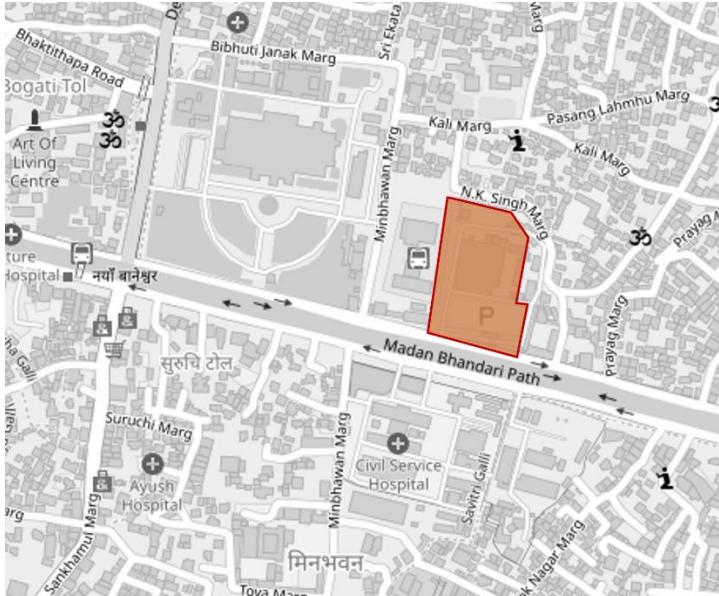
BICC HALL

CIVIL SERVICE HOSPITAL

DEPARTMENT OF SURVEY

Figure 104 EXISTING ACTIVITIES AROUND THE SITE

4.6 SITE ACCESSIBILITY

The site is accessible through one main road which is considered as a major two ways road, on the west and arterial roads on north and east. The main road is 32m wide with 2m pedestrian road on both sides. The secondary road is 4m wide. The transportation does not seem to be a problem as the public vehicles are available in a short distance from the site which connects to many areas.

- Approx. 400m from Baneshwor Junction.
- 2.1km from Maitighar mandala
- 5.5km from Airport
- Provision of public buses and bus stops
- Local road attached to site

Figure 105 SITE ACCESS

4.7 SITE PROXIMITY
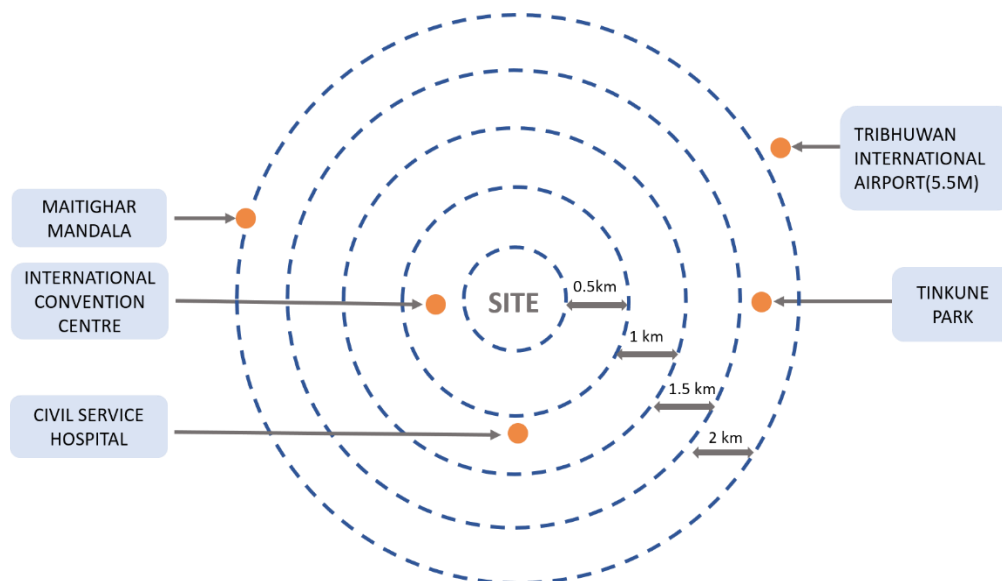
Figure 106 SITE PROXIMITY

4.8   SURROUNDING BUILDINGS
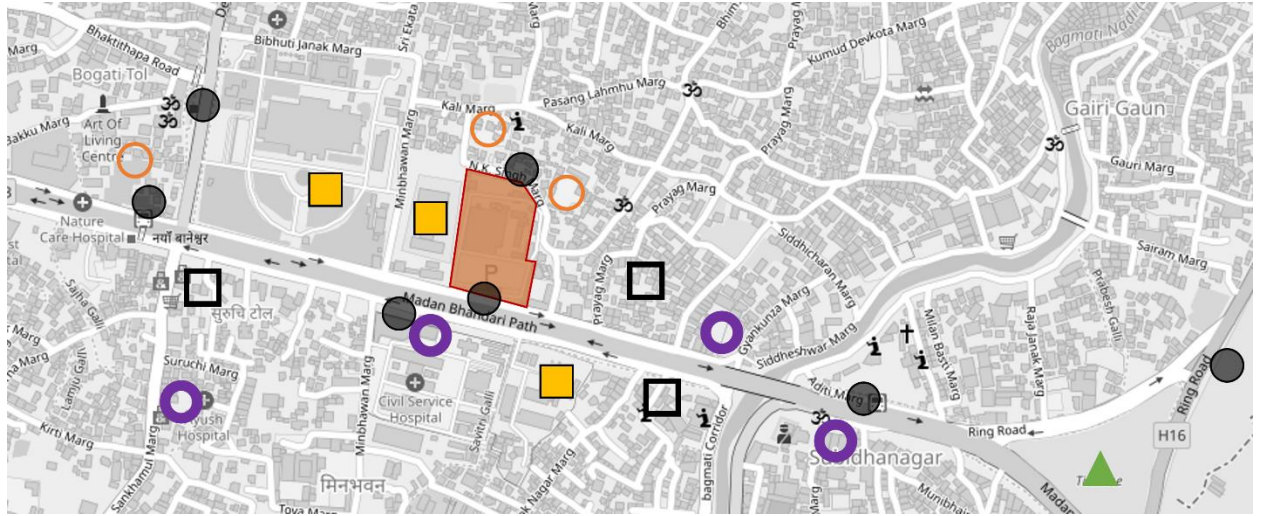
Figure 107 PUBLIC SERVICES AND LANDMARKS

○ **SITE**

🟧 **GOVERNMENT BUILDINGS**
- BICC(Birendra International Convention CenteR)
- Department Of Transport Management

○ **EDUCATIONAL INSTITUTES**
- Uniglobe College
- Ace Institute of Management
- EPS School
- Training Institutes

▲ **PUBLIC SPACES**
- Tinkune

☐ **MIXED-USE COMMERCIAL**
- Mega Bank/Standard Chartered Bank
- Everest Hotel
- Citizen Investment Trust
- Nepal SBI
- Restaurants

● **TRANSPORTATION**
- Bus Stops
- Tribhuvan International Airport

◎ **HEALTH CENTERS**
- Civil Hospital
- Kantipur Hospital

4.9   CLIMATIC ANALYSIS

The climate plays a big role in how to design the building, and the amount of isolation needed to achieve thermal comfort. The mean minimum temperature in Baneshwor is 18°C and mean maximum temperature is 28°C in the year 2021 whereas the average annual rainfall is 1256.8 mm. The figure below shows the temperature, where the orange curve is the maximum temperature, the blue curve is the minimum temperature. The violet curve is the average precipitation on the day.

Climate analysis is crucial for the project, to understand the extreme sunlight change from winter to summer. During the winter, the low sun angle provides with little sunlight and long. Shadows for a very short amount of time while in summer, the high sun angle gives long hours of sunlight.

Average Rainfall (mm Graph for Baneshwar)
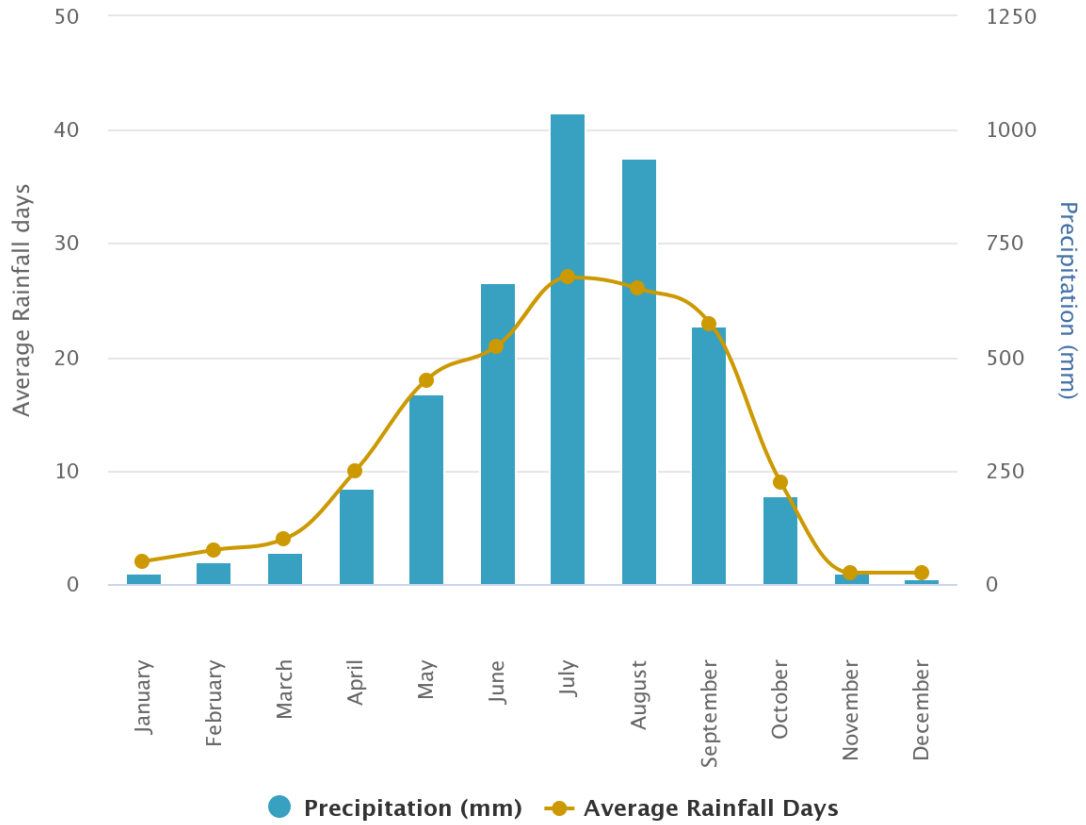
Figure 109 AVERAGE RAINFALL (Online, 2022)

Figure 108 AVERAGE TEMPERATURE (Online, 2022)
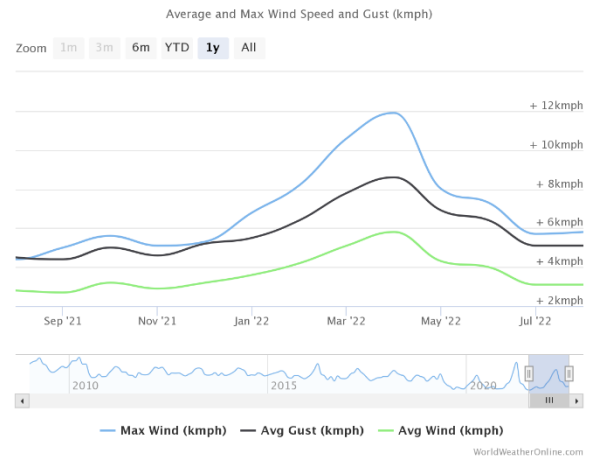
Figure 110 AVERAGE WIND SPEED (Online, 2022)

According to the graph above, the hotter months of the year are April, May, June with temperature over 25°C and the colder months are December, January, February with temperature below 6°C. The highest precipitation is during the month June, July, August.

Therefore, a climate study is a crucial component to research to provide an architectural solution that is well-thought-out overall. This demonstrates how the building materials and technologies we use today are available everywhere in the world. Consequently, architects have a duty to employ them sparingly and with care. Buildings can be made to last and operate for a long time if they are designed properly, considering the climatic conditions and the surrounding area.

4.10 SWOT ANALYSIS

4.10.1 STRENGTH

- Close to an urban center with highly evolved socio - economic overheads.
- Easily accessible from public transportation.
- Presence of important buildings in precinct allows project to function as part of larger network.
- Well-lit throughout the day.

4.10.2 WEAKNESS

- Traffic Congestion
- Being in the prime location can create unwanted disturbances.
- Declination of open space and greenery of surroundings.

4.10.3 OPPORTUNITIES

- Booming commercial area.
- Close to institutions of higher learning.
- Close to an international airport.

4.10.4 THREAT

- Lack of green spaces.
- Main road nearby causing sound and air pollution.
- Heavy traffic in primary road.
- Haphazard development making built environment unpleasant

5 PROGRAM FORMULATION

1.ADMINISTRATION					
PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
Reception	1		10	10	
Waiting Area	1	10	3	30	
Staff workspace	1	6	10	60	
Manager's Office	1	1	20	20	
Director's Room	1	1	24	24	
Meeting Room	2	8	2.5	40	
Account Room		4	10	40	
Archive Room	1		20	20	
Pantry	1			15	
Mentor's Room	1			15	
General Technician's Room	1	2	12	24	
Store				15	
TOILET					
MALE(2UR/2WC/2WB)				12	
FEMALE(3WC/3WB)				12	
SPECIAL(1WC/1WB)				3.3	
TOTAL				**340.3**	

2.INCUBATOR AND ACCELERATOR					
PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
BUSINESS SUPPORT	2	8	12	192	
CONSULTANT OFFICE	2	8	12	192	
PLACEMENT CELL	4	10	12	480	
FINANCE CENTER	2	8	12	192	
TOILET					
MALE(2UR/2WC/2WB)				12	
FEMALE(3WC/3WB)				12	
SPECIAL(1WC/1WB)				3.3	
TOTAL				**1083.3**	

3.MAKERSPACE

PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
Molding or Casting/ Silkscreen Space	1	10	13	130	
Conference	1	40	3.8	152	
Electronics Area	1	6	25	150	
WOOD WORKSHOP	1	5	80	400	
METAL WORKSHOP		5	80	400	
MATERIAL SPACE (MATERIAL STORE)	1			150	
LASER CUT/CNC ROOM				200	
3D PRINTING ROOM				150	
MEDIA LAB AND PHOTOGRAPHY				285	
INCHARGE ROOM	8	1	15	120	
VR DEMONSTRATION	1	2	12	24	
INFORMAL CLASSROOMS				200	
TESTING AREA	1			200	
OFFICE	2		20	40	
STORE	6		10	60	
TOILET					
MALE(2UR/2WC/2WB)				12	
FEMALE(3WC/3WB)				12	
SPECIAL(1WC/1WB)				3.3	
TOTAL				**2688.3**	

4.MULTIPURPOSE HALL

PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
FOYER		50	0.5	25	
LOUNGE AREA	1			50	

SEATING		100	1.6	150	
GREEN ROOM				60	
STORE				20	
EXHIBITION HALL		100	2.5		
PERMANENT				250	
TEMPORARY				300	
TOILET					
MALE(4UR/4WC/6WB)				16	
FEMALE(5WC/5WB)				24	
SPECIAL(1WC/1WB)				3.3	
TOTAL				**898.3**	

5.LIBRARY					
PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
PROPERTY COUNTER				15	
SECURITY GATE				0.8	
CIRCULATION COUNTER				39	
CATALOGUE AREA	3		3.5	10.5	
READING AREA	1	100	3	300	
COLLECTION AREA	50		6	300	6M2 FOR 1000 BOOKS
DIGITAL LIBRARY	1	20	7.5	150	
LOUNGE AREA	2	10	4	80	
KITCHEN		100	0.5	50	
MALE(4UR/4WC/6WB)				16	
FEMALE(5WC/5WB)				24	
SPECIAL(1WC/1WB)				3.3	
TOTAL				**988.6**	

6.CAFE					
PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
DINING		100	1.6	160	
BAKERY				20	
STORAGE		100	0.1	10	
SERVICE AREA				15	
STAFF AREA				15	
CLEANING AREA				37	
CHANGING ROOM				10	
TOILET					
MALE(4UR/4WC/6WB)				16	
FEMALE(5WC/5WB)				24	
SPECIAL(1WC/1WB)				3.3	
TOTAL				**310.3**	

7. CO WORKING SPACES					
PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
COMMON WORKAREAS	5	10	7	350	
	5	20	7	700	
DESIGNATED COMMON AREAS	5	10	7	350	
	5	15	9.3	697.5	
PRIVATE WORKSPACE	15	2	9.3	279	
	10	4	9.3	372	
	3	10	9.3	279	
LOUNGE AREAS	3	8	4	96	
MEETING	2	16	7	224	
BREAKOUT SPACES	4	10	10	400	
TOILET					
MALE (10UR/5WC/5WB)				28	
FEMALE (10WC/5WB)				32	
SPECIAL(1WC/1WB)				3.3	

TOTAL				3810.8	

8.SERVICES					
PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
HVAC	1			75	
ELECTIRCITY	1			100	
SECURITY & SURVEILLANCE	1			37	
TOTAL				212	

9.PARKING					
PROGRAMS	UNIT	CAPACITY	AREA/PERSON(M²)	AREA(M²)	REMARKS
2 WHEELERS			2*1.5		
4 WHEELERS			2.3*5		
CYCLE PARKING			1.8*0.72		

TOTAL AREA = 10,331.9 SQ.M

CIRCULATION=30% OF TOTAL AREA=3099.57 SQ.M

TOTAL FLOOR AREA=13431.47 SQ.M

5.1   ADJACENCY MATRIX
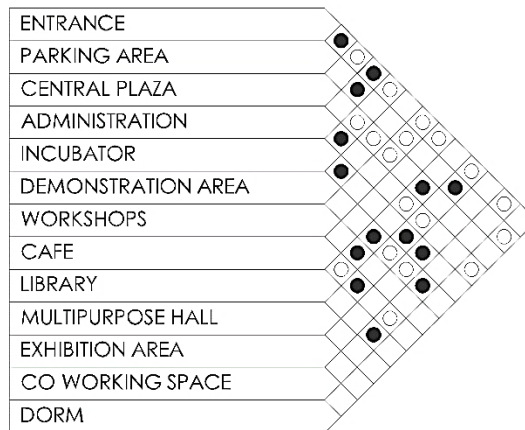
Figure 111 ADJACENCY MATRIX

6 CONCEPT DEVELOPMENT

6.1 CONCEPT

CONNECTING PEOPLE

The fundamental idea behind this project is to provide areas where people can accidentally bump into one another and interact. This ensures that people can exchange thoughts and experiences with one another, which helps stimulate the development of novel ideas. This led to the invention of something new. The goal of the entire design was to create a place where people could interact, exchange ideas, and work in a flexible atmosphere to promote innovation. The synopsis of the conceptual design has been done as follows.

6.1.1.1 CENTRAL PLAZA SPACE

The building's focal point, the central plaza, is a multipurpose outdoor area with seating, natural elements, and chances for events like festivals, maker fair, social gatherings, and so on. As a result, this area assumes the character of a dynamic space that offers the complex a functionally adaptable environment. At the center of the structure, the plaza serves as a key attraction and offers views in all directions.

6.1.1.2 COMMUNICATION THROUGH COLLISION

Creation of such places where a person if must go to point B from A then has to travel through point C which in normal cases are circulation spaces. Spaces such as open green spaces, corridors, double height spaces, courtyard, staircase are spaces where such interaction occurs, so design of such spaces.

Central Plaza

Connecting Bridge
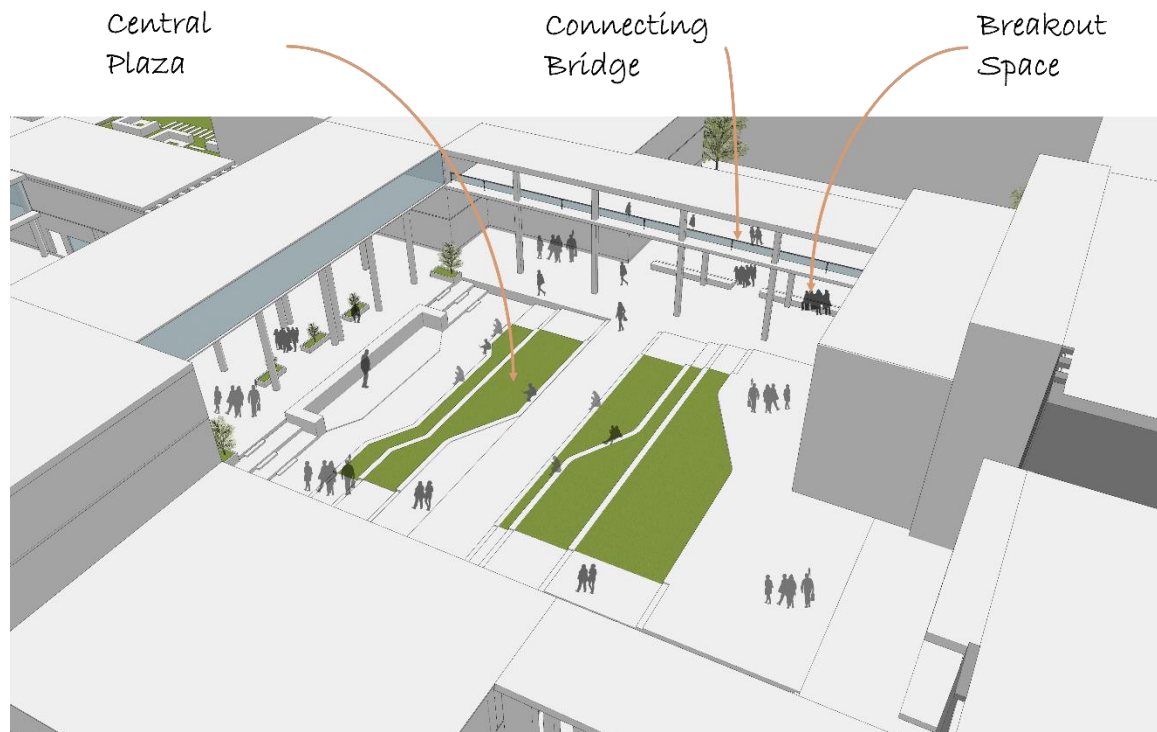
Breakout Space

6.1.1.3 CREATION OF MULTIPLE POCKET SPACES & BREAKOUT SPACES

Multiple courtyards have been created to maximize the space where people collide and communicate and collaborate with each other. Spaces such as pocket spaces are liked by the youth and love to spend time in such spaces thus creation of multiple pocket spaces with different types of functions where they can play games, get refreshment or meet people. These types of space help the youth for refreshment during time of confusion and chaos.

6.1.1.4 CONNECTING BRIDGE

Connection of the components of youth hub 'Coworking, Incubator, Makerspace' through bridges for easy access from one building to other. The bridge is directly connected to central plaza visually. Thus, one can see various activities in the pocket spaces as well as the central plaza when using the bridge.

6.2 FORM DEVELOPMENT
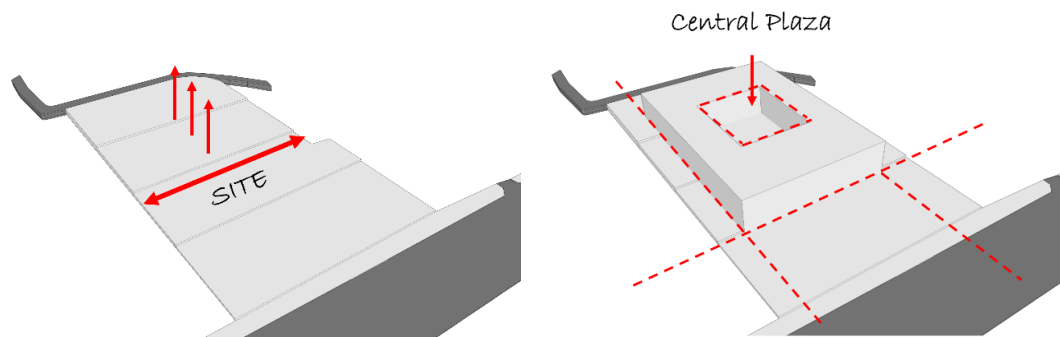
Firstly, the site was taken, and a rectangular form was extruded as the site itself is almost rectangular. Then, a central plaza was built, serving as a linking area to which people had access from everywhere.
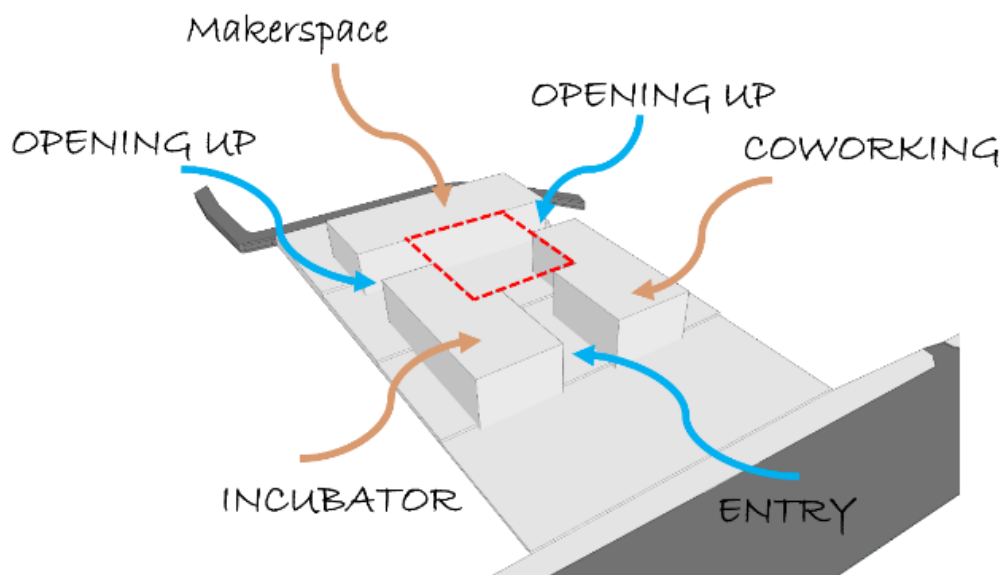
The volume was separated into the three main parts of the youth hub—Coworking, Incubator, and Makerspace—after the shape for the center plaza was removed. This was done to ensure that the wind would blow through the main plaza and for the purpose of lighting. Coworking and incubator were kept near the main entrance for easier access to the public while makerspace was at far from other buildings for minimizing the noise to the working spaces.
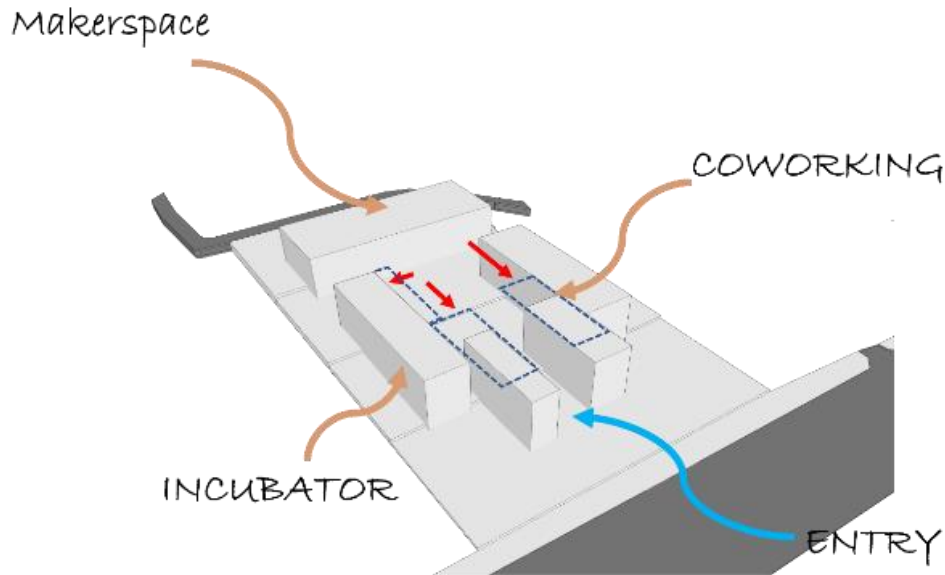
Then, the individual blocks were moved to allow more light, to enter the building.
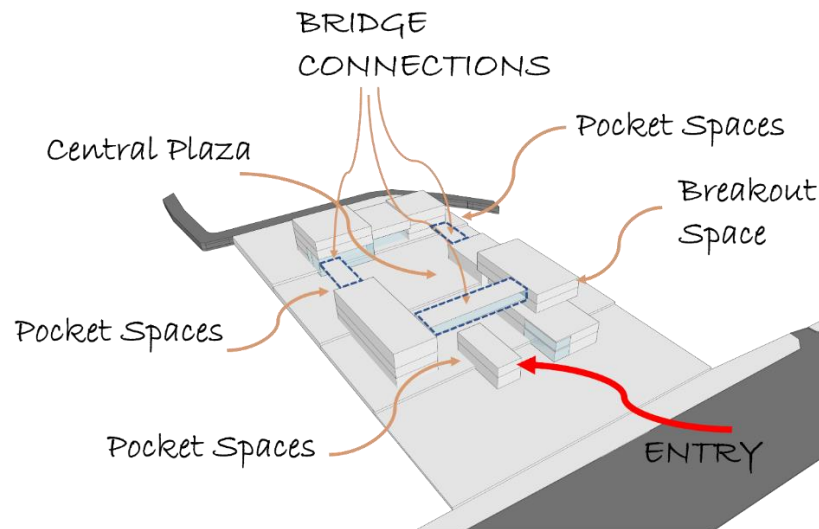
Further volume adjustments were made to create breakout and pocket spaces for various recreational activities.
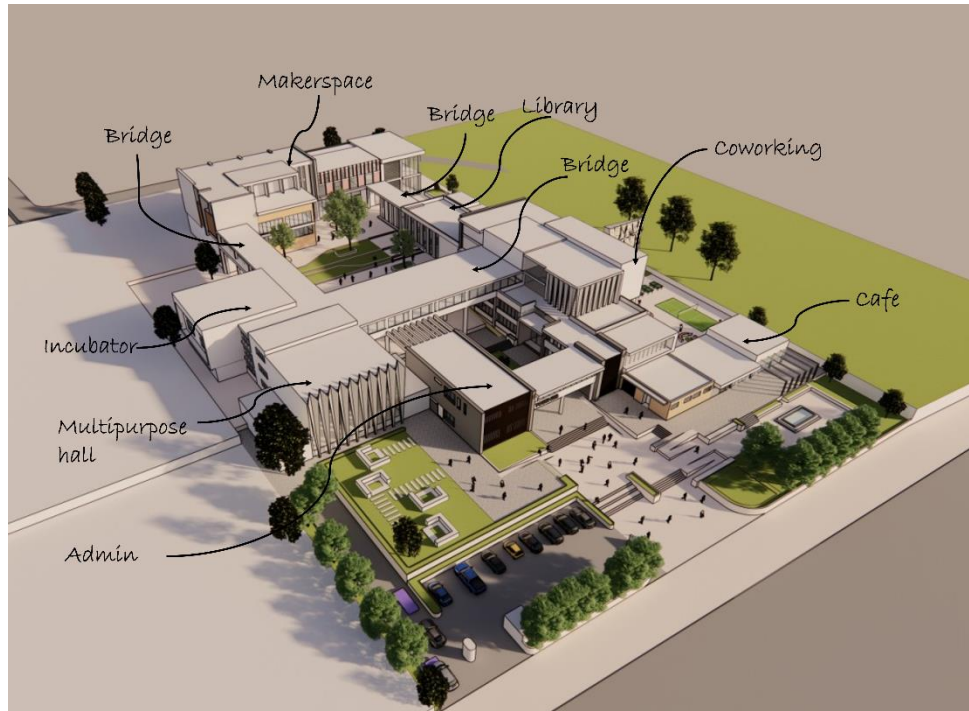
Final Form

6.3   AREA ALLOCATION

6.3.1   DESIGN COMPONENTS
Admin: 446 m^2
Makerspace: 2,567 m^2
Incubator: 1902 m^2
Coworking: 3580 m^2
Multipurpose Hall: 500 m^2
Exhibition Space: 175 m^2
Library: 1032 m^2
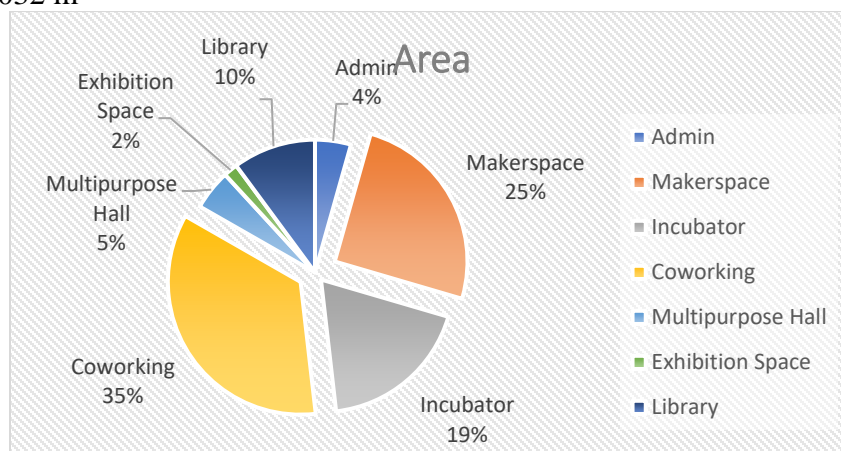
6.3.2 COWORKING

Hotdesking: 761 m^2
Private Offices: 777 m^2
Meeting Room: 309 m^2
Lounge Area: 162 m^2
Breakout Space: 160 m^2
Pantry: 78 m^2
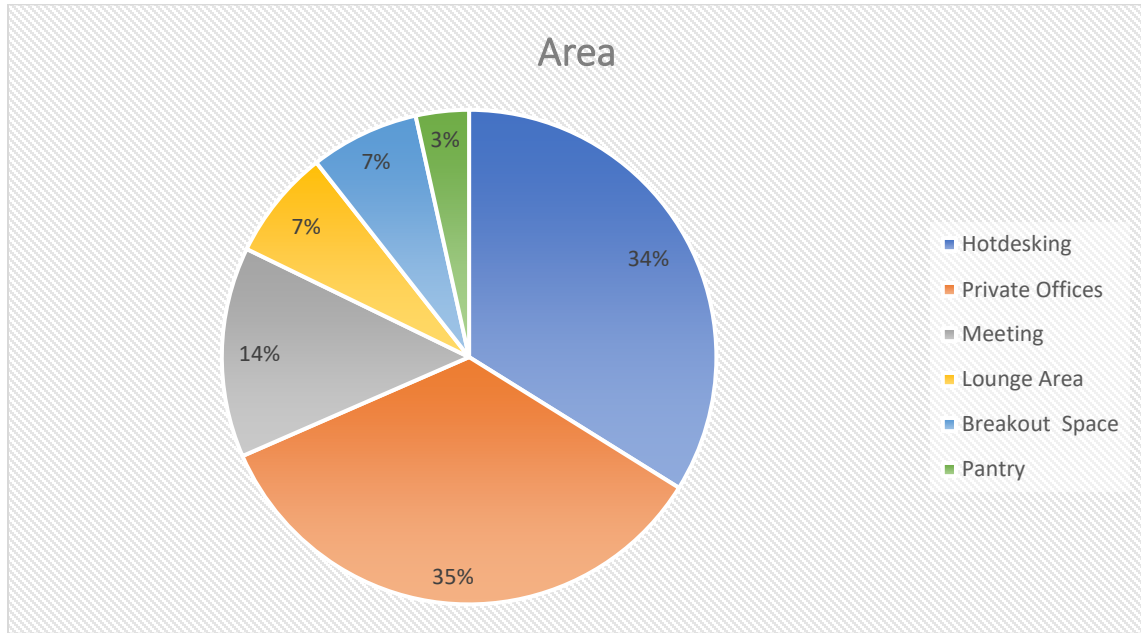
Site Area: 17570
Total Built-up Area: 10202 m^2
Ground Coverage: 6079 m^2 (34.59% of site Area)

6.4 DESCRIPTION OF DIFFERENT SPACE

6.4.1 MASTERPLAN

The site consists of two roads one of which is the Madan Bhandari highway and another secondary road in the north. Both the roads provide entry to the Youth Hub. Entry to the south is mostly used by visitors of the Coworking and Incubator and the Northern entry is mostly used by the users of Makerspace. From both entry there are sufficient numbers of surface parking. There is a basement which is accessed from the main road only. The basement consists of 212 bike and 69 car parking.

Figure 112 Masterplan

6.4.1.1 CAFÉ

After entering the site from Madan Bhandari highway and parking one can find a Cafe which can be used by users and the visitors as well.

Figure 113 Cafe Exterior

6.4.1.2 ADMIN BLOCK

After parking the vehicles, the users are directly led to the admin where the visitors gather information and can take membership for using the coworking, Incubator or Makerspace. From here they can also access the pocket space besides the parking.

Figure 114 View from the Main Road Entry

Figure 115 Courtyard Showing Entry to Admin and Coworking

Figure 116 Breakout space and Ramp to Parking

6.4.1.3 COWORKING BLOCK

After taking membership from the admin one can use the facilities in the coworking block which includes hotdesking, lounge space, pantry, printing and scanning, meeting hall, breakout space and a library which can be used by everyone. The coworking block is a four storied building in which the lower levels consist of hotdesking while the upper floors consist maximum number of Private Offices. The coworking block is connected with café and a breakout space for a lively environment.

Entrance to library is provided only at the first-floor level so that it is close from every floor and for security reasons as well. A breakout space has been also provided outside of library which can be used as a outdoor reading area.

Figure 117 Coworking Lobby

Figure 118 Coworking Entrance Lobby

Figure 119 Coworking Collaborative Staircase
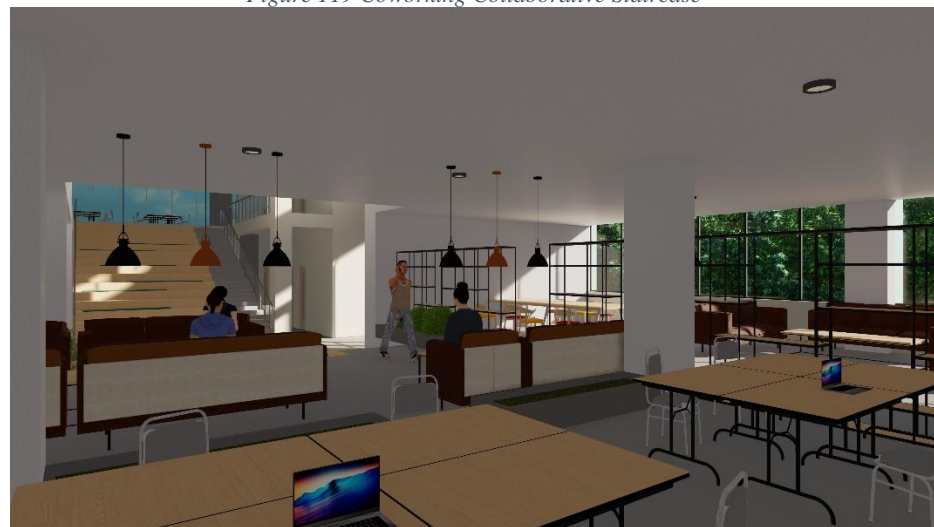
Figure 120 Coworking Hotdesking

Figure 121 Breakout Space Connecting Cafe and Coworking

Figure 122 Breakout Space in the Bridge

Figure 123 Hotdesking in the Bridge

Figure 124 Hotdesking in the Bridge

Figure 125 Library Interior

6.4.1.4 INCUBATOR BLOCK

The incubator block is a three storied block consisting of Finance Centre, Business Support and a Legal Consultation Office along with an attached Multipurpose Hall. The entrance to the Multipurpose Hall is given separately so that it can be rented as well and while doing so no one gets disturbed. The incubator block is connected to Coworking block by a bridge on the 2nd floor to ensure connection between coworking and Incubator. And also, with the makerspace so that there is a connection between them and it makes it easier for prototyping as well.

A breakout space has been provided beside the incubator where one can play basketball. It is connected with the parking from secondary road and the central plaza as well along with the Makerspace block.

Figure 126 Incubator Block and the connecting bridges

Figure 127 Breakout space showing bridge between incubator and makerspace.

6.4.1.5 MAKERSPACE BLOCK

The makerspace block is a 3 storied block which can either be reached from the central plaza or from the secondary road as well. It consists of Wood workshop, Metal workshop, CNC cutting, Photography workshop, 3D printing, Electronics, Molding/Casting on the first two floors along with a certain number of Dorm for people working on a project for a longer period on the 2nd floor. It also consists of an informal classroom for taking a class, exhibition space for exhibiting the models made, demonstration area for demonstrating the prototypes and private workspaces for people working for a longer period. The outdoors consists of an outdoor workshop for wood workshop. Also, service lift has been provided for transferring the materials along with the service road connected to outdoor workshop.

The makerspace is also connected with the coworking space on 1st floor of makerspace which corresponds to 2nd floor of Coworking space. This is due to the double height floors of Makerspace block. It is connected from a terrace of coworking space which is used as a breakout space consisting of games and refreshment areas.

Figure 128 View of Makerspace From Secondary Road

Figure 129 Outdoor Makerspace

Figure 130 Outdoor Reading Area Showing Makerspace

Figure 131 Breakout space of Coworking terrace showing connection to Makerspace.

6.4.1.6 CENTRAL PLAZA

The central plaza is the heart of this project consisting of green seating spaces. It consists of an OAT where different events, exhibition can be done. People can also use it as a space to work as it consists of green seating space.
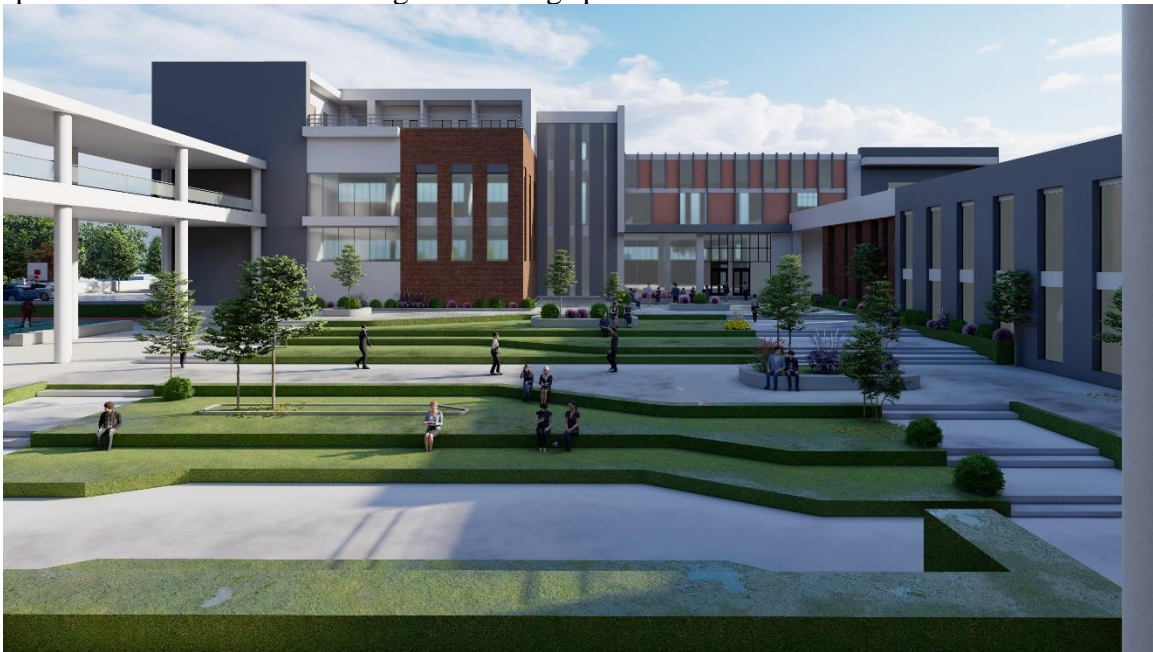
Figure 132 Central Plaza

6.5   PHYSICAL MODEL

MODEL FRONT VIEW
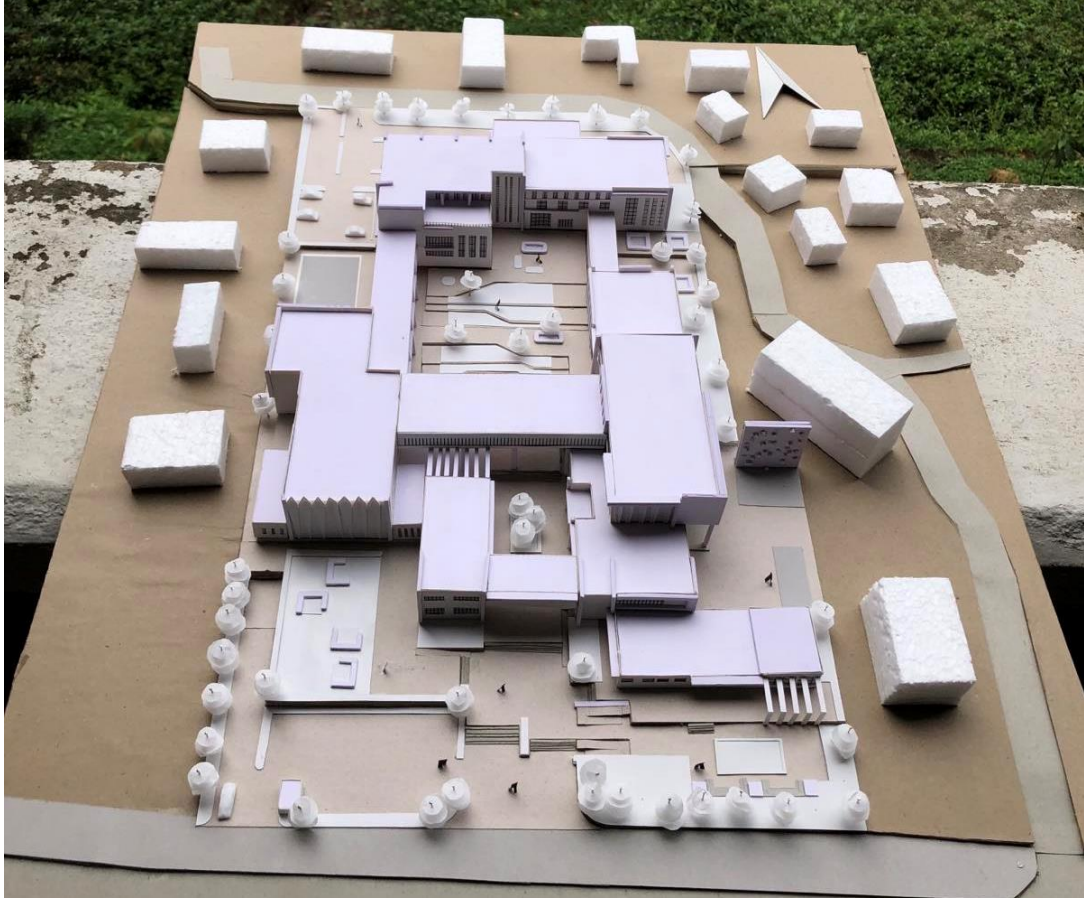
TOP VIEW OF MODEL

VIEW OF MODEL FROM EAST ELEVATION

OUTDOOR MAKERSPACE

CENTRAL PLAZA

VIEW FROM SECONDARY ROAD

Figure 133 Physical Model

6.6 WATER SUPPLY

The size of tank is determined by water demand calculation.
Calculation of water demand (litre/ capita/day):

6.6.1.1 CAFE
No. of users: 120
Consumption:120 X 50 liters/day = 6000 liters/day

6.6.1.2 ADMINISTRATION
No. of users: 20

Consumption:20 X 45 liters/day = 900 liters/day

6.6.1.3 MULTIPURPOSE HALL & EXHIBITION SPACE
No. of users: 320

Consumption:320 X 15 liters/day =4800 liters/day

6.6.1.4 INCUBATOR
No. of users: 210

Consumption:210 X 15 liters/day = 3150 liters/day

6.6.1.5 MAKERSPACE
No. of users: 116

Consumption:116 X 45 liters/day = 5220 liters/day

6.6.1.6 DORMITORY
No. of users: 12

Consumption:12 X 45 liters/day = 540 liters/day

6.6.1.7 LIBRARY
No. of users: 120

Consumption:120 X 20 liters/day = 2,400 liters/day

6.6.1.8 COWORKING
No. of users: 466

Consumption:466 X 45 liters/day = 20,970 liters/day

Table 7 calculation of water demand

Particulars	No. of users	LPCD	Total
CAFE	120	70	6,000
ADMIN	20	45	900
MULTIPURPOSE	320	15	4,800
INCUBATOR	90	15	1,350
MAKERSPACE	116	45	5,220
DORMITORY	12	45	540
LIBRARY	120	20	2,400
COWORKING	466	45	20,970
Total	1264		42,180

Total water required/day:42,180 liters/day = 42.180m^3 x3(safety factor) =126.54 m^3
Fire Demand= 50,000 liters (NBC)= 50m^3
Total underground water tank = 176.54m^3
Underground Water tank size= 10mx5mx3m

Calculation of Overhead= 40% of underground tank as pumping thrice a day
$$= 0.4x42.18$$
$$=16.872 \text{ m}^3 \sim 17000 \text{ Liters}$$
So, 4 water tank of capacity 5000liters (dia.= 1.8m and height 2.2m) is used.

6.7   SANITARY

6.7.1   SEPTIC TANK CALCULATION

Table 8 Septic Tank Calculation

No. of Users			
Primary Users		Secondary Users	
Admin	20	Café	120
Coworking	466	Multipurpose	320
Makerspace	116	Library	120
incubator	90	Dormitory	12
Total	692	Total = 572 20% of total = 114	

Total number of users = 806
Volume of septic tank required = No. of users x 3cu.ft
$$= 806 \text{ x } 3 \text{ cu.ft}$$
$$= 2,418 \text{ cu.ft}$$
$$= 68.4 \text{ m}^3$$

Hence,
No. of Septic tank = 1
Volume of each septic tank=68.5 m^3
Assuming the height of septic tank = 3m
L x B x H = 68.4 m^3
3BxBx3 = 68.4 m^3
B = 2.8 m, L = 3 x 2.8m = 8.4m
Septic Tank Size = 8.4m x 2.8m x 3m
Size of soak pit = 4 x sp.6 (Sp.6 = Dia. 5m and depth 2.75) from standard

7 CONCLUSION

Innovation, Collaboration, and entrepreneurship has been a growing interest among the younger generation; Youth, of today as a medium to explore limits of their imagination. It has been found to be the core aspect which helps in innovation among the youths.

This thesis project entitled "'Youth Hub', A hub for innovation", will provide youth with a platform where they can share ideas, work together in field of entrepreneurship and can test their ideas along with learning. The thesis research is an approach to provide youth with a space where they can explore anything and grow as an individual and as a community.

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ANNEX