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The project: Training and Incubation Hub 'Agropole' - El Alia Biskra

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Dedication

This dissertation is dedicated to:

My great parents ….Who taught me the meaning of patience and perseverance, who always take care of me and support me through their prayers,

My dearest sister … Yasmine…My source of hope and happiness in this life,

My beloved brothers ….Abdeldjalil and Mahmoud …. Who stands by me when things look bleak,

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Acknowledgements……

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INTRODUCTIVE CHAPTER

General Introduction:

In 1954, Walter Gropius, a German architect, emphasized that to have the features of modern living, architecture must be flexible enough (Forty, 2000). Spatial flexibility is defined in the ability to achieve change in conditions without changing the system. This concept is built in the architecture of responding to the new requirements and conditions of space by changing human space. Moreover, today's modern society needs buildings that can fit itself with technological advances and, consequently, modern user needs.

Among this, the need for spatial flexibility has become very urgent. It starts to be an essential feature of architecture. Thus, Designers are experimenting and creating spaces full of innovative ideas crossing the border in the traditional approach of unchangeable buildings design using several methods, so buildings will no longer symbolize a static hierarchical order; instead, they become flexible containers for use by a dynamic society (Rogers, Richard 1998)

1 Problematic:

In the Saharan regions of Algeria, agriculture has always been a key element in development; it is economically a significant activity for the oasis populations. While the agricultural development policies, which has mobilized significant financial and human resources, has many shortcomings, the most important of which revolve around the poor management; unsuitable farm models; and the poor connection between academic institutions with professional agricultural institutions.

Biskra as a Saharan city with its potential in terms of fertility of agricultural lands is the most adequate emplacement of an Agropole project where research requirements, training and start-ups incubator can meet in order to boost new professional farmers and companies.

Technopoles, Agropoles are mainly a group of innovation institutions, research and training centres located on a proximate area, which are typically functional equipment that should be better designed with a flexible approach in order to facilitate the interaction between the different spaces and actors. Highlight that Spatial Flexibility is embraced as a key component in designing of new urban projects that could be multifunctional to serve for different events and uses, this offers more usability of the spaces and allow to cover various activities.

This observation prompted us to raise a question about Training and Incubation Agropoles and how their different functions and uses can be adapted to the different changes using the approach of spatial flexibility in architectural design as the following :

What are the key methods for a spatial flexible project, that could be achieved in a Training and Incubation hub project "Agropole"?

2 Objectives:

- The definition of the several methods of spatial flexibility in the design process of an urban project.
- The creation of a Training and Incubation Hub **"**Agropole**"** specialized in the field of agriculture using a spatial flexible design approach.
- Connect academic institutions and universities with a professional Hub in the field of agriculture.

3 Methodology:

The proposed research approach takes the form of the study of the concepts of the Spatial flexibility Collecting data on the Training and Incubation hubs and trying to materialize these concepts in our project.

We have adopted the following methodology:

- We have done in-depth literary research in the latest studies and research related to the general concepts of to the theme and the project.
- An analytical approach (example analysis and field analysis) to identify the main concepts, which will serve as a reference and help in the design of our project.
- We updated the official program of the project through the conclusions of the analysis of examples and technical requirements.
- Through previous studies, we have developed the crossing elements through which we will include the application of the subject in the project in order to achieve the objectives of the project.

4 The structure of the dissertation:

The introductive chapter:

The general introduction and the state of the problematic of the subject and the project. This phase of the study is considered the first phase of the methodology followed.

Chapter I: (Theoretical):

In this chapter, we will discuss concepts and theories related to Spatial flexibility, and all that relates to the concept and its strategies, characters, etc. and we look at the detection of all the meanings and theories related to the project of a Training and incubation hub "Agropole".

Chapter II: (Analytical):

This chapter contains an analysis of international examples of training and incubation centres related to the project by extracting its design principles and various architectural ideas in addition to presenting different data for the city and the site ground.

Chapter III: (Application):

After the theoretical and analytical previous study, this last chapter will be concerning the passing elements and the project development process. Ending by presenting the applications of the theme strategies in the design project and the graphic and schematic presentation of the Training and Incubation Hub "Agropole" in Biskra.

5 Work plan:

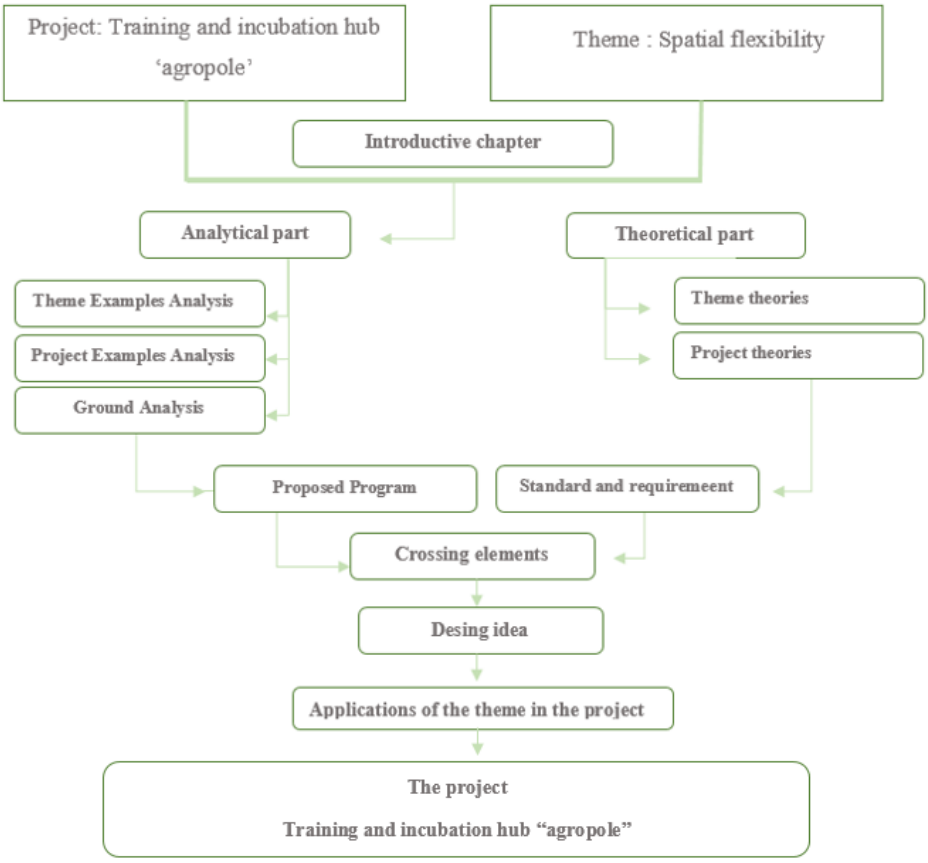


Figure 1 Work plan

Source :(researcher, 2021)

Chapter I:

General Theories and Concepts

Introduction:

This chapter deal with the theoretical aspect of our research, through the definition of the most important concepts related to the subject and the project, in order to have a reference sources that can be used later in the design process.

Concerning the theme subject, the first concept is the architectural flexibility. A general identification of its history, it different meanings and types. Highlighting the concept of the spatial flexibility, which is a type of the flexibility in architecture by identifying its meanings and strategies that could be followed in the design process of the project to obtain a flexible Training and Incubation Hub.

Finally, get to know the different aspects of the training and incubation centres, their main services and their role. Moreover, knowing their design principles and architectural conditions.

I The Theme Concepts:

I.1 The Flexibility in Architecture:

I.1.1 The definition of the Flexibility:

The English colloquial usage of the words “flexibility “are:

- Ability to change or be changed easily according to the situation
- Able to be easily modified to respond to altered circumstances
- The quality of bending easily without breaking) (Oxford English Dictionary Online, 2020)

I.1.2 The definition of the Flexibility in architecture:

- Dluhosch (1974) define the Flexibility in architecture as the ability to achieve a change of conditions without changing the system. It can be achieved not only by the design of space itself, but also by building systems that support (as cited in FarokhiFirouzi, 2014).
- Steven Groak (1992) distinguish between “adaptability” and “Flexibility”, by defining the adaptability as the capable of different social uses, while the “flexibility” as the capability of different physical arrangement on the building. The building’s capacity for accommodating changed uses will depend on the extent to which it is adaptable and/or flexible(as cited in Tristan et al., 2012).p

- Flexibility in architecture is based on the principle that a building can absorb, or adapt, to reflect changes in use throughout their lifetimes. Flexible buildings are intended to respond to changing situations in their use, operation or location. This architecture adapts, rather than stagnates; transform rather than restricts; is motive, rather than static; interacts with its users, rather than inhibits. It is a design form that is, by its very essence, cross-disciplinary and multi-functional; consequently it is frequently innovative and expressive of contemporary design issues(Kronenburg, 2007)

I.1.3 The appearance of the concept of flexibility in architecture:

Flexible architecture is not a new phenomenon, but a form of building that has evolved alongside human beings developing creative skills. This kind of architecture has been used for centuries. People used flexible and movable shelters. Those constructions shelters have been developed to respond to the different conditions of climates as better as possible. African tents of Bedouin that adapted to the desert climate, Asian yurts which consists of separate parts with a geodetic wall formation and compression and tension rings of the ceiling, to the American tipi by its peculiar pointy shape works as a wind shield, all of these shelters were the first step in the application of flexibility in architecture (Elmokadem et al., 2019). Moreover, the traditional design of Japanese dwelling has had the most influence on current concepts of flexibility and adaptability in architecture (Holmes, 2012).

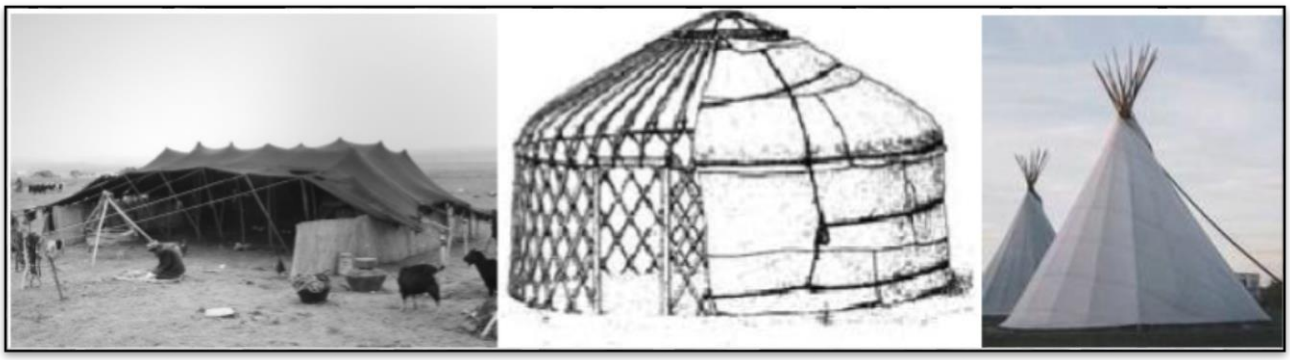


Figure 2 Shelters over history

Source: (Elmokadem et al., 2019)

Since the Second International Congresses of Modern Architecture (CIAM) which was held in Frankfurt in 1929, the notion of flexibility in building design first emerged from where the debate for reduced space standards led to the concept of flexibility ; this ideally means if there was to be less space, then the space needed to be used in an efficient and flexible manner (Tristan et al., 2012). Around the early 1950s, the term “flexibility” entered the field of architectural terminology and has been known as one of the most attractive words in architecture as a “Buzzword”.

In 1954, Walter Gropius insisted that architecture needs to be flexible enough to contain “the dynamic features of modern life” (Kim, 2008)

I.1.4 Types of Flexibility in architecture:

Types of flexibility are based on the way that the flexibility is going to be used in the building. It can be also evaluated in different stages of the construction.

Different authors classified these types based on their own practice. These classifications may contain overlapping or totally different factors. Some of these classifications are:

I.1.4.1 The classification according to Dittert:

In 1982, Dittert classified the concept of Flexibility in architecture into two groups:

- Functional flexibility
- Structural/Spatial flexibility.

I.1.4.2 The classification according to Van Eldonk & Fassbinder :

In 1990, Van Eldonk & Fassbinder added one group to the Ditteret’s categorization, which was the "Character flexibility".

I.1.4.3 The classification according to Gilani:

Gilani (2012) classified the notions of each category in the following table :

Table 1 the notions of the different types of flexibility

Source: (Gilani, 2012)

<table>
<tr><td rowspan="9">Non moveable parts;structure
structural, skin & core
Spatial/ flexibility</td><td rowspan="6">Extendibility and division</td><td rowspan="6">According to scale and direction</td><td rowspan="2">Component/ site scale</td><td rowspan="2">Horizontal</td><td>Extension</td></tr>
<tr><td>Division</td></tr>
<tr><td rowspan="4">Building scale</td><td rowspan="2">Horizontal</td><td>Extension</td></tr>
<tr><td>Division</td></tr>
<tr><td rowspan="2">Vertical</td><td>Extension</td></tr>
<tr><td>Division</td></tr>
<tr><td>Form of roofs</td><td colspan="4">Possibility of vertical extension</td></tr>
<tr><td rowspan="2">Structural method</td><td colspan="4">Incomplete/ indeterminate buildings</td></tr>
<tr><td colspan="4">Standardized modularization</td></tr>
<tr><td>Flexible Facade</td><td colspan="4">Possibility of changing openings</td></tr>
</table>

Cultural/character flexibility	**Individuality**: change of condition based on users performances and their culture	
	cultural identify	
	Adaptable to different users with different identities	
	Providing privacy	**Exterior privacy:** privacy for semi-private spaces (outer and inner hall)
		Interior privacy: Privacy for private spaces
Movable parts (layout & furniture) Functional flexibility	**convertibility**	Ability to convert space from one function to another without any structural modification
		Ability to exchange or interchange space functions without any structural modifications
	Versatility: spatial multi use with minor structural modification	
	The ability to separate and rejoin the rooms and units in terms of movable partitions	
	Multi-functionality: the ability of having different functions at the same time, at the same place or by a same furniture	
	Flexible furniture: the ability to rearrange furniture	
	The ability to place wet spaces within specific zones but not to be permanently, fixed, freedome of main space as generic space	
	Adaptable to climate	
	Adaptable to people with physical disabilities	

I.1.5 The characteristics of flexible architecture:

Flexible architecture requires design that is shaped by attitude to integrate the requirements of the present with the possible changes of the future. Kronenburg (2007) identifies four key factors that characterize flexible architecture:

Adaptation, Mobility, Transformation, and Interaction(Elmokadem et al., 2019).

I.1.5.1 Adaptation:

Adaptive buildings are created to accommodate multiple kind of functions, specified by users' activities. Buildings, with one special purpose, can operate for all different uses. These types of buildings are known as an open building, with an unsuitable space that can be easily absorbed in the later stage. The Open Construction Strategy is the most formal strategy for adaptive architecture (Elmokadem et al., 2019).

An adaptable building should provide a space plan able to be arranged in several scenarios to meet different needs, life styles and uses.

Functional and spatial adaptability can be achieved by designing the building as a combination of independent system-based layers organized hierarchically according to their expected lifespan and rate of change (structure, circulation routes and access, envelope, technical services and installations, space plan and furniture). In order to allow for upgrading, adding, replacing or removing of the components of each layer without affecting the structure of the others or the whole components (Nakib, 2010).

I.1.5.2 Mobility:

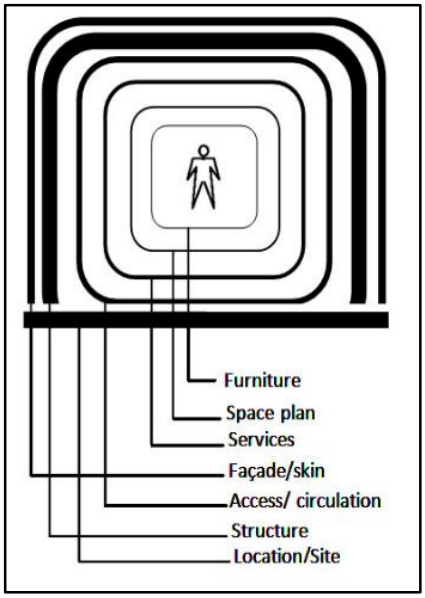


Figure 3 The different layers of the building
Source :(Nakib, 2010)

Mobile architecture is defined as an architecture that represents physical movement, architecture that changes places within a time range. “Mobility” refers to buildings that can physically relocate from one place to another. Many demountable buildings that are produced commercially today are already widely used in a number of fields – in commerce, industry, military, education, health care, housing, where they fulfil their individual roles (Larissa, 2013).

Mobility in buildings can be also achieved by installing partitions and furniture that are light, mobile, demountable, reusable and recyclable (Nakib, 2010).

Figure 4 Mobile demountable partitions in a co-working space
source: (Www.archdaily.com, 2021))

I.1.5.3 Transformation:

Transformable buildings are able to change their shape, space, appearance by the physical alteration to their structural components, outer shell or internal surfaces. The mechanisms used to enable movement have to be reliable, robust, maintenance-minimum, easy operable. Important features of mechanical movements of building parts are opening and closing joints (Larissa, 2013).

The important additional aspect of transformable architecture is ability of the building to interact with external environment and respond to climatic situations. Roofs, windows or other parts of the facade can be opened for example for light or closed for any other atmospheric reasons. This kind of control removes the barrier that buildings usually have between inside and outside, and again contributes to environmental sustainability (Larissa, 2013).

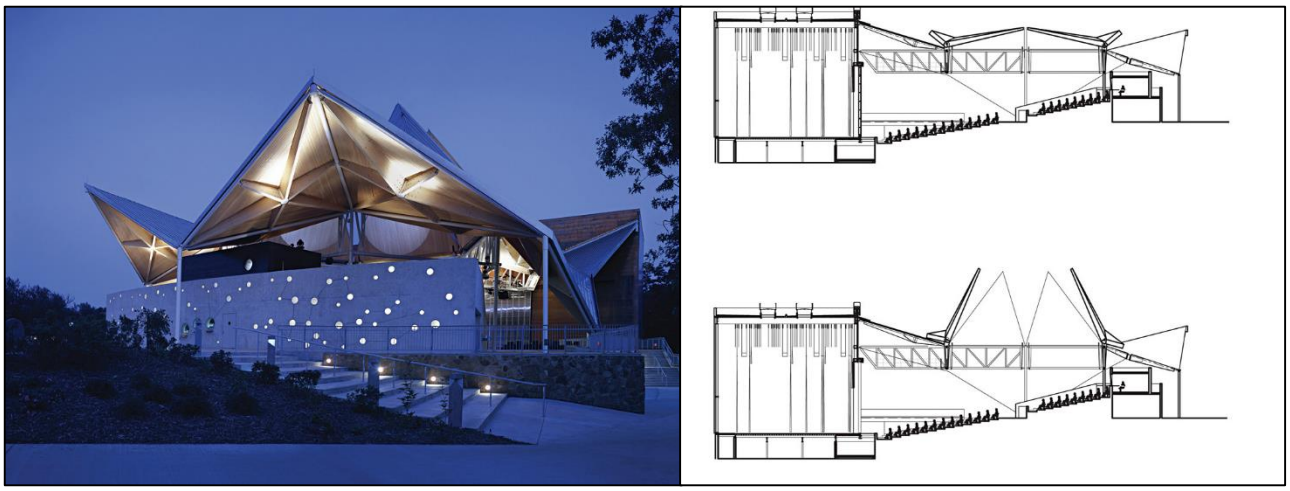


Figure 5 Transforming the interior event space into an interior event space; Bengt Sjostrom Starlight Theatre
Source:(Larissa, 2013)

I.1.5.4 Interaction:

The interactive architecture is a kind of architecture that performs interaction between the building, people and appliances. It merges physical interaction of environment with people and interactive design, where the mind moves through abstract spaces. Largely, the interactive design depends on the technological system employed in the creation of the interactive building (Larissa, 2013).

I.2 The spatial flexibility:

The theoretical framework spatial/structural flexibility is more concerned with professional interventions as a way to change the condition by the aim of satisfying different users; it depends on physical and structural features of the building. Users can change their buildings according to their own preferences based on professional intervention. The change is based on size and situation which gradually in-crease need for more activities and events and to separation into multi-functional spaces (Mahdinejad & Ehsani Oskouei, 2016).

I.2.1 The objective of the spatial flexibility in architecture:

Buildings are constructed with materials and processes that make them potentially more durable than ever in the past, but at the same time, the changing environment and user requirements are demanding ever more flexibility from them. Laboratories, hospitals, or corporate office buildings are often submitted to change, modifications and growth. Accordingly they must been designed to be more flexible and adaptable (Herrera, 1990).

- Flexibility property in buildings means they can evolve as per the required performance when any change in already set condition takes place. Structural/spatial flexibility of buildings has a role in influencing the service life of existing buildings and the possible life of the building newly constructed (Neenu S K, 2019).
- Many old and present buildings were demolished, but some of them were refurbished and granted a second life of functionality. It is based on the analysis that some of the buildings were more prone to demolishment, but somewhere more suitable for redevelopment and reuse due to their flexible design approach (Neenu S K, 2019).

I.2.2 The parameters of spatial flexibility in architecture:

I.2.2.1 Extendibility & division:

I.2.2.1.1 Extensibility by adding new parts:

It is a form of building adaptation assumes that the main part of the project is preserved and can submit a few transformations. The extension, for its part, is the subject of an emergence of a full

part design, in connection with the initial building preserved. In this case, one of the major challenges is that projects lies in taking into account the links and articulations between the "Base building" and its extension (Architectes, 2015).

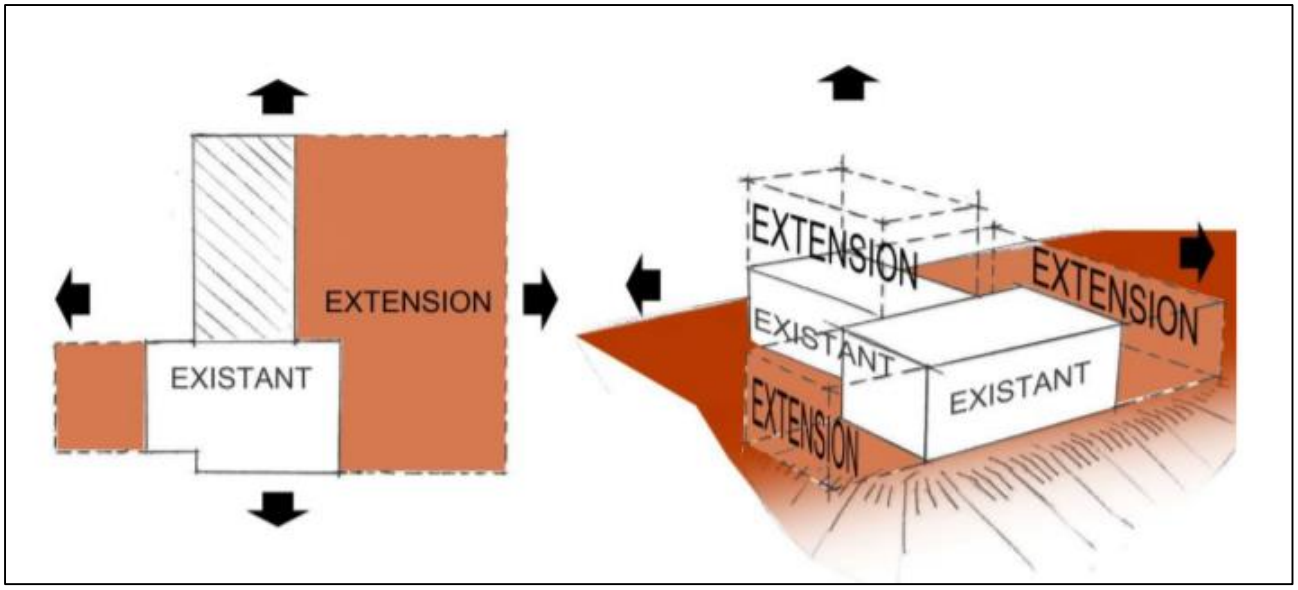


Figure 6 : Extension possibilities schemes
Source:(Architectes, 2015)

I.2.2.1.2 Extensibility by applying the standard modularization:

Extendibility is also the ability to apply the “standard modularization” which is an open-ended unobstructed structural design, which allows for vertical or horizontal additions or modifications through the free placement of services(Karimnezhad, 2017).

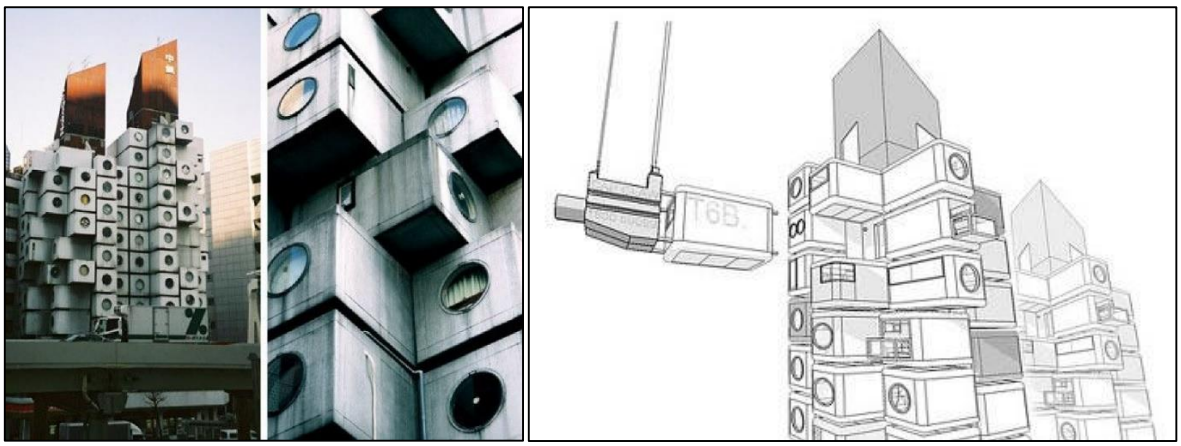


Figure 7 Vertical extensibility in the Nakagin Capsule Tozer of Kisho Kurokawa; Japan
Source: (Ishida, 2017)

I.2.2.1.3 Division by applying the free space:

Grouping and placement of service in specific zones and freeing of the rest of space for end-users spatial definition and division (Karimnezhad, 2017)

Figure 8 The application of the notion of the free space;Flex commercial building ;Usa –
a: the free plan b: the interior flexible space
source : (https://www.arch2o.com)

I.2.2.2 Form of Roofs:

The form of the rooftop of the project has an important role in the possibility of vertical extensions; horizontal roofs are the adequate forms, which permit vertical extension.

Figure 9 Extensible building with horizontal roof
source : (http://www.eiffage-phosphore.com.)

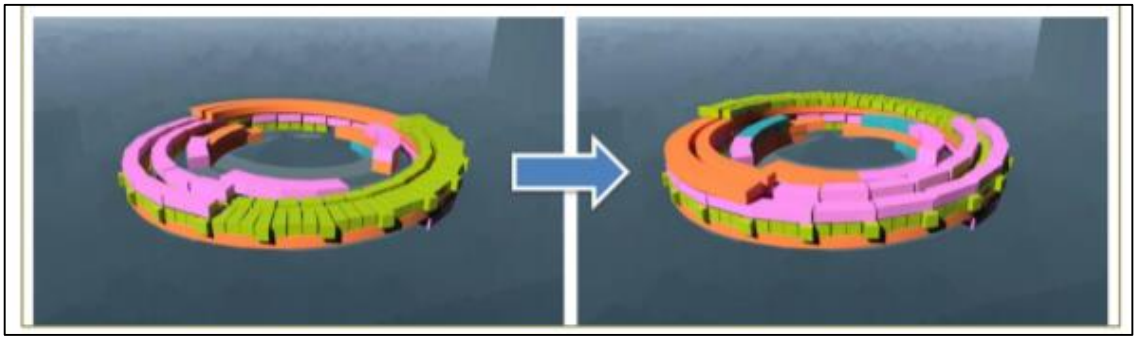


Figure 10 Vertical adding of a new floor
source *:* (http://www.eiffage-phosphore.com.)

I.2.2.3 Structural method:

I.2.2.3.1 Incomplete/Indeterminate buildings:

Architectural indeterminacy is related to levels of spatial specificity; it is the refusal to choose a safe and introverted position. It is the degree to which a particular structure is adaptable to evolving demands. Some users demand liberty from rigidly programmed spatial typologies, where they have been forced to use space in a pre-determined way. Contemporary architectural discourse has moved from the creation of controlled determinacy to indeterminacy to fit with the radical changes brought about by digital technology development.(Baik, 2013)

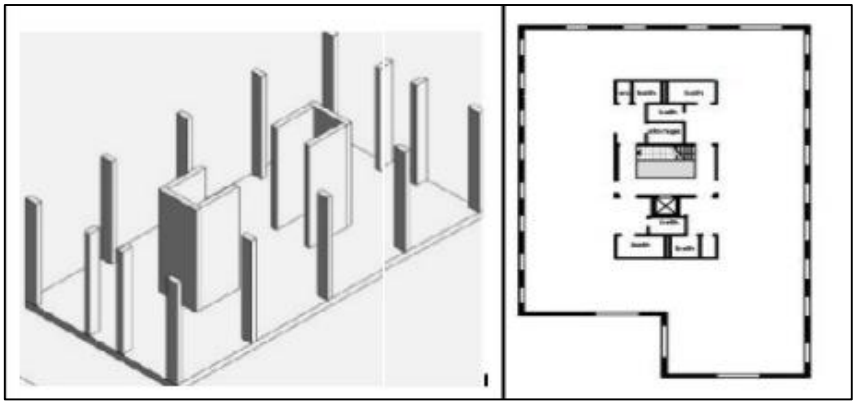


Figure 11 Incomplete building: focusing on permanent elements and leaving the rest for users to change
source : (Gilani, 2012)

I.2.2.3.2 Standardised modularization:

Modularization aims to structure the building or parts of it into chunks, called modules, which sparsely interact. Structuring defines interfaces between modules. (Mohamad et al., 2013)

Standardization aims to group similar modules in one type of module, and tries to minimize the different types of modules. Minimization of types can include changes to the design of modules.(Mohamad et al., 2013)

Modular architecture is based on the design and use of systems composed of separate repetitive elements (standard units), which are similar in size, shape and functional nature. These can be linked up to each other, be replaced or added (agi-architects, n.d.)

Figure 12 Jinlong modular Prefab School; china
source : (Www.archdaily.com, 2021)

I.2.2.3 Flexible facade:

In order to allow easy interior changes of conditions of spaces and the integration of new technologies the following indications should be considered in the facade design:

Designing a versatile envelop which is able to meet the building internal changes. Double skin when possible, to allow absorbing internal changes without affecting the exterior skin (Nakib, 2010)

Figure 13 Double skin ; business incubator, Spain
source : (Www.archdaily.com, 2021)

Making the building envelope independent of the structure and provide means for access (to the envelop system) from inside the building and from outside to facilitate maintenance and repair (Nakib, 2010)

Figure 14 Independent envelope; cultural center, Turkey
source : (Www.archdaily.com, 2021)

Designing sober facades by avoidance of the overabundance of ornaments and extravagance while considering details. That allows easier adaptation to new uses. Choosing materials that allow a building to weather beautifully and grow old gracefully (Nakib, 2010)

Figure 16 Modular prefabricated facade design, research center; Portugal
source : (Www.archdaily.com, 2021)

Base the façade design on a modular system to allow replacement, updating, integration of new technological features and suit of fashion. Base the modularity on a fractal composition in order to avoid monotony and uniformity while creating mixed, dynamic and personalized facades (Nakib, 2010)

Figure 15 Sustainable sober facade ; factory, Vietnam
source : (Www.archdaily.com, 2021)

Increase the contact and exchange areas of the building by creating an irregular and meandering perimeter. That enable the building and its different parts to breathe, and interact as well as to be better ventilated and lit, etc. it also helps to enhance physical and visual accessibility and permeability (Nakib, 2010).

I.3 Sustainability through Flexibility:

"*If a building doesn't support change and reuse, you have only an illusion of sustainability*"(as cited in Va, 2018)

In the context of sustainability, architecture seems to act as a container of changing circumstances, where individuals and groups play an important role in the creation of their habitats, and at the same time, it provides opportunities for long-term flexibility and adaptability. Therefore,

architecture must be capable of sustaining changes and be based on long user needs. Architecture does not end with its foundation and outer walls. But the complete design infrastructure of urban planning, interior, landscape, product and systems design are part of the sustainable architecture (Yilmaz, 2006).

A framework of needs more complex and diversified characterizes the contemporary society; hence, it requires flexibility and adaptability of the building's design, and therefore a "sustainability" related to not only the energy and environmental aspects, but also functional, social and economic ones. Thus, the ability to adapt must concern not only the formal aspects of building, but, in this wider concept of sustainable building, also could affect internal distribution, functional and spatial organization, flexibility of structural and technical systems, management of active and passive control devices of energy flows (Tramontin et al., 2012).

However, it is important to emphasize that these design choices are totally dependent on the designed building system organization, so that it is necessary to consider the different features of building organism jointly and systematically, to ensure from the begin a wider range of flexibility and adaptability. The real aim in contemporary architecture should not be to achieve permanent buildings, but organisms that can evolve and adapt to the variable climatic conditions and emerging needs (Tramontin et al., 2012).Thus; Flexibility is a fundamental aspect of sustainability(Va, 2018)

I.3.1 Flexible design Strategies to achieve sustainability in Architecture:

I.3.1.1 Using durable materials:

The use of recyclable materials such as steel, steel buildings have proved to last longer with much lesser need for repairs when compared with other building materials. Moreover, the use of steel as structural materiel provide efficient floor space which are column free and thereby offering useful free space plan and useful circulation space and sufficient flexibility to deal with differing spatial requirements (Manewa et al., 2016).

I.3.1.2 Using the Domotic :

The Domotics is all the techniques of electronics, building physics, automation, IT and telecommunications used in buildings, more or less "interoperable" and allowing to centralize the buildings subsystems of home and business.

Dynamic envelope are one of the applications of domotics with self-control which moves according to the external climate changes and internal requirements of light and moisture to

completely control the amount of light and air entering the project and reduce energy consumption (Almada & Gomes, 2014).

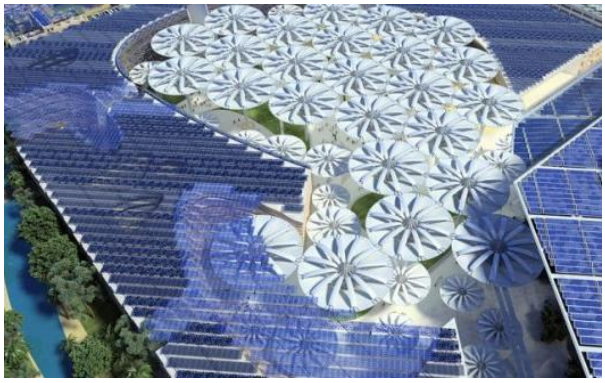


Figure 17 domotic parasols in function “opened’, Masdar city
source : (Www.archdaily.com, 2021)

Figure 18 domotic parasols ‘closed ’ absence of need , Masdar city
source : (Www.archdaily.com, 2021)

I.3.1.3 Using movable sleeve:

Creating a movable sleeve provide the building the ability to adapt along the seasons changes and benefit from the sun as a heating source. The covering sleeve, slides along tracks to allow the sun to penetrate through warming the building in cooler months. In warmer periods, the sleeve can be positioned to enclose the space, creating cooler conditions inside the space. The process takes some minutes and it moves with a small motor (Almada & Gomes, 2014)

Figure 19 Sliding house
source : (Almada & Gomes, 2014)

II The project concepts:

II.1 Innovation Clusters:

II.1.1 Definition of Innovation

- "Innovation is a tool that gives the opportunity of a different work field or service to the entrepreneurs "(DRUCKER, 2012)
- "The commercially successful exploitation of new technologies, ideas or methods through the introduction of new products or processes, or through the improvement of existing ones. Innovation is a result of an interactive learning process that involves often several actors from inside and outside the companies."(Porter & Stern, 2001)
- "Innovation expresses technological development and making works in more good methods and ways. The firms catch the advantages of competition and with innovation and see the innovation as a wide concept including both new technologies and new ways of doing works."(Porter & Stern, 2001)

II.1.2 Definition of Innovation Clusters:

The Innovation clusters are resource centers, which are capable of identifying solutions adapted to the needs of small businesses and supporting them in their departure through technologies and innovation.

The Innovation clusters have a role in enhancing the innovation potential of small businesses. They are structured around a particular field (technology, agriculture, marine science … etc) they search and distribute a set of technical and organizational solutions adapted to the needs of small businesses. To do this, the Innovation clusters position themselves as interlocutors of the various technical and institutional partners likely to cooperate with the small business sector. This also allows them to provide these companies with an overview of developments, particularly in terms of technology, methods, regulation and promotion that they need in order to start their own business (www.travail-emploi.gouv.fr/, 2021).

It called also as "competitiveness cluster" which aims to support innovation. It promotes the development of particularly innovative collaborative research and development (R&D) projects. It also supports the development and growth of its member companies, notably through the marketing of new products, services or processes resulting from the results of research projects (www.competitivite.gouv.fr, 2015).

II.1.3 Background on Innovation Clusters:

Since the 1990s, places dedicated to innovation have emerged, France launched a new industrial policy; Competitiveness clusters were created to mobilize the key factors of competitiveness, foremost among the capacity for innovation, and to develop growth and employment in promising markets.

The initiative launched on September 14, 2004 during the Interministerial Territorial Planning Committee (CIADT) - since then CIACT with a C for competitiveness - is part of a global policy of support for the emergence and development of clusters of competitiveness.

Considering that, the first necessity was to consolidate the strengths of the French economy and to support the emergence of a competitive offer in areas where France is lagging behind.

Competitiveness clusters have been in place since mid-2005. Initially, this program seemed to aim to support innovation in cutting-edge sectors; today, the definition has been extended to all major industrial sectors. They concern emerging technological fields (nanotechnologies, biotechnologies, microelectronics, etc.) and more mature fields (automotive, aeronautics, etc.) and are different in their importance (regional poles, with a global vocation or only national ones).(www.competitivite.gouv.fr, 2015).

II.1.4 Technopoles:

A Technopole is a Site bringing together companies of high technology and educational and research institutions (www.dgrsdt.dz, 2021)Technopoles are a kind of clusters that are defined by the concentration, over a defined geographical area, of a business incubator for companies, research and training organizations. Private or public, in order to develop knowledge and generate local synergies in terms of technological innovation. They are the result of public policies aimed at economic development focused on high-tech activities (Berthinier-poncet, 2013).

The terms ‘Technopole’ or ‘science park’ cover a wide concept relating not only to the physical buildings for high-tech activities but also to the many relationships established in these environments with universities, research, and industry. All of these various terms can be used to describe such parks: research parks, science parks, technology parks, technopoles, techno parks, science centres, business innovation centres, centres for advanced technology and similar versions of the same concept (BALKAN & IN, 2006).

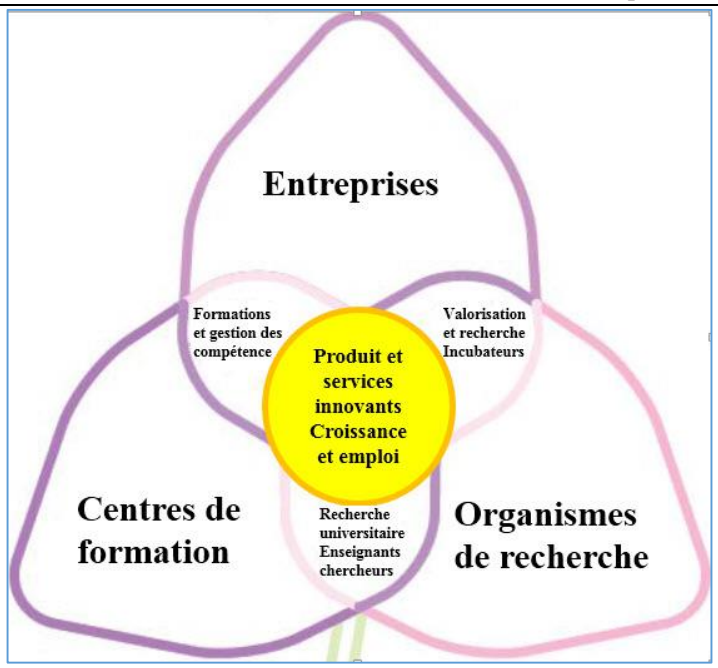


Figure 20 Technopole organisation
source :(www.competitivite.gouv.fr, 2015)

II.1.5 The advantages of Technopoles:

As explained by Zeitschrift et al (2006) :

- Technology transfers carried out from Universities ; training institutions and research centres associated with the technopolitan process, as a source of ideas and projects for entrepreneurs gathered under the banner of the technopole.
- The synergies resulting from the presence of researchers, professionals and students in the same place working on different subjects and exchanging ideas. This was the famous "cafeteria principle", where we meet and where synergies are supposed to arise spontaneously.
- Logistical facilities grouped together in the same place costing each entrepreneur proportionately less through timeshare use.
- Researchers and students in the technopole have the opportunity to exchange ideas with entrepreneurs, develop scientific and technical projects that meet industrial needs, carry out internships or create a start-up.
- From an economic point of view, the technopoles pursue a major objective: the maintenance of employment in the territory, once again thanks to the synergies developed locally.
- Institutions can promote their research, take advantage of the technological infrastructures in place and better identify market needs due to the geographical proximity of companies (Zeitschrift et al., 2006).

II.2 Training and incubation hub “Agropole”:

II.2.1 Definition of Agriculture:

Agriculture (from Latin agriculture, composed from "ager", field and "anger", cultivate) is a process by which humans manage their ecosystems to meet the needs food first and others of their society. It designates all the know-how and activities having for object the cultivation of the land, and, more generally, all the work on the environment natural (not only terrestrial) allowing the cultivation and harvesting of living beings (plants, animals, even fungi or microbes) useful to humans (Harris & Fuller, 2014).

II.2.2 Branches of Agriculture:

Agriculture is a specialized subject that is associated with the studies of several branches of agriculture science encompassing the applied aspects of basic sciences. The applied aspects of agricultural science consist of the study of field crops and their management including soil management.

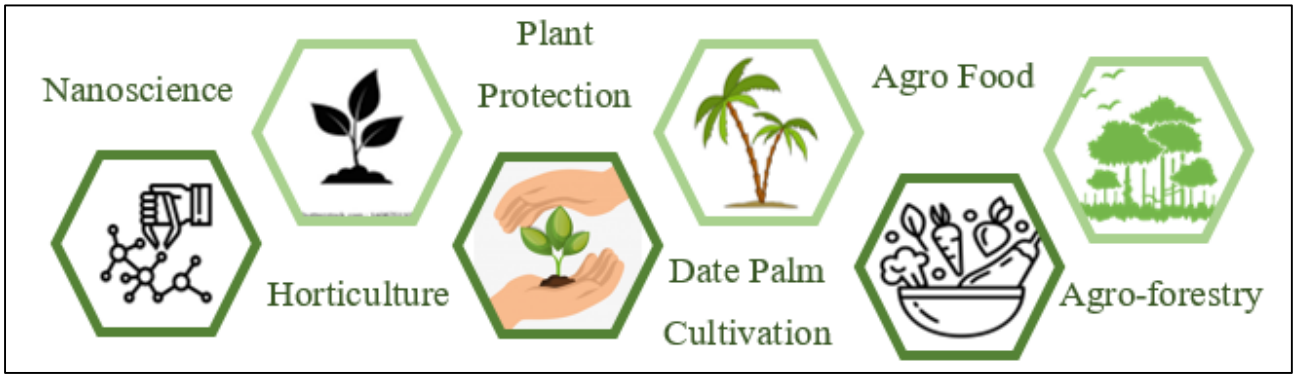


Figure 21 Branches of architecture
source :(researcher, 2021)

II.2.3 Definitions of the Agropole:

The Agropole is a Technopole specialized in the field of agriculture that can be defined as a combination of several actors , in a given geographical area, of incubators for new companies, training centers and public or private research units engaged in a partnership approach intended to generate synergies (R&D, Marketing, Commercial, incubation….) Around joint projects with an innovative character.(www.agropole.com, 2021)

II.2.4 Examples of Agropoles:

Table 2 Agropole examples
Source (Researcher, 2021)

	Agro Food Park, Denmark	**Qualipole of Berkane, Morocco**	**Agropôle molondin ,switzerland**
	 Figure 22 Agro Food Park,Denmark source : (Www.archdaily.com, 2021)	 Figure 23 Qualipole of Berkane, Morocco source : (www.medz.ma, 2021)	 Figure 24 Agropôle molondin switzerland source : (www.agropole.com, 2021)
Services	-incubators -innovation center -food university -greenhouses -multi-user buildings - laboratories -Social activities and sport - conference centre and Restaurant -green land use -Reaserch institutions	-Institute of Agronomic Research and R e D -auditorium - Administration -Green land	-auditorium - research and training institute -incubators -restaurant -greenhouses -Administration

c

II.3.3 Training:

II.3.3.1 Definition of Training:

- training that is given to managers and people working in professions to increase their knowledge and skills(oxford advanced learner's dictionary, 2020).
- Consists of teaching one to person the knowledge and skills necessary to perform of its current functions in theory as well as in practice. Vocational training is generally adopted for people

already exercising a professional activity, and wishing increase their skills (www.jobintree.com, 2021)

II.3.3.2 Definition of professional training:

Professional training is a training process aimed at acquiring the knowledge's, skills and know-how essentials to the exercise of a professional activity or a profession in a certain sector of activity(DimitriLéonard; M, 2008).

II.3.3.3 Definition of Training center:

Training centers are establishments in which students are trained in very specific professions(www.organisme-de-formation.com, 2021).

Figure 25 Training concept illustration
source :(www.pinterest.com, 2021)

II.3.3.4 The role of an Agricultural Training center:

- Improve the professional skills of employees, increase the quality of their products and services, improve their potential for innovation and competitiveness, and move from a logic of survival to a logic of growth
- Allow the individual to acquire the knowledge and know-how (skills and experience) necessary for the exercise of a trade or professional agricultural activity
- Training of agricultural technicians that are capable of contributing to the smooth running of any agro ecological initiative
- Master the different cultures of the agricultural environment
- Allows young people and adults to improve their agricultural professional skills(http://www.fao.org/, 2021).

II.3.3.5 Principles for Training Space Design:

Based on the Learning Space Design Guidelines (2018) There are six principles to be considered when designing learning spaces are:

- Interaction: Enable meaningful, active and collaborative interactions between participants.
- Technology: Provide appropriate technology to support diverse, enriched and flexible instructional practices and learning experiences.
- Environment: Design a sustainable and healthy environment that is conducive to learning, and will support the long-term use of the space.
- Flexibility: Design for a wide range of instructional practices, student activities, curricula, room uses, and potential for change.
- Accessibility: Ensure that principles of accessibility are central to the design of all learning spaces, and that all participants have a common experience
- Location: Locate learning spaces to support effective building zoning, circulation and access.

II.3.3.6 Agricultural training center main spaces:

-Classrooms:

The classroom is the most common learning space. The classroom is most effective for 30 people, with variations that include front of room scheduled instruction, lectures, media viewing and small group work, scheduled and/or drop-in small group active learning, student use of technology, and student and instructor interaction (Learning Space Design Guidelines, 2018)

-Conference room:

Multiple purpose medium-size instruction rooms. Depending on the seating configuration, the rooms may accommodate lecture-style instruction or encourage interaction in the form of roundtable discussions and teleconferences. Often two or three conference rooms can be combined to form a larger conference room by opening movable partitions that slide or fold into pockets in the walls (Learning Space Design Guidelines, 2018)

-Laboratory:

A place equipped for experimental study in a science or for testing and analysis a research laboratory broadly : a place providing opportunity for experimentation, observation, or practice in a field of study (Learning Space Design Guidelines, 2018).

II.3.4 Research:

II.3.4.1 Definition of scientific Research:

Scientific research is a dynamic process or a rational approach, which allows the examination of phenomena; solve problems and to obtain precise answers from the investigation. This process is characterized by the fact that it is systematic and rigorous and leads to the acquisition of new knowledge.

Figure 26 Research concept illustration
source :(www.pinterest.com, 2021)

II.3.4.2 Definition of Research center:

A research center is an entity, such as a higher education institution and research, a research organization, a scientific cooperation foundation or a research institute, whatever its legal status (public or private law body) or its mode of financing. Its mission is to carry out basic research activities or industrial research or experimental development and disseminate their results through the teaching, publication or transfer of technology (www.dgrsdt.dz, 2021).

II.3.4.3 Definition of the Agricultural research:

Agricultural research can be broadly defined as any research activity aimed at improving productivity and quality of crops by their genetic improvement, better plant protection, irrigation, storage methods, farm mechanization, efficient marketing, and a better management of resources (Loebenstein & Thottappilly, 2007).

II.3.4.4 The role of the Agricultural Research center:

- Produce and disseminate scientific knowledge and innovations, mainly in the fields of agriculture, food and the environment

- One of the important tasks of agricultural research institutes is to collect, process and formulate appropriate packages of practices, based on recent research results and farmers' needs, and then to disseminate them using suitable media and methods.
- Increasing knowledge and developing technological innovations in agriculture.
- Provide scientific and technical advice to policy makers on agricultural activities and strengthen the competitiveness of agriculture.
- Sustainable exploitation of agricultural wealth.

II.3.4.5 Principles for research Space Design:

- Cre5ativity, Innovation & Technology
- Health & Safety
- Interaction: Interdisciplinary collaboration has become paramount to academic and corporate-based research. Fixed benches and utilities limit scientists to their individual workstation and hinder them from working in teams.
- Adaptability: Science and technology change rapidly, and the facilities used for them do too. Therefore, new laboratory must be flexible and adaptable.
- Sustainability: In the context of a lab, it means developing new approaches (technical, operational and behavioral) to enhance the environmental performance of a space that feels safe, inclusive and connected, with a sounds economic approach (Miller et al., 2018) .

II.3.4.6 Agricultural research center main spaces:

-Laboratory:

A place equipped for experimental study in a science or for testing and analysis a research laboratory broadly : a place providing opportunity for experimentation, observation, or practice in a field of study.(Learning Space Design Guidelines, 2018)

-Computer laboratory:

Computer Labs assumes a vital role in helping to keep the research centerc at the leading edge of information technology by continously enhancing and upgrading its facilities and services for research development and administrative applications.It provide a modern research environment for industry standard software in agricultural and environmental sciences.

-Researcher’s office:

It is a desk that serve as storage space and personal work area for researchers.

-Library:

It is a major space in this type of equipment because it provides the theoretical support and the documentary base and books that scientific research will need.

II.4 Incubation:

II.4.1 Definition of incubation:

According to the UK Business Incubation, Incubation is a unique and highly flexible combination of business development processes, infrastructure and people, designed to nurture and grow new and small businesses by supporting them through early stages of development and change(Voisey et al., 2006).

Figure 27 Incubation concept illustration
source :(www.pinterest.com, 2021)

II.4.1.2 Definition of incubator:

A Business Incubator is a place to welcome and support people with business creation projects. It offers them support in terms of training, advice, funding and fundraising.

A Business Incubator is a structure that welcomes and supports small businesses and Start-ups until their creation during their first months of existence.(www.dgrsdt.dz, 2021)

II.4.1.3 The role of the agricultural business incubator:

- Detect, welcome and support innovative business creation projects.
- Accommodation and logistical support for business project leaders and newly created businesses.
- Support for creators in the development of their business plan, particularly in organizational, legal, industrial, commercial areas and for the recruitment of the management team.
- Identifying and adopting technologies appropriate for specific agribusiness enterprises.

- Identifying and motivating entrepreneurs in agribusiness enterprises, frequently in rural areas.
- Building commercial conduits in the form of value chains which integrate new value creating activities in rural and urban spaces

II.4.1.4 Principles for Incubators Space Design:

- Creative synergy: by considering each user's requirements to conduct business. Having open creative areas with centrally-located amenities, promotes a relaxing environment – allowing better and more honest participation in discussions/workshops.
- Creating flexible and highly responsive spaces that allow people, in a range of group configurations, to decide what work.
- Using materials in unexpected ways, incorporating amenities that allow the users to feel comfortable, or incorporating cutting edge technology.
- An open environment promoting connection and interaction between the users (ARCHITECTS, 2016).

II.4.1.5 Incubator main spaces:

-Coworking spaces:

Are essentially shared workspaces. They offer affordable office space for those looking to escape the isolation of a home office or coffee shop. These shared workspaces offer a suite of office-like amenities such as hot-desks, private meeting rooms, kitchens, coffee and more (Www.archdaily.com, 2021)

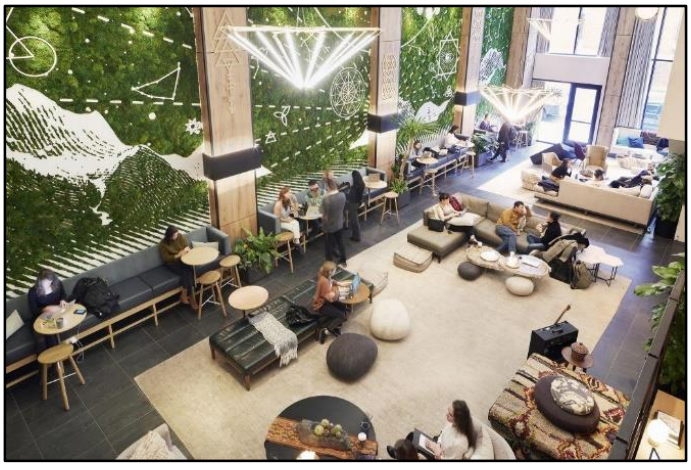


Figure 28 Coworking space
source :(www.pinterest.com, 2021)

-Fablab: A Fab Lab (or fabrication laboratory) is a small-scale workshop for personal digital fabrication, equipped with an array of flexible computer controlled tools and various materials, with the aim to make "almost anything" (Www.archdaily.com, 2021)

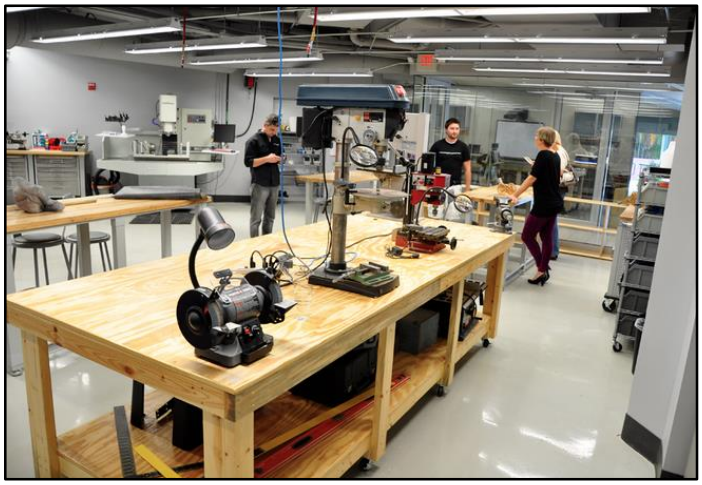


Figure 29 Fablab space
source :(www.pinterest.com, 2021)

-Meeting room:

Meeting spaces are locations of information exchange, whether it is presented by a single speaker or a group of colleagues discussing a particular subject. Depending on the company profile, it can be more casual or traditional. (Www.archdaily.com, 2021)

II.5 Technical requirements of Training and incubation Hub:

II.5.1 External requirements :

-urban integration:

Urban integration is a must. Technopoles and training centres should be considered as one of the city's lungs. It creates jobs, knowledge, transversal social exchanges, and, in the end, economic value for the territory. Its promotion to the city population and economic actors, its accessibility, its links with other innovation actors in the city should be addressed with special care.The project must be located in an agricultural area approximate to the urban fabric (Www.eib.org, 2010)

-Accessibility:

The proximity of transportation or access infrastructures. In the knowledge economy, rapid transportation facilities are as important as intangible networks. (Www.eib.org, 2010)

- Site entrances:

The project must have a multiple kinds of entrances visitors, logistics , users, workers. (Www.eib.org, 2010)

II.5.1 Internal requirements of main spaces:

-Laboratories conditions :

Circulation: A single corridor with the multiple options is the most adopted one. A single corridor lab design with labs & offices adjacent to each other.

The layout of a lab can have any shape or form. It can be linear, square, rectangular or curvilinear.

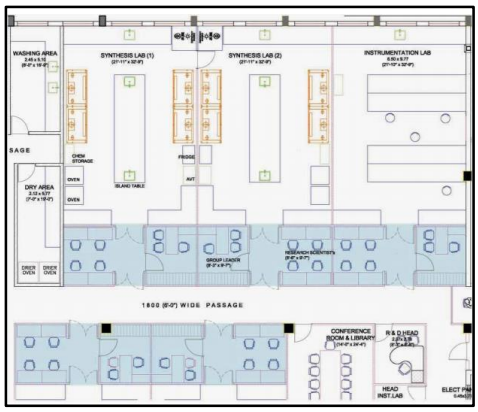


Figure 30 Wide corridor in laboratory
source : (Ally, 2010)

-Classroom conditions:

Thermal and acoustic comfort: provide a maximum physiological comfort for students in classrooms (air conditioning unit). Need for adequate sound and heat insulation (offer optimal conditions of comfort for learning activities).

Lighting: is provided by natural light from the bays glazed, artificial intensity of 750 lux for workshops of meticulous activities and 600 lux or the other workshops.

Figure 31 Lightning in classroom
source:(www.pinterest.com, 2021)

-Coworking spaces conditions:

Coworking spaces must be a flexible planning space and computerized workstation connections, equipped side-by-side workstations and coffee corner, bright, casual in light colors.

They must benefit from natural and artificial lighting avoiding directly lighting.

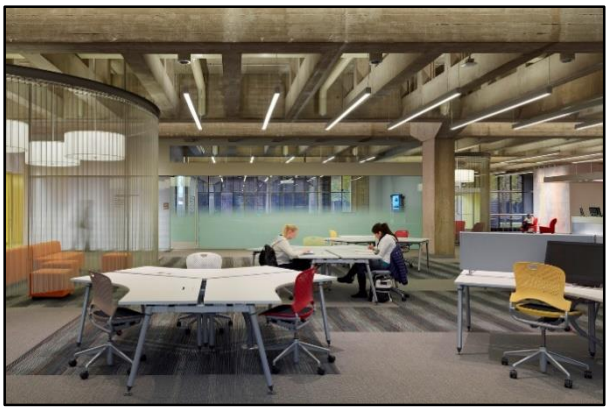


Figure 32 Flexible Coworking space
source:(www.pinterest.com, 2021)

Figure 33 Sustainble Coworking space
source:(www.pinterest.com, 2021)

Conclusion:

After we touched the important informations of both of the project and the subject, and explaining the importance of each one. Understanding all the characteristics of the training and incubation hubs, led us to understand the importance of these type of projects to the economical, environmental, and social needs of our context. Thus the flexibility design approach emphasize the efficiency of those Agropoles and this combination appears workable and beneficial.

In the next chapter will analysis and study everything related to the project such as its main requirements of technical, functional, and architectural aspects and the study of several examples of the subject by extracting how the strategies of the spatial flexibility are applied in those examples.

Finally, make a site ground analysis and identify the program of inner and external spaces of the project by referring to the project examples before.

CHAPTER II:

ANALYTICAL CHAPTER

Introduction:

This chapter aims to analyse some examples of centres and Agropole. Also some projects that treat the theme of Spatial Flexibility in architecture and highlighting the used principles, by analysing the way that architects deal towards those concepts. In addition, knowing the architectural ideas used at the level of the Training and Incubation centres, how architects applied the strategies of the spatial flexibility on the buildings. These process allowing a better understanding of the subject and the project in order to apply those ideas in the final design of our project. Moreover, studying the potentials and the problems of the site ground in order to deal with it in the process of the project design and to better integrate the project in its context.

I Analysis of the Project Examples:

II .1 Project Technical Card:

Table 3 Project Technical Card

Source: (researcher, 2021)

01	**Northwest Missouri State University Center for Innovation and Entrepreneurship**
	Architects:Gould Evans
	Localisation : MARYVILLE,USA Built Area: 4273 m²
	site Area: 2 ha
	Date of realisation: 2009
	Architects:Gould Evans
02	**Agro Food Park -New multi user house-**
	Architects:William McDonough + Partners and GXN together with 3XN Architects
	Localisation : AARHUS, DENMARK
	Built Area: 8000m²
	Date of realisation: Under construction
	Client : agro food park

03	**Spanish-Portuguese agricultural research center**
	Architects: Canvas Arquitectos
	Localisation: Salamanca, Spain
	Built Area: 4800 m²
	site Area: 2 ha
	Date of realisation: 2008
	Client : The University of Salamanca
04	**Clemson University Watt Family Innovation Center**
	Architects:: Perkins and Will
	Localisation :CLEMSON,UNITED STATESBuilt Area: 77000 ft²
	Date of realisation: 2016
	Architects:: Perkins and Will
	Localisation :CLEMSON,UNITED STATESBuilt Area: 77000 ft²

II.2 Choice criteria:

Table 4 Choice criteria

Source: (researcher, 2021)

Northwest Missouri State University Center for Innovation and Entrepreneurship	The project was chosen dueto its situation and its relation with the urban fabric and other institutional project , also it contains the most of important functions of the project .
Agro Food Park -New multi user house-	The project was chosen due to its multi use purpose and it represent a clear example of an incubator project

Spanish-Portuguese agricultural research center	The project has all the main component of our global project with a typical integration on the site near a valley
Clemson University Watt Family Innovation Center	The project location in a urban fabric surrounded with institutional projects, its innovative conceptual ideas of the interior design are remarquable and it can be used in our project.

I .3 Conceptual idea:

Table 5 Conceptual idea

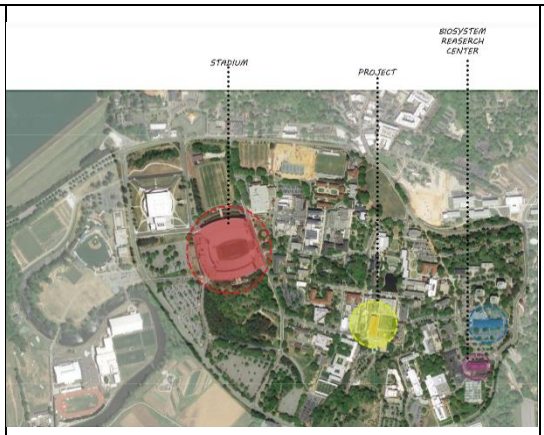
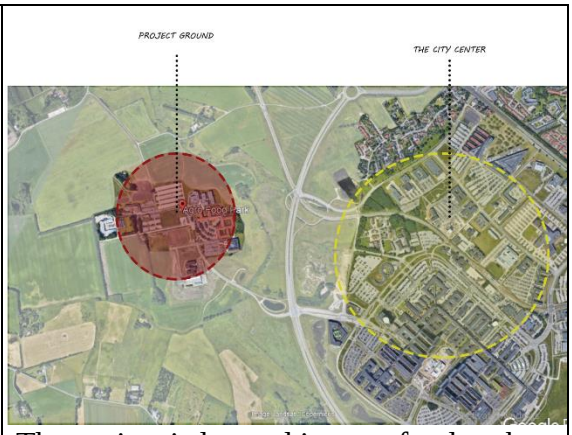
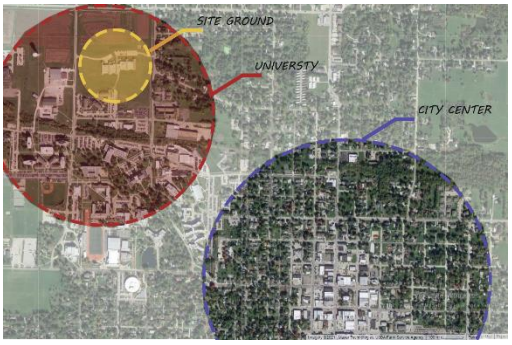
Source: (researcher, 2021)

Northwest Missouri State University Center for Innovation and Entrepreneurship	The Center for Innovation and Entrepreneurship houses an incubator space for start-ups specializing in agricultural research as well as an academic teaching and research facility for related academic fields.
Agro Food Park -New multi user house-	A hub for agricultural innovation .Aiming to serve as a benchmark for future global food industry development, the project will combine urban density with agricultural.
Spanish-Portuguese agricultural research center	The building emerge in the landscape distancing itself from a housing environment without a clear order; hidden in the landscape.
Clemson University Watt Family Innovation Center	A place for genius people to research and innovate and it is the soul of architecture that can create something beyond of just a building, a place for inspiration is admired.

I .4 Urban integration:

Table 6 Urban integration

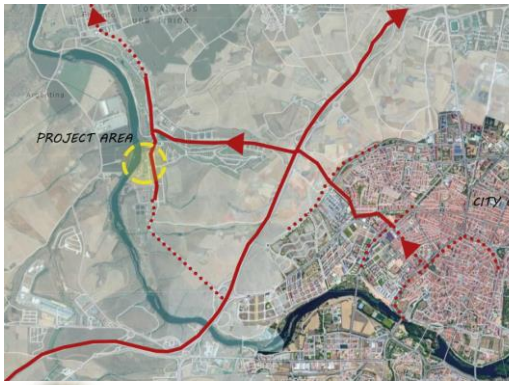
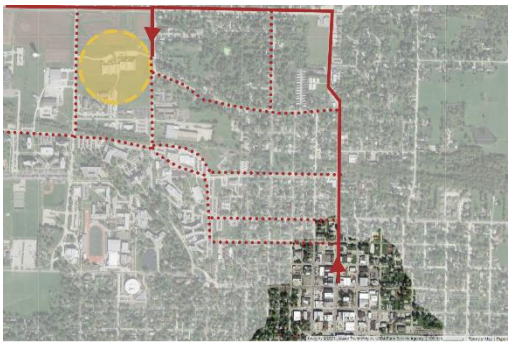
Source: (researcher, 2021)

Clemson University Watt Family Innovation Center	 The project is located in an institutional area in the city center of Clemson in USA	**Agro Food Park -New multi user house-**	 The project is located in agro food park near the city center surrounded by agricultural lands
Northwest Missouri State University Center for	 The project is located on NORTHWEST MISSOURI STATE UNIVERSITY near the city center	**Spanish-Portuguese agricultural research center**	 The project situation is in distance with the city center surrounded by agricultural lands
Conclusion	The project must be located and in harmony with its immediate environment “reaserchand educational institutions” with the presence of agricultural lands		

I .5 Accessibility:

Table 7 Accessibility

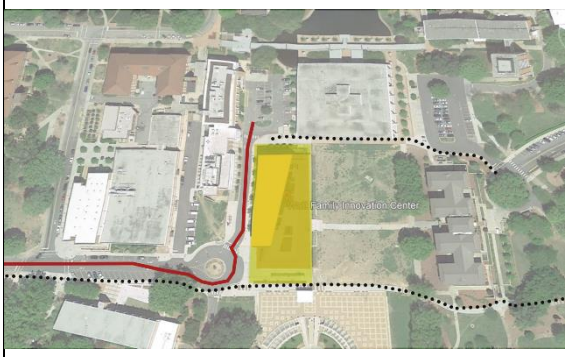
Source: (researcher, 2021)

Spanish-Portuguese agricultural research center	 Project site Main direct roads Secondary roads the project placement is in a secondary roads but it is so close to the main road easy accessible from the city center	**Agro Food Park -New multi user house-**	 Main direct roads Secondary roads The project is easy accessible from secondary roads.
Northwest Missouri State University Center for	 Project site Main direct roads Secondary roads The project placement is on an unclosed university ground, surrounded by roads, so it is accessible from a main road and secondary roads	**Clemson University Watt Family Innovation Center**	 Main direct roads The project placement is easy accessible from a main road.
Conclusion	The project must have a good accessibility and easy to reach from diverse roads.		

I .6 Site entrances:

Table 8 Site entrances

Source: (researcher, 2021)

Spanish-Portuguese agricultural research center	 Pedestrian ways Mechanical main roads Mechanical secondary roads Mechanical entrance Pedestrian entranc Greenhouse mechanical entrance The entrances on the site project are multiple and separated, the Paths are organized	**Agro Food Park -New multi user house-**	 Main direct roads Secondary roads The entrances on the site project are multiple and public , the Paths are unorganized
Northwest Missouri State University Center for	 Pedestrian ways Mechanical main roads Mechanical secondary roads Mechanical entrance Pedestrian entranc Greenhouse mechanical entrance The entrances on the site project are multiple and separated, the Paths are organized	**Clemson University Watt Family Innovation Center**	 Main direct roads The project has one main closed mechanical entrance , with multiple pedestrian entrances
Conclusio	It is better for the site entrance to be accessible from multiple separated kinds of entrances.		

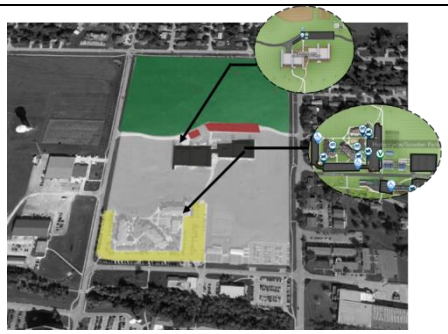
I .7 Built and unbuilt spaces :

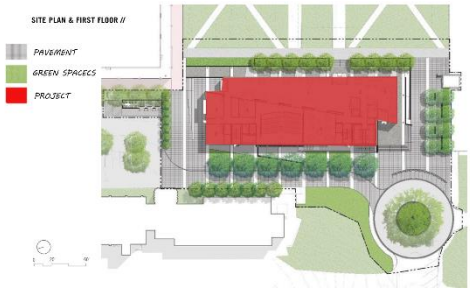
Table 9 Built and unbuilt spaces

Source: (researcher, 2021)

<table>
<tr>
<td>Spanish-Portuguese agricultural research center</td>
<td> 

The relationship between Built and unbuilt spaces -Built 24%- Unbuilt 76%
The project has a various kind of parking</td>
<td>Agro Food Park -New multi user house-</td>
<td> 

The project has various built and unbuilt private and shared spaces with other buildings of the agro food park</td>
</tr>
<tr>
<td>Northwest Missouri State University Center for</td>
<td> 

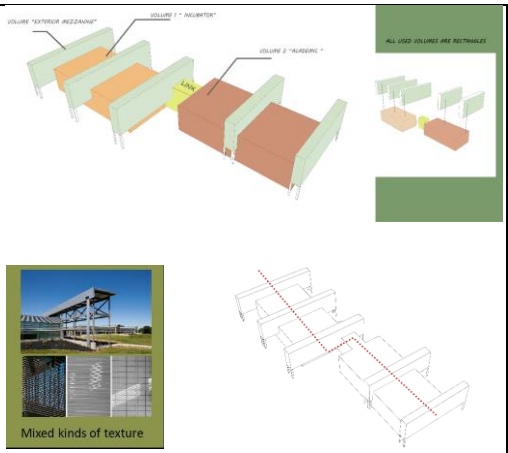
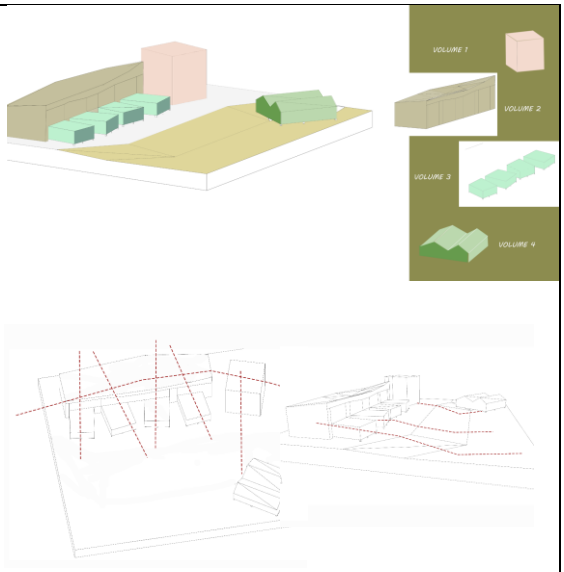
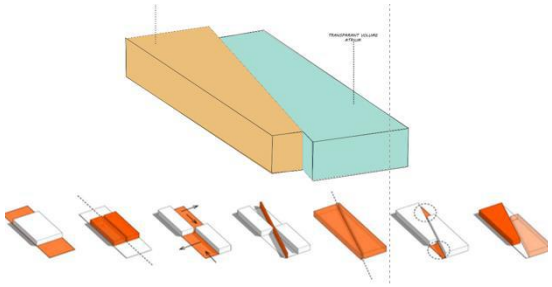
The relationship between Built and unbuilt spaces Built 3%-Unbuilt 96</td>
<td>Clemson University Watt Family Innovation Center</td>
<td> 

The relationship between Built and unbuilt spaces
• Built 87%
• Unbuilt 13%</td>
</tr>
<tr>
<td>Conclusion</td>
<td colspan="3">In the conception of the project, it is better to give importance to the exterior unbuilt spaces in order to have exterior / interior convivial and useful spaces. The building Positioning must located after in-depth study</td>
</tr>
</table>

I.8Volumetry:

Table 10 Volumetry

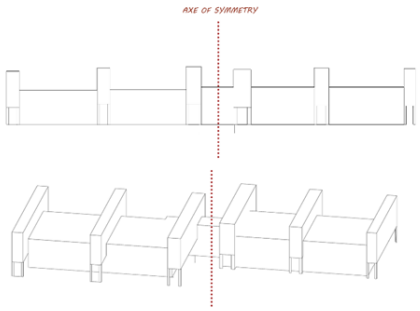
Source: (researcher, 2021)

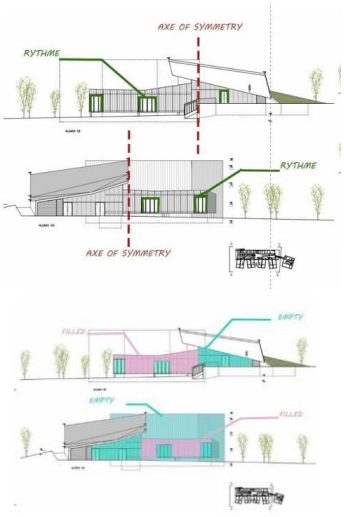
Northwest Missouri State University Center for Innovation and Entrepreneurship	 Modular construction prepared to grow for future expansion there is a functional translation on the external volume.	**Spanish-Portuguese agricultural research center**	 The components of the volume are separated, connected with circulation paths each volume has a main function
Agro Food Park -New multi user	 There is no separation of the volume components the three volumes are assembled as (One block).	**Clemson University Watt Family Innovation Center**	 The volumetry is simple devided to two parts due to the internal functions
Conclusion	The use of simple geometric volumes one block or decomposed volumes ; in order to differentiate between the main functions		

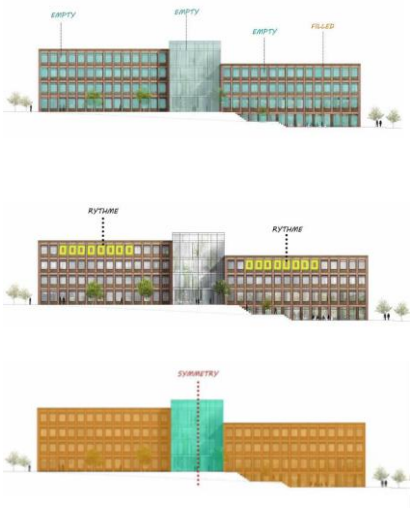
I.9 Elevations :

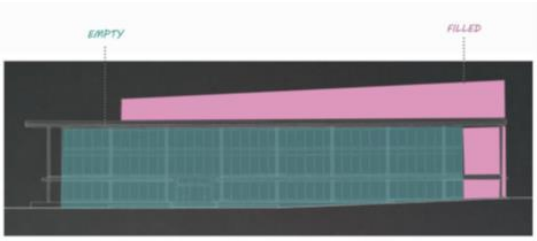
Table 11 Elevations

Source: (researcher, 2021)

<table>
<tr>
<td>Northwest Missouri State University Center for Innovation and Entrepreneurship</td>
<td> 


The façade is balanced with the presence of repetition and symmetry.</td>
<td>Spanish-Portuguese agricultural research center</td>
<td> 

Percentage of Empty and filled:
-Empty 55%-Filled 45%
There is an homogeneity in the elements of the facades by symmetry and repetition</td>
</tr>
<tr>
<td>Agro Food Park -New multi user house-</td>
<td> 

The facades are balanced with thepresence of repetition.</td>
<td>Clemson University Watt Family Innovation Center</td>
<td> 

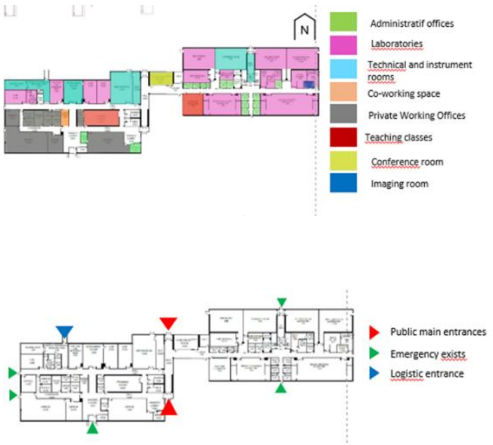
The facade is asymmetric but there is homogeneity in the elements of the facades by repetition</td>
</tr>
<tr>
<td>Conclusion</td>
<td colspan="3">The use of homogeneous elements and simple design of elevations</td>
</tr>
</table>

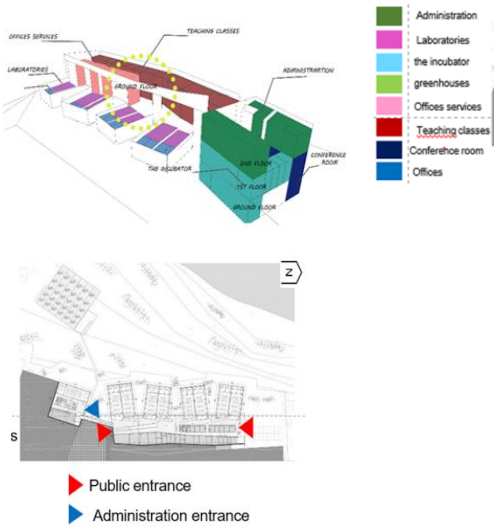
I.10 The Presentation of floors:

I.10.1The entrances:

Table 12 The entrances

Source: (researcher, 2021)

<table>
<tr>
<td>Northwest Missouri State University Center for Innovation and Entrepreneurship</td>
<td> 

The use of different kind of entrances depends on the kind of the users</td>
<td>Spanish-Portuguese agricultural research center</td>
<td> 

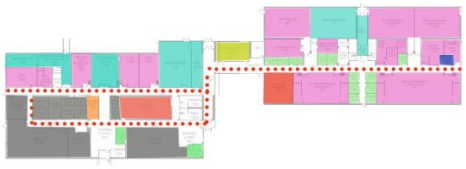
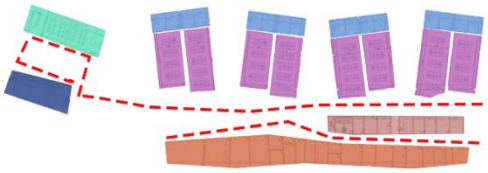
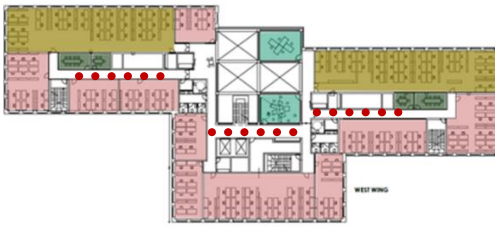
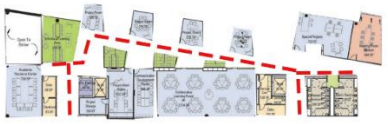
The use of different kind of entrances depends on the kind of the users</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clemson University Watt Family Innovation Center</td>
<td> 

The use of different kind of entrances depends on the kind of the users</td>
</tr>
<tr>
<td>Conclusion</td>
<td colspan="3">It is better that the project have different kind of entrances.</td>
</tr>
</table>

II.10.2 The spatial organization

Table 13 The spatial organization

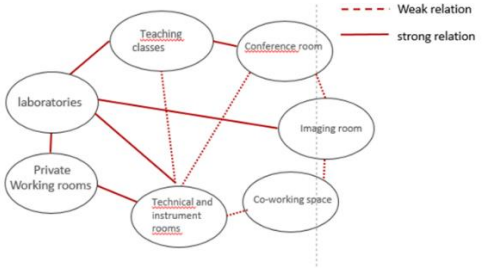
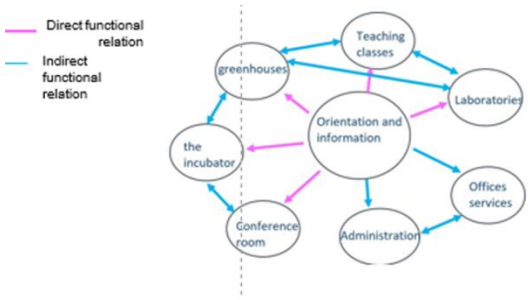
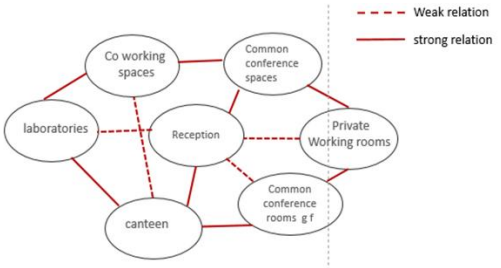
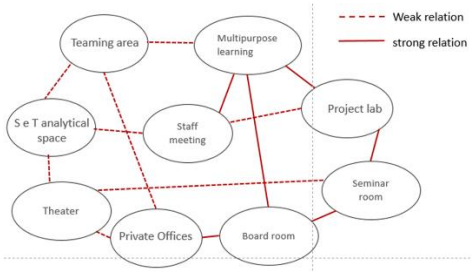
Source: (researcher, 2021)

Northwest Missouri State University Center for	 Linear spatial organization	**Spanish-Portuguese agricultural research center**	 Linear spatial organization
Agro Food Park -New multi	 Linear spatial organization	**Clemson University Watt Family Innovation Center**	 Linear spatial organization
Conclusion	The spatial distribution must be clear, all spaces must be achievable and visual for the public users The functional organization relations between the spaces on the project must be considered especially on the research unity		

I .10.3 Functional organization

Table 14 10.3 Functional organization

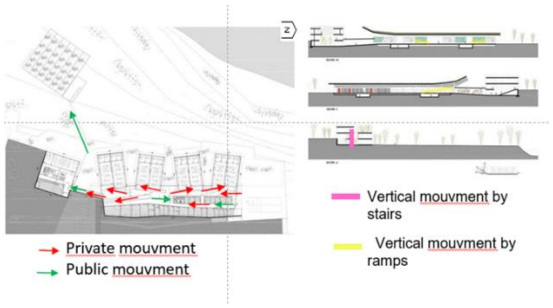
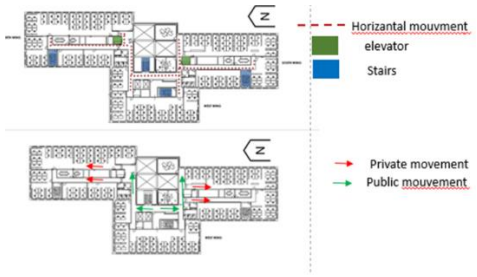
Source: (researcher, 2021)

Northwest Missouri State University Center for		**Spanish-Portuguese agricultural research center**	
Agro Food Park -New multi user		**Clemson University Watt Family Innovation Center**	
Conclusion	The functional organization relations between the spaces on the project must be considered especially on the research unity		

II.10.3 Movement study:

Table 15 Movement study

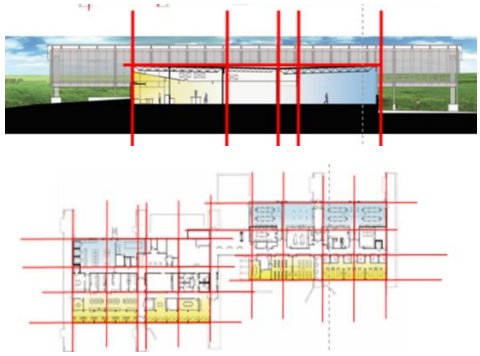
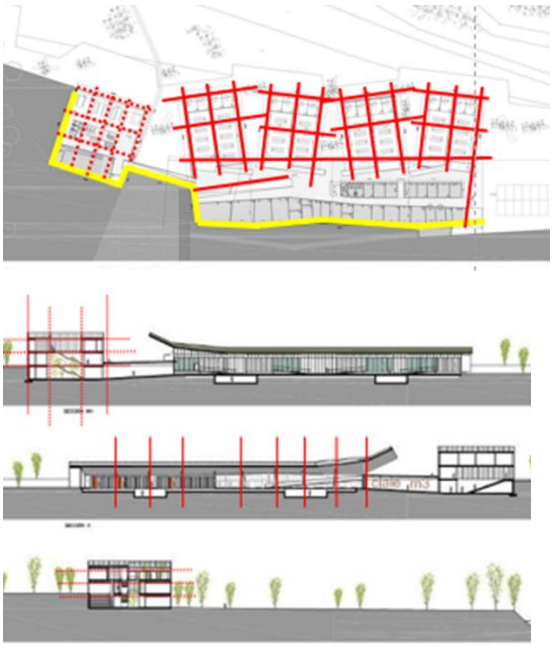
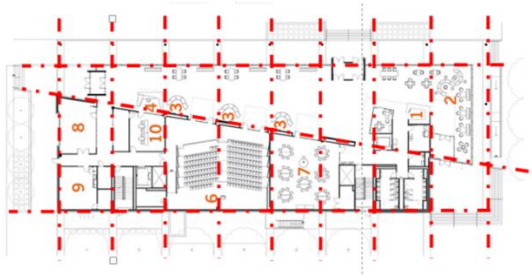
Source: (researcher, 2021)

Northwest Missouri State University and Center forInnovation Entrepreneurship		**Spanish-Portuguese agricultural research center**	
Agro Food Park -New multi user house-		**Clemson University Watt Family Innovation Center**	
Conclusion	Public circulation and the circulation of workers can be crossed.		

I .10.5 Structural system:

Table 16 Structural system

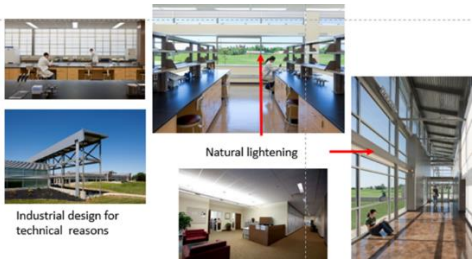
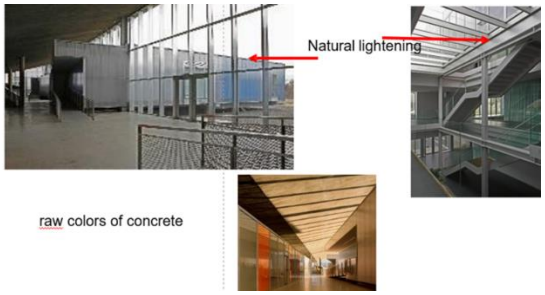
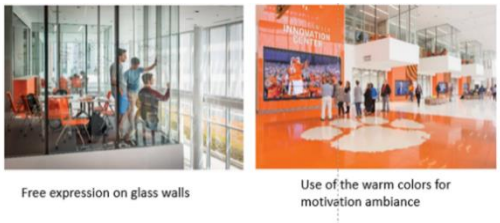
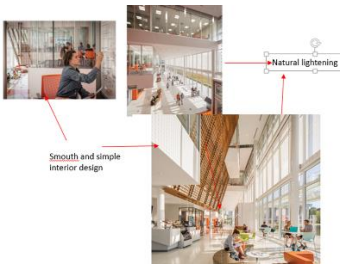
Source: (researcher, 2021)

Northwest Missouri State University Center forInnovation and Entrepreneurship	 The use of a Metallic regular structure frame	**Spanish-Portuguese agricultural research center**	 Mixed structural system Concrete , metallic , bearing wall
Agro Food Park -New multi user house-	 The use of a Metallic regular structure frame	**Clemson University Watt Family Innovation Center**	 The use of a Metallic regular structure frame
Conclusion	It is better to metallic structural system especially in the research labs and incubator in order to have a free plan and an optimal flexibility .		

I .10.6 Ambiances:

Table 17 Ambiance

Source: (researcher, 2021)

Northwest Missouri State University Center forInnovation and Entrepreneurship	 The interior ambiance is simple and clean with an industrial touch taking into consideration the air and lightening conditions for technical acquires of labs	**Spanish-Portuguese agricultural research center**	 The use of lateral daylighting through large windows with a reasonable manner
Agro Food Park -New multi user house-	 The interior ambiance is open and convivial with simple design in the presence of the vegetation	**Clemson University Watt Family Innovation Center**	  The use of glass for transparency ; the presence of warm colors in the flexible work spaces
Conclusion	The project research spaces must be ventilated and laminated with a reasonable manner, the incubator spaces should be convivial and comfortable		

II Analysis of the theme Examples:

II.1.The 1st example: Montessori school, Amsterdam:

- **Flexibility by Arrangement of Spaces**

The Montessori School in Delft was designed by Herman Hertzberger, was built in 1960-1966 and some extension and renovation were done in 1968-1970

Choice criteria: the project has an educational function designed by one of the pioneers of the flexibility.

Figure 34 Montessori school, Amsterdam

source: (www.archdaily.com;2021)

The main conceptual idea: Designing a spatial flexible spaces by zoning and condenses functional systems and allows users to use the rest of the space as they want.

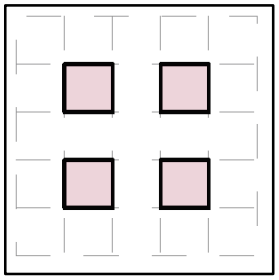


Figure 35 The conceptual idea “zoning"

source: (www.archdaily.com;2021)

Figure 38 Condence functional Spaces in borders

source: (www.archdaily.com;2021)

Figure 37 The emergence of a central free space

source: (www.archdaily.com;2021)

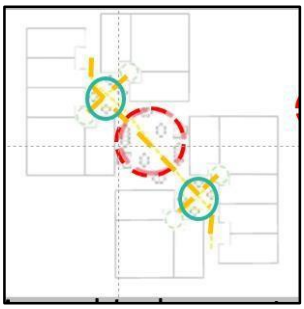
Figure 36 The use of the Free Exterior spaces)

source: (www.archdaily.com;2021)

The use of the free space in order to have a central learning street with several change activities

Figure 39 The central Meeting spaces with an underground flexible chairs used when needed

source: (www.archdaily.com;2021)



Semi-public space

Public space

Un hierarchical space transition from private to public

Figure 40 central living space hierarchy

Source: (www.archdaily.com;2021)

II.2.The 2nd example: Innovation Centre 2.0, GERMANY:

- **Flexibility by Operational Elements:**

The Innovation Centre 2.0 is a special place for software development and a special place for designed by SCOPE Architekten in 2016.

Choice criteria: the project is an innovation centre the working and training spaces are designed with a great spatial flexibility.

Figure 41 Innovation Centre 2.0,GERMANY

source: (www.archdaily.com;2021)

The main conceptual idea :

Designing a spatial flexible spaces by operational elements like Sliding walls

The use of the sliding walls to pass from public to private space depends the space activities

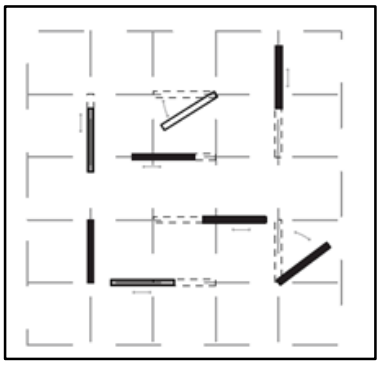


Figure 44The conceptual idea "operational elements source: (www.archdaily.com;2021)

Figure 43 Free plan with open spaces source:(www.archdaily.com;2021)

Figure 42 Closed space for more privacy source:(www.archdaily.com; 2021)

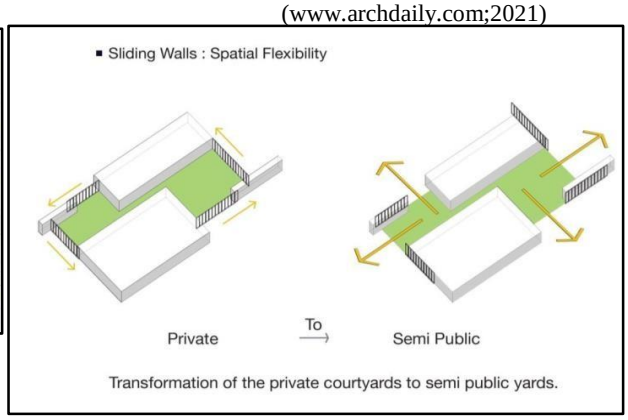


Figure 45 sliding wall diagram source:(www.archdaily.com;2021)

Figure 46 Flexible use of spaces due to movable walls source:(www.archdaily.com;2021)

II. 3 The 3d example: Flex: Flexible Learning Environments Los Angeles:

- **Flexibility by modular system:**

The project is a leaning environment in los angeles designed HMC Architects in 2010 for a participation in a design competition.

Choice criteria : the project is a learning and reaserch environments was designed with flexible approach in order to make future expansions possible .

Figure 47 Flex: Flexible Learning Environments Los Angeles
source:(www.archdaily.com;2021)

The main conceptual idea:

Designing a modular adjacent hexagonal spaces

which can be evolutive in the future

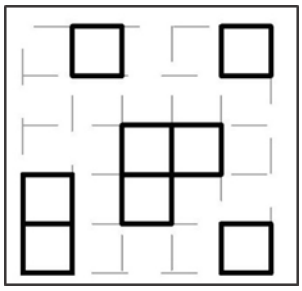


Figure 48 The conceptual idea “modular system "
source:(www.archdaily.com;2021)

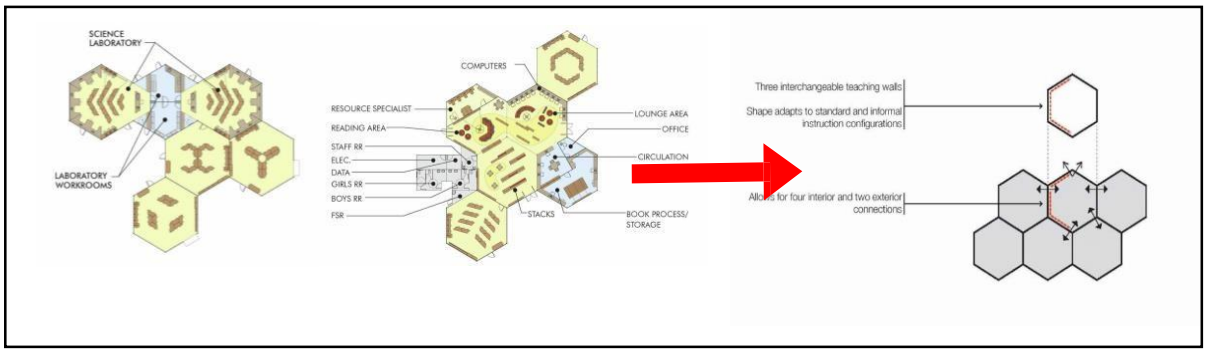


Figure 49 The use of the hexagonal form in the plan

source:(www.archdaily.com;2021)

The use of modular system such as hexagonal or square to give the project a possibility to the future expensions or the temporary expensions.

Figure 50 Flexible interior and exterior spaces are obtained
source:(www.archdaily.com;2021)

II. 4 The 4th example: The Shed, NEW YORK, USA:

- **Flexibility by flexible framework :**

The Shed is an 18,500-m² arts centre dedicated to commissioning, producing, and presenting original works of art, across all disciplines

- Choice criteria: The project has an innovative conception idea Based on spatial flexibility designed to solve the lack of space on Project area.

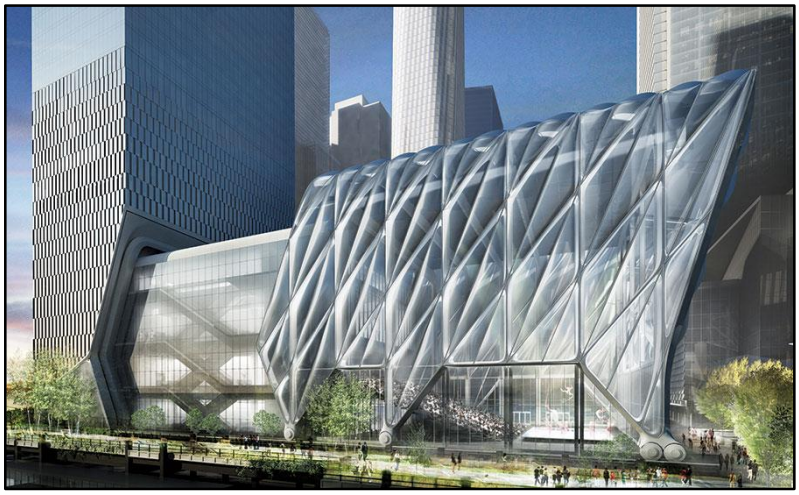


Figure 51 The Shed, NEW YORK, USA
source:(www.archdaily.com;2021)

The main conceptual idea:

The project comprises a fixed structure with a stack of column- free galleries encased within a telescoping outer shell that slides onto an adjoining plaza.

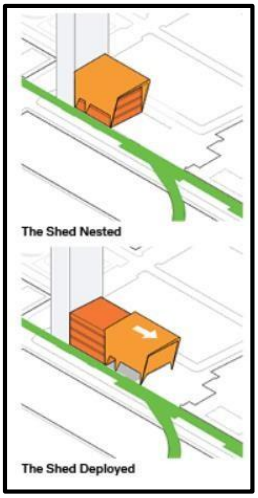


Figure 53 "flexible structural framework diagram

source :(www.archdaily.com;2021)

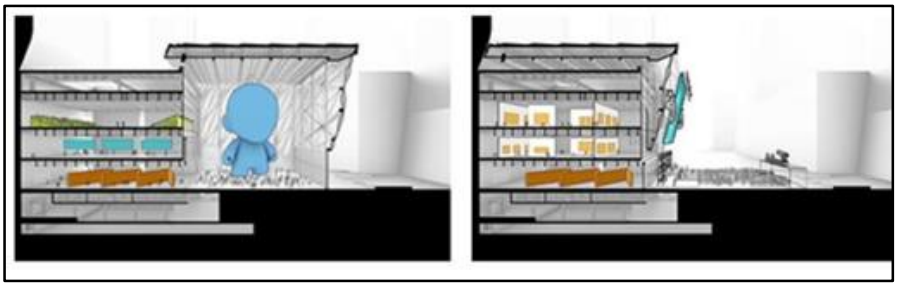
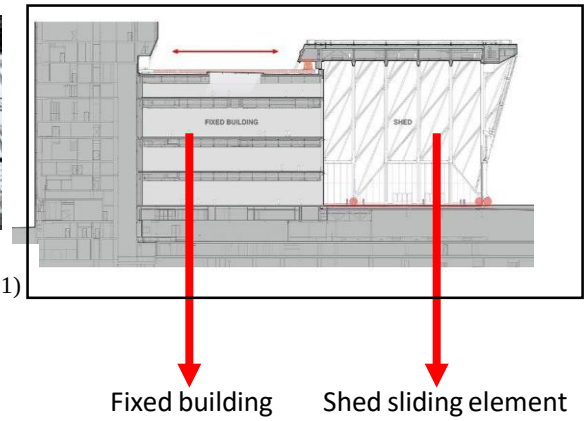


Figure 52 The conceptual idea "flexible structural framework "
source :(www.archdaily.com;2021)

Figure 54 The sliding shell structure "source:(www.archdaily.com;2021)

Figure 55 The interior space "source:(www.archdaily.com;2021)



II. 5 The 5th example: Rolex Learning Centre, Switzerland

- **Flexibility using Free plan and ramps:**

A learning centre located at the EPFL de Lausanne campus which includes diverse programs such as a library, multipurpose hall, café, restaurant, labs , etc.

Choice criteria: the project has an innovative conception idea Based on spatial flexibility and urban integration.

Figure 56 Rolex Learning Centre, Switzerland "source:(www.archdaily.com;2021)

The main conceptual idea :

The project is about a single space building with a concrete waves forms creating a large amount of openness under the building, inviting people to walk under.

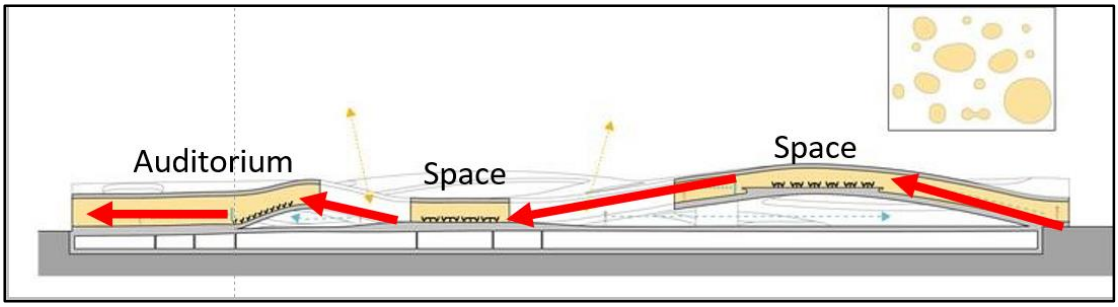


Figure 57 Interior circulation accessibility from space to an other is directly provided by the ramp"
"source: (researcher;2021)

The use of the free plan and ramps make a fluide mouvment offers flexibility to use the building in many different ways**.**

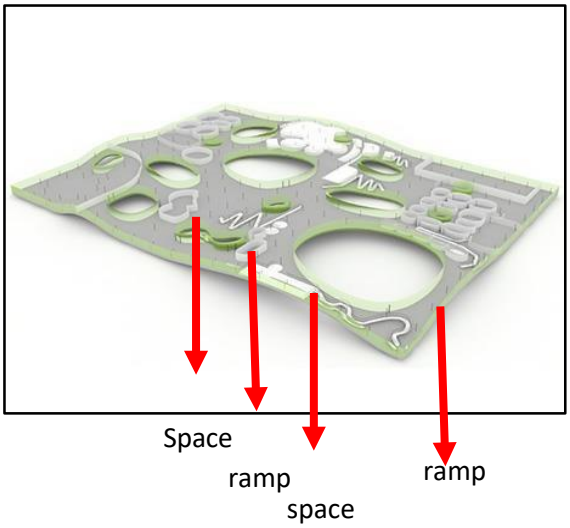


Figure 58 interior space configuration
"source: (researcher;2021)

Figure 60 flexible Interior Auditorium
"source: (www.archdaily.com;2021)

Figure 59 Flexible exterior of project
source: (www.archdaily.com;2021)

III Analysis of the Ground :

III.1 Choice criteria:

The site was chosen due to its presence in an urban fabric that is characterized by the presence of research centres and universities with a good connectivity to its environment.

III.2 The location of the ground:

The project ground is located in the east of the city ,exactly in ElHouda street ; where the distance between it and the state headquarters is 1.5 km , near to the bridge n° 2(Oued Sidi Zerzour)

Figure 62 site location
source : (Researcher ; 2021)

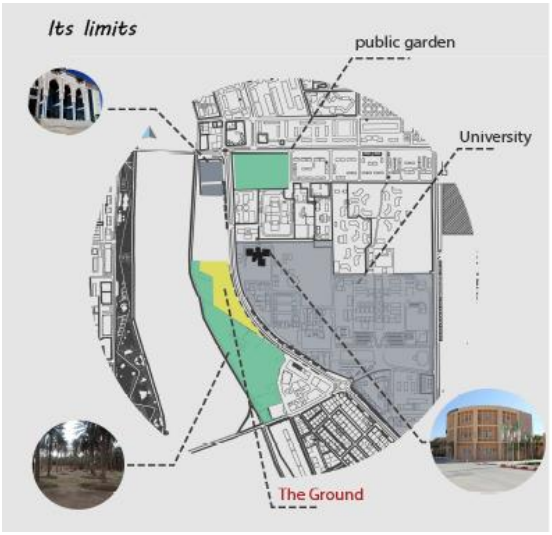


Figure 61 Site surrounding
source: (Researcher; 2021)

The project ground is located on an strategic urban area surrounded by multiple educational and research institutions in the presence of the Palm Forest and the valley.

III.3 Accessibility and Transportation:

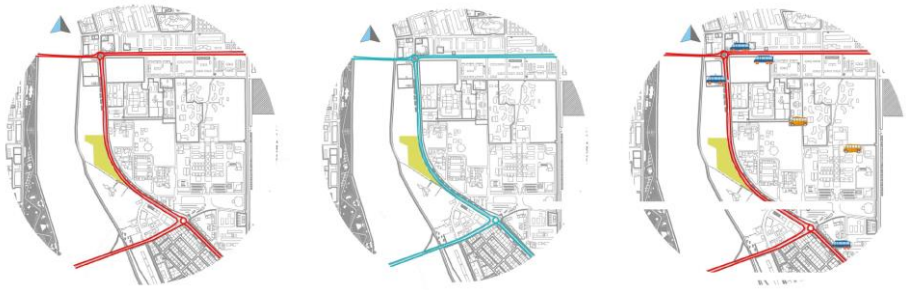


Figure 63 Site Accessibility and transportation
source: (Researcher; 2021)

The placement of the project is in a main road accessible from a directly mechanical and pedestrian

paths with a high mechanical flow in the presence of multiple public transportation .

III.4 Topography and Morphology:

Figure 64 Site Topography and Morphology
source: (Researcher; 2021)

The ground is irregularly shaped almost flat estimated at 28,000 m2 its level is low compared to the road with a long front elevation which provide clearance and visibility.

III.4 Existing networks:

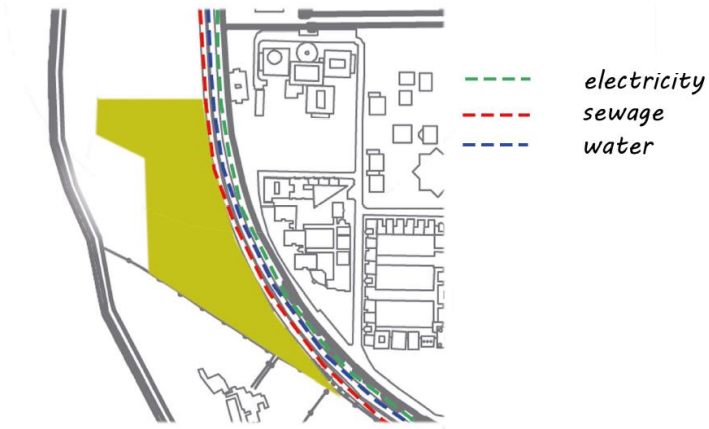


Figure 65 Existing networks on the site context
source: (Researcher; 2021)

The presence of water, sewage and electricity networks, which facilitates linking the project to this networks.

III.4 Climate study:

The ground is exposed to the sun in most of the time with a lack of shades,so solarization must be considered, especially in the sumzmer.

also it is exposed to winds from the north side and that must be considered too. the site has a poor average of precipitation .

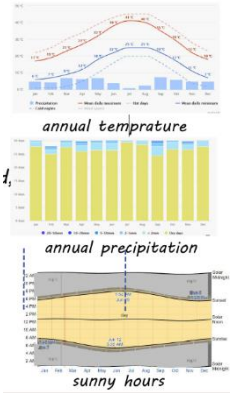


Figure 66 Climate study
source: (www.worldclim.org; 2021)

III.4 strengths and weaknesses:

-**Strengths** with recommendations:

- Proximity to scientific equipment's that have a relation with the project functions.
- Presence of public transportation that can facilitate the accessibility to the project.
- The presence of a plant zone (palm grove), on the ouest side of the land that can be used as an experimentation land of the project.
- The location on a direct road with a long front urban elevation.
- The proximity to the valley that can offer underground water to feed the site with water

- **Weaknesses** with recommendations:

- the high temprature must be traited using protection methods such as vegetation, best orientation and shading elements.
- Sonore nuisance caused by Heavy mechanical traffic can be decreased by using of the Vegetation
- The lack of security on the area .
- The heavy mechanical traffic which disturbs the pedestrian accessibility to the site

can be traited by making a footbridge

IV Program of Spaces:

The proposed program is developed through the analysis of the examples in addition to the international technical requirements. Moreover, from the study of the capacity of the project it resulted that our project can accommodate 50 researcher; 100 student and 20 companies.

After the analysis of the kinds of agriculture in biskra and the identification of the missing agricultural research specialities in institutions we decided to make 4 research units are the following:

Horticulture, Date palm development, plant integrated protection, Nano science

Component	Activity	Space		Area (m²)	Number	Total area (m²)
Training	**Training for 100 Person**	Reception Hall		100	01	960
		Conference classes		80	04	
		Teaching classes		40	05	
		Application laboratory		80	02	
		instrument deposit		40	01	
		Product deposit		40	01	
		Locker room M/F		10	02	
		Computer room		80	01	
		Library	Lecture room	150	01	355
			Indexing space	15	01	
			Loan space	15	01	
			Print space	15	01	
			Workshop	15	01	
			Book deposit	40	01	
			Manager's office	15	01	

Component	Activity	Space	Area (m²)	Number	Total area (m²)
Training	**Training for 100 Person**	Multipurpose room	60	01	
		Sanitary	15	02	
	Administration	Director office	30	01	195
		Secretariat office	20	01	
		Accounting Office	15	01	
		Scolarity office	20	01	
		Meeting room	40	01	
		Meeting room for teachers	40	01	
		Sanitary	15	02	
Total					1510

Component	Activity	Space	Area (m²)	Number	Total area (m²)
Reaserch	**Researchers shared spaces**	Reception Hall	100	01	
		Break area	80	01	
		Meeting room	60	02	

Component	Activity	Space		Area (m²)	Number	Total area (m²)
Research	**Researchers shared spaces**	**Library**	Lecture room	150	01	725
			Indexing space	15	01	
			Loan space	15	01	
			Print space	15	01	
			Workshop	15	01	
			Book deposit	40	01	
			Manager's office	15	01	
	Date palm development	Laboratory		80	01	
		Instrument deposit		40	01	
		Product deposit		40	01	
		Preparation lab		50	01	
		Germination room		20	01	
		Computer room		80	01	
		Locker room M/F		10	02	
		Technical room		20	01	

Component	Activity	Space	Area (m^2)	Number	Total area (m^2)
Research	**Date palm development**	Responsible office	15	01	450
		Researchers offices	10	02	
		Sanitary	15	02	
		Archive	20	01	
	Horticulture	Laboratory	80	01	450
		Instrument deposit	40	01	
		Product deposit	40	01	
		Preparation lab	50	01	
		Germination room	20	01	
		Computer room	80	01	
		Locker room M/F	10	02	
		Technical room	20	01	
		Responsible office	15	01	
		Researcher’s offices	10	02	
		Sanitary	15	02	
		Archive	20	01	

Component	Activity	Space	Area (m^2)	Number	Total area (m^2)
Research	**Nano science**	Genetic/ molecular lab	100	01	495
		Imaging room	20	01	
		Instrument deposit	40	03	
		Product deposit	40	02	
		Preparation lab	50	01	
		Computer room	80	01	
		Locker room M/F	10	02	
		Technical room	20	01	
		Responsible office	15	01	
		researcher's offices	10	02	
		Archive	20	01	
		Sanitary	15	02	
	Plant integrated protection	Laboratory	80	01	
		Instrument deposit	40	01	
		Product deposit	40	01	

Component	Activity	Space	Area (m²)	Number	Total area (m²)
Research	**Plant integrated protection**	Preparation lab	50	01	395
		Computer room	80	01	
		Locker room M/F	10	02	
		Technical room	20	01	
		Responsible office	15	01	
		researcher's offices	10	02	
		Sanitary	15	02	
		Archive	20	01	
	Administration	Director office	30	01	175
		Secretariat office	20	01	
		Archive	20	01	
		Accounting Office	15	01	
		Meeting room	40	01	
		Sanitary	15	02	
Total					2690

Component	Activity	Space	Area (m²)	Number	Total area (m²)
Incubator	**Incubation**	Reception hall	80	01	870
		Private working spaces	10	10	
		Co-working spaces	80	02	
		Start-up office	15	03	
		Fablab	60	01	
		Training classes	30	04	
		Projection room	70	01	
		Meeting room	40	02	
		Open Library	80	01	
		Financial expert office	15	01	
		Marketing expert office	15	01	
		Legal expert office	15	01	
		Cafe space	30	01	
		Sanitary	15	02	

Component	Activity	Space	Area (m²)	Number	Total area (m²)
Incubator	**Administration**	Director office	30	01	175
		Secretariat office	20	01	
		Accounting Office	15	01	
		Meeting room	40	01	
		Archive	20	01	
		Sanitary	15	02	
Total					1250

Component	Activity	Space	Area (m²)	Number	Total area (m²)
Administration	**Reception**	Director office	30	01	205
		Secretariat office	20	01	
		Accounting Office	15	01	
		Meeting room	40	01	

Component	Activity	Space	Area (m²)	Number	Total area (m²)
Administration	**Reception**	Cleaning room	15	01	
		Archive	20	01	
		Sanitary	15	02	
		Bursar office	15	01	
		Restaurant and cafeteria	100	01	
		Hall of Exposition	150	01	
		Auditorium	400	01	
		Sanitary	15	02	
Total					810
Total project area without circulation					6260
Circulation 15%					939
Total project area					7199

Exterior spaces :

Exterior spaces			
Green houses			
Experimentation lands			
Animation exterior space			
Parkings	Visitors : 30 places	Workers : 10 places	Logistics : 02 places

Conclusion

According to the analytical approach made on the different models used for program development, we can say that this approach is a highlight of the project from which we can draw points that can guide our approach and help to develop the project in accordance with the standards.

The structure of those types of Agropoles bring together companies, training and research centres in the same territory. The vocation of which is the creation of synergies thanks to proximity effects and facilate the transfer and exchange of information this constitute a solution for the huge gap existing between the actors in those entities .

From the analysis of the models with their programming, we came out with a program where we assign to each component the spaces that constitute it by developing in the form of a pole the following components: Training, research, incubation, It remains for us to project them graphically, giving each space its importance by applying the spatial flexibility.

By the confrontation between the agricultural assets of the city of Biskra and the site's requirements for a training and incubation hub. We can include that the chosen site represents a strategic base for our project that we will develop the design process of it in the following chapter.

Chapter III:

The Project Presentation: Crossing Elements and Design Graphics

Introduction:

After we discussed and explained, everything related to the spatial flexibility and after the analytical study of the training and incubation hub 'Agropole' and mentioned all the related definitions and characteristics, technical and functional requirements. Ending with the extraction of the spatial program of the project, so we have gathered the majority of what is needed to start the design stage.

In this chapter, we will explain the design stages of the project and how to integrate all that was derived from the previous theoretical study and analysis of the examples and site ground, to design a training and incubation hub, which achieve all its objectives. In addition, showing how to translate the design idea at the level of its near context and internal level and showing the most important elements of the spatial flexibility that are applied in the project.

Finaly, a graphic display for the entire plans with the interior and exterior views of the project and some details of the complex architectural elements used in the project

I. Objectives and intentions:

- **The creation of a training and incubation hub '' agropole "with attractive characteristics:**

By using a spatial flexibility design approach in the project

By creating an adaptable project for changes and future needs of the users

By creating a sustainable open project in order to give the area more accessibility and public interaction in the near context

- **Take advantages of the site potentials:**

  By using a flexible linear form in order to break the monotony and have an attractive urban elevation.

  The use of the deteriorated palm grove area for green lands use.

  By creating a synergy with the other institutions in the site context.

  By using a flexible exterior spaces that fit with climate changes.

- **Design an adaptable and multi-functional interior spaces:**

  By using an indeterminate spaces using free plan.

By using sustainable and flexible materials.

By using of operational elements.

II. Crossing elements:

II.1 The project and its context:

II.1.1 Urban integration:

An anarchic urban context that does not follow any sustainable or ecological approach. The absence of the security on site area , our project will be established as a response to the challenges of the site, opening the unsecure site to its context, presenting the new image of the place, work in synergy with the similar institutions (university, CRSTRA) that are present in the nearby. The project will serve in the reinforcement of the agricultural development of the city.

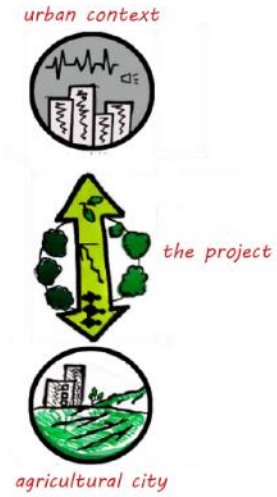


Figure 67 project relation with the city
source: (Researcher, 2021)

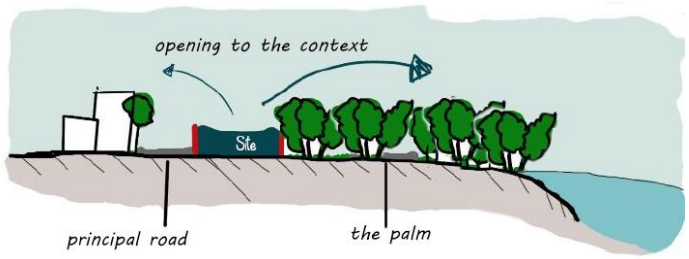
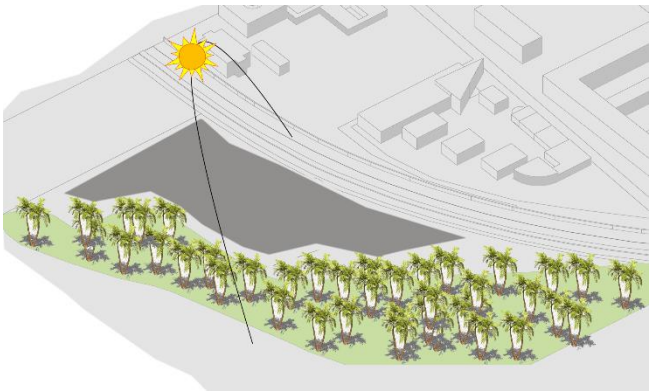


Figure 68 site interaction with its context
source: (Researcher, 2021)

II.1.2 Solarisation:



The site is completely exposed to the sun, which requires protection that can be established by using the vegetation and parasols

Figure 69 site interaction with its context
source: (Researcher, 2021)

II.1.3 Accessibility:

The site accessibility from its context is difficult due to the high mechanical flow on the principal road, for these reason we propose to make a footbridge which relate the site with the context providing an easy secure accessibility for university students and citizens .

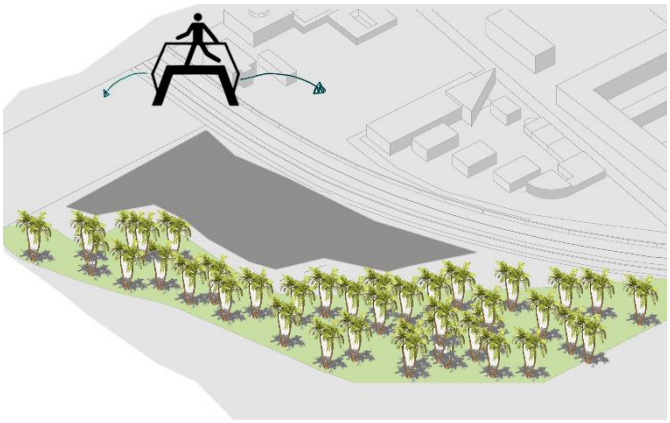


Figure 70 footbridge proposition
source: (Researcher, 2021)

II. 1.4 Entrances:

The site ground have a long linear shape with the presence of only one principal façade which is opened into a principal mechanical road, so the principle entrances will be positioned in the main road with taking the consideration of the kinds of users and the distribution of the main components of the project.

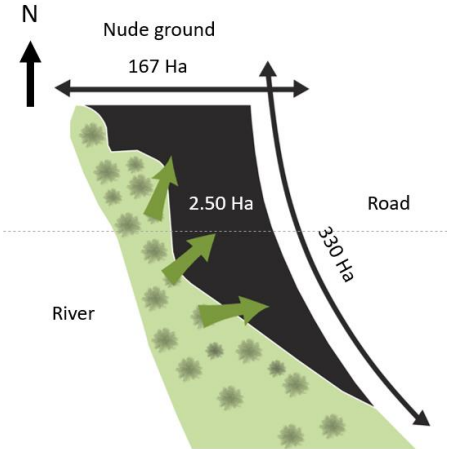


Figure 71 Site shape and dimensions
source: (Researcher, 2021)

As we have a long façade and our project need to be more flexible: using a central axe which traverse the site ground in order to determine the central public shared space of the components of the project. These axes define also the main public entrance on the site project.

Leaving free areas in the extremity of the ground in order to use it for the green lands and greenhouses.

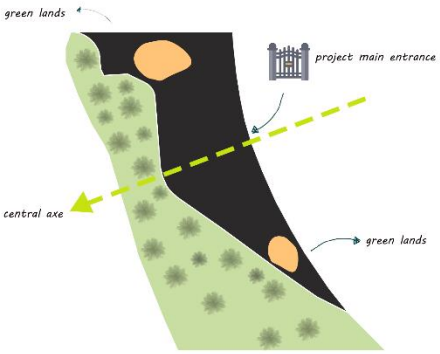


Figure 72 Site entrance
source: (Researcher, 2021)

II.1.5 Master plan organization:

The project have 3 main function :

- Training
- Incubation
- Research

The three function are working together so there is a synergy between all functions in order to have a whole project.

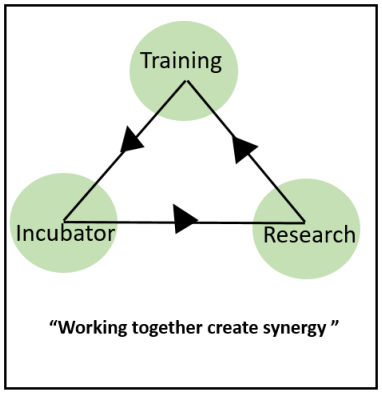


Figure 74 main components of the project
source: (Researcher, 2021)

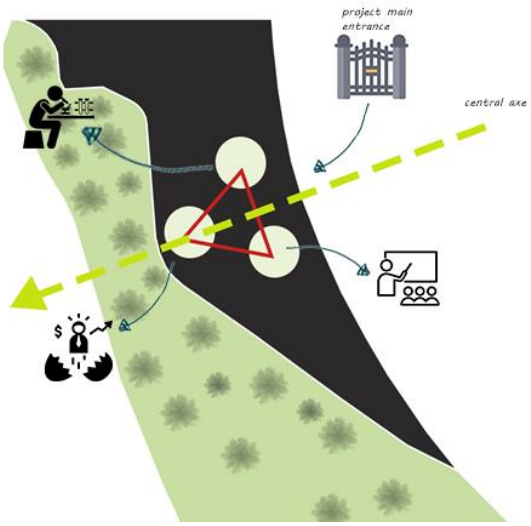


Figure 73 main components of the project zooning
source: (Researcher, 2021)

III. Design idea:

In order to begin the conceptual idea and relate the project to the theme we realized a frame on the master plan using visual axis to the palm grove and functional relation axes to the university and the CRSTRA this axes starts from the centre of the site.

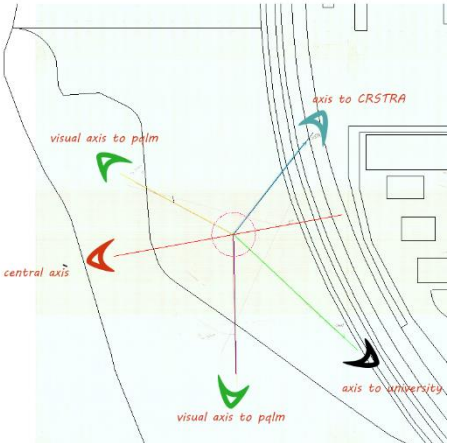


Figure 75 using visual and functional axes
source: (Researcher, 2021)

Using parallels and relate between the axes to clear the views from and into the project. It opens the project to its context by the emergence of a central flexible open plaza in the project, which is related to the palmers and the front facade, and it will play the role of the coordination and the animation between the main buildings on the site project.

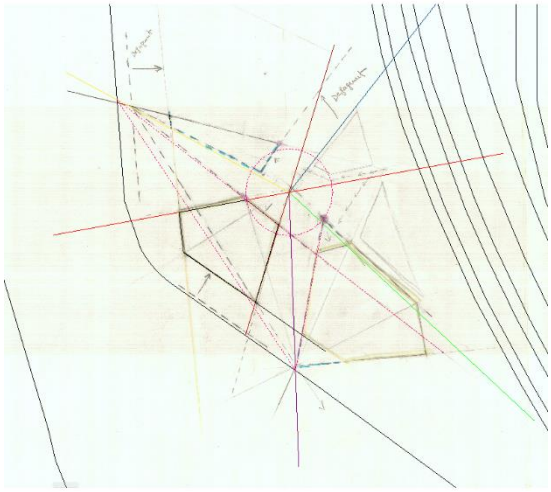


Figure 76 Clear the views and open a flexible central space
source: (Researcher, 2021)

The emergence of the buildings shapes based on the orientation of the views to the palms with consideration of the climatic conditions.

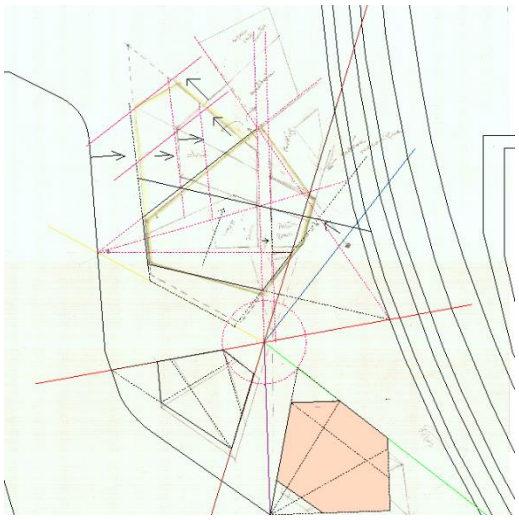


Figure 77 Clear the views and open a flexible central space
source: (Researcher, 2021)

The volumetry process:

When the architectural spaces' context needs flexibility, the structure, as well as the architectural form, should be both designed because the most important challenge in investigating flexibility in architectural context is structure. Thus, to materialize this flexibility we choose to use the art of Origami by using flexible frameworks, which give the opportunity to have more free open spaces and heights.

After defining the shapes of the project buildings we started the conception of each volumetry by folding the facades regarding to the views into the palms and the site core and the internal distribution of the spaces.

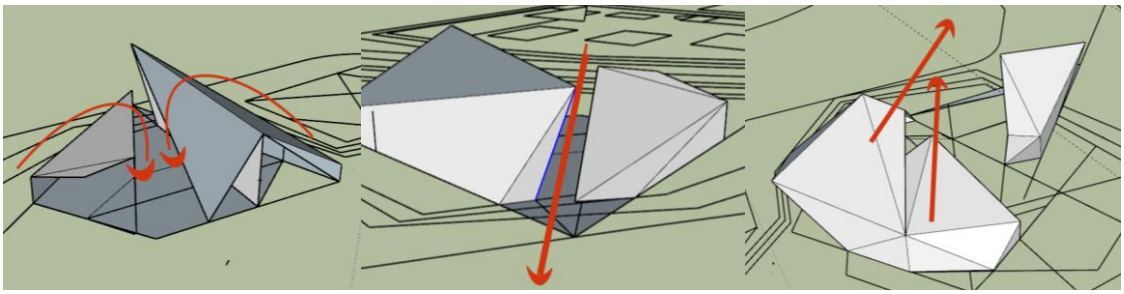


Figure 78 the volumetry folding parts and orientations
source: (Researcher, 2021)

The orientation and the explosion of the volumes in order to have open spaces, patios, and clear exterior/ interior visiblity on the buildings and on the site with its surrounding.

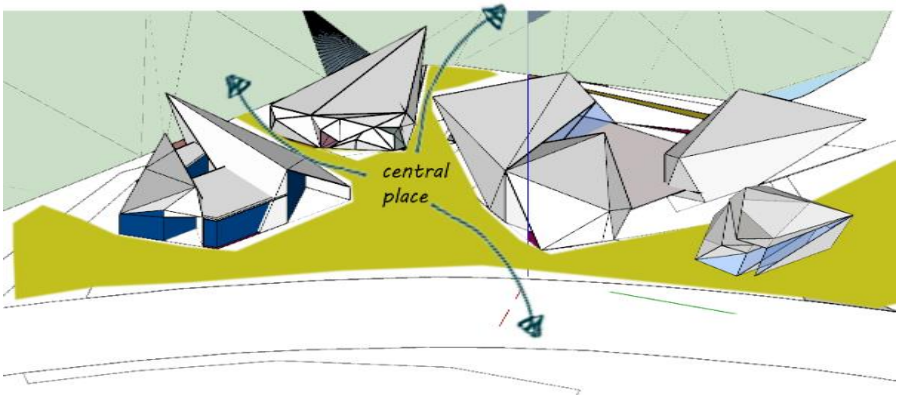


Figure 79 the volumetry of the project
source: (Researcher, 2021)

IV The applications of the theme in the project:

IV.1 the use of flexible framework:

The auditorium volume is designed in order to have an extensible multifunctional exterior/ interior space, which can be used if needed of a cover space such on raining days or hot summer to avoid the sun it can be used for multiple such as:

Exhibitions, exterior workshops, animation spaces in events and visits.

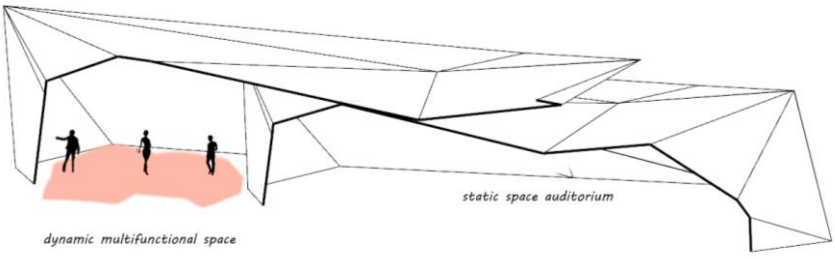


Figure 80 the volumetry of the project
source: (Researcher, 2021)

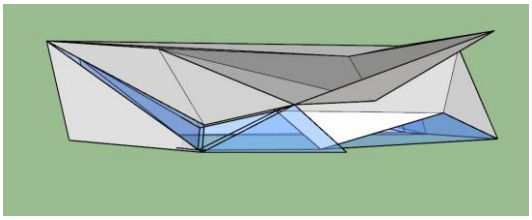


Figure 82 closed volume
source: (Researcher, 2021)

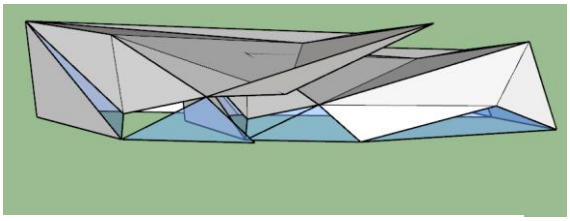


Figure 81 opened volume
source: (Researcher, 2021)

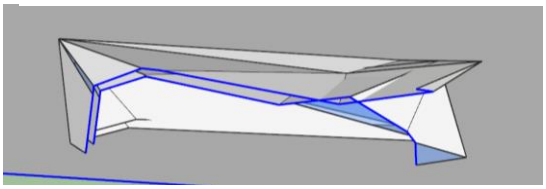


Figure 83 closed volume section
source: (Researcher, 2021)

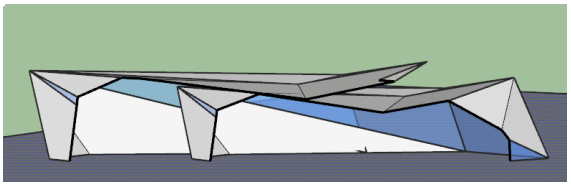


Figure 84 opened volume section
source: (Researcher, 2021)

IV.2 the use of Free plan:

Using the art of origami in the volumetry design realized by the use of a sustainable flexible structure, which is the metallic structure, it gives the possibility to have a huge interiors and free plan as it is recommended for our project.

IV.3 the use of operational elements:

Due to the use of free plan interior space can be designed in multiple menner, operational elements or movable partitionshave give a heightly flexible interiors which can accommodate with user needs, it can be installed and removed or changed when the user or the use change so It provide adaptability to multiple modifications due to the user need

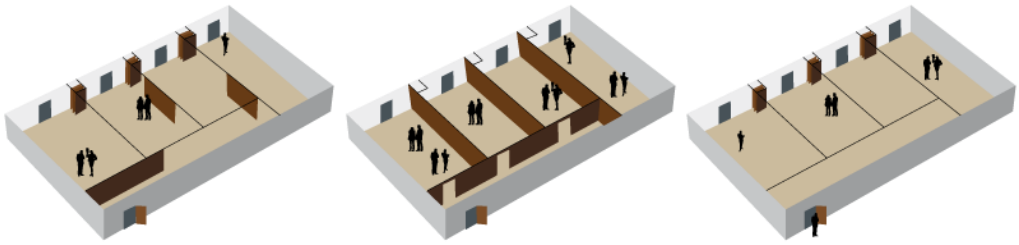


Figure 85 free space with operational partitons
source: (Researcher, 2021)

IV.4 the use of arrangement of spaces:

The most important space in the incubator building in is the coworking space which a shared space with a large dimensions and a flexible atmosphere, thus we designed the incubator building

using the concept of arrangement of spaces by zooning the offices and private working spaces in the extremity of the building leaving the centre like a living room for multi uses and coworking space.

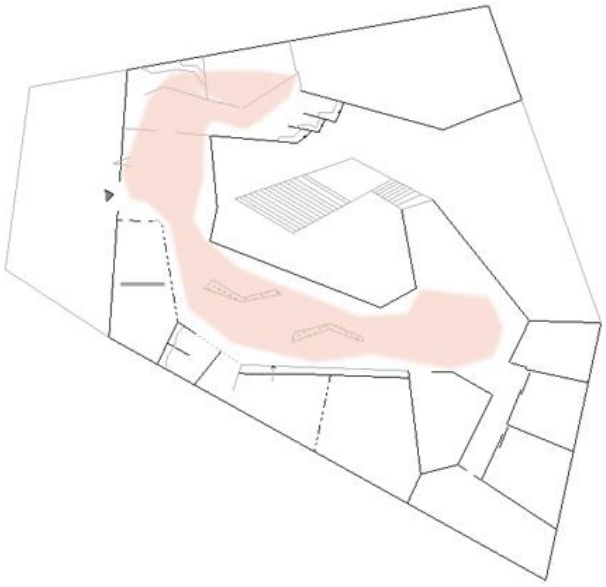


Figure 86 shared free central space in the incubator plan
source: (Researcher, 2021)

IV.5 The use of modular dynamic exterior roofs:

The central place of the project site will be used as the public exterior convivial and flexible space such as an open coffe space, animation, agriculture…, it has the role of the articulation between the existing buildings on the site. Giving the spirit of the oasis with the palm grove that surround the site ground through the organic forms of the exterior flexible dynamic parasols, which are designed with a domotic system. It helps the project with the shading the external spaces when needed, provide power supply to the project

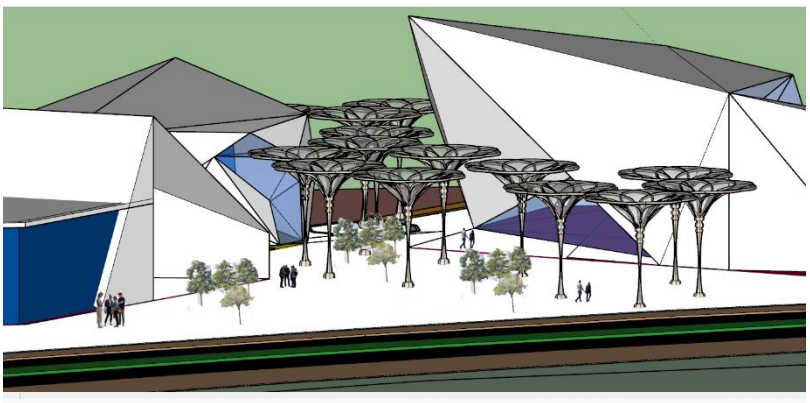


Figure 87 dynamic exterior roofs
source: (Researcher, 2021)

V Graphic presentation of the project:

The project is located in el Alia; Biskra, near the University of Biskra and the research centre CRSTRA.

The project is about four main buildings “Training centre, Research centre, business incubator and an Auditorium. The exterior spaces are mainly designated to the green lands and houses, animation and exhibition.

V.1 Situation plan:

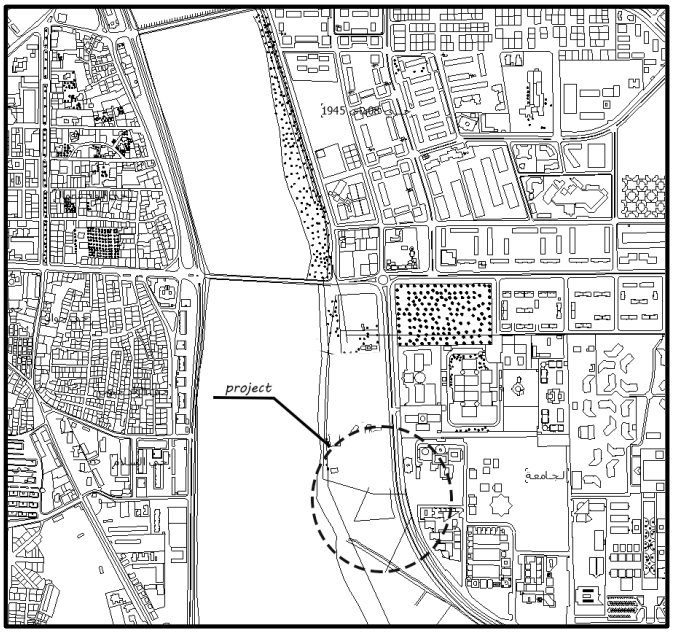


Figure 88 site plan
source: (Researcher, 2021)

The site is present in an urban fabric with a good connectivity to its environment. It is located on an strategic urban area surrounded by multiple educational and research institutions in the presence of the Palm Forest witch the use of it will provide a good service to the near and far environment .

In addition, the fact that the urban context does not follow any sustainable or ecological approach with the absence of the security on site area.

Makes our project an important addition to be established as a response to the challenges of the site, opening the unsecure site to its context, presenting the new image of the place, work in synergy with the similar institutions (university, CRSTRA) that are present in the nearby. The project will serve in the reinforcement of the agricultural development of the city.

The site is completely exposed to the sun, which requires protection that can be established by using the vegetation and parasols, this is an opportunity to reinforce the presence of green spaces and ecological solutions in the area.

V.2 Master plan:

Figure 89 Master plan
source: (Researcher, 2021)

V.3 Assembly plan:

Figure 90 Assembly plan
source: (Researcher, 2021)

Each component has two to three access, one for the public and others are technical, serves for the personal or specific spaces like the library in the training centre.

The interior are well connected to the exterior of the project by the presence of the animated centre that helps a better distribution and connectivity between all the functions. It is the core of the exchange and sharing. Also on the levels of the views, all the components have good perspectives to the main centre and the lively activities of it.

V.4 Plans:

V.4.1 Training centre plans:

Figure 92 Ground floor plan
source: (Researcher, 2021)

Figure 91 first floor plan
source: (Researcher, 2021)

V.4.2 business incubator plans:

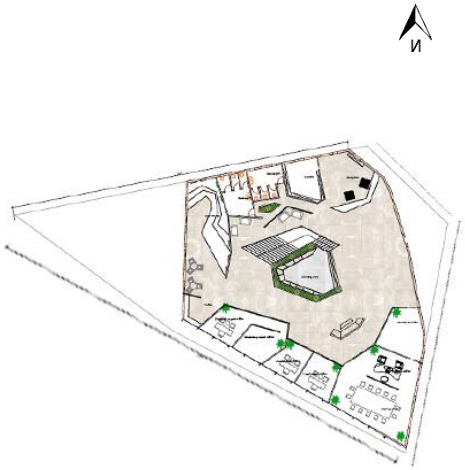


Figure 93 Ground floor plan
source: (Researcher, 2021)

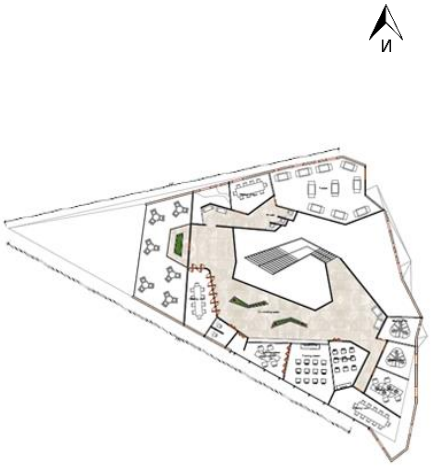


Figure 94 first floor plan
source: (Researcher, 2021)

V.4.2 research centre plans:

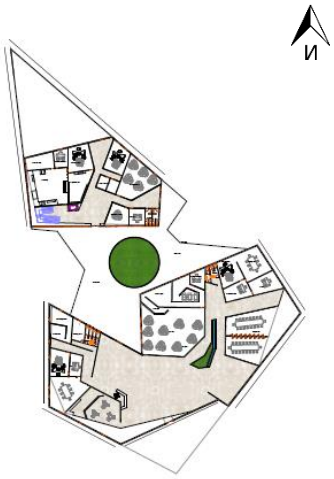


Figure 97 Ground floor plan
source: (Researcher, 2021)

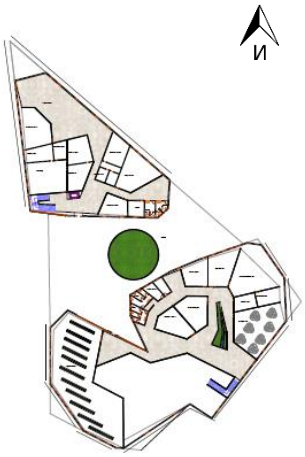


Figure 96 first floor plan
source: (Researcher, 2021)

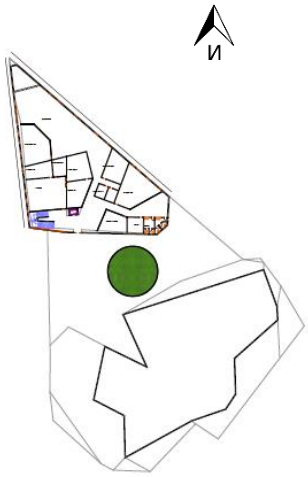


Figure 95 Second floor plan
source: (Researcher, 2021)

V.5 Elevations:

Figure 99 West elevation
source: (Researcher, 2021)

Figure 98 North elevation
source: (Researcher, 2021)

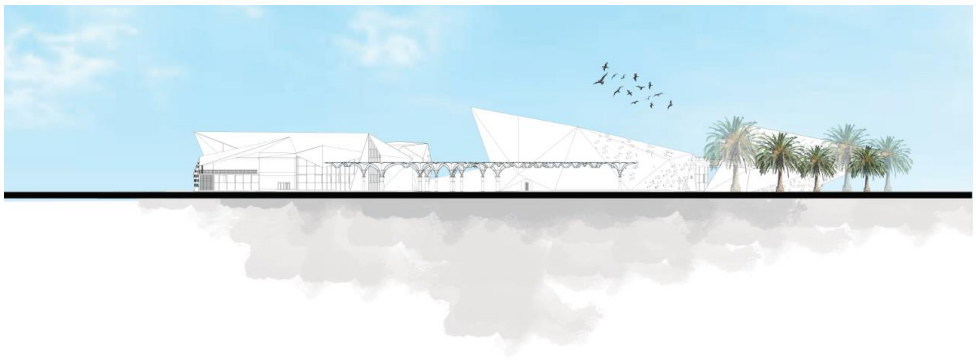


Figure 101 Est elevation
source: (Researcher, 2021)

Figure 100 South elevation
source: (Researcher, 2021)

V.6 Views:

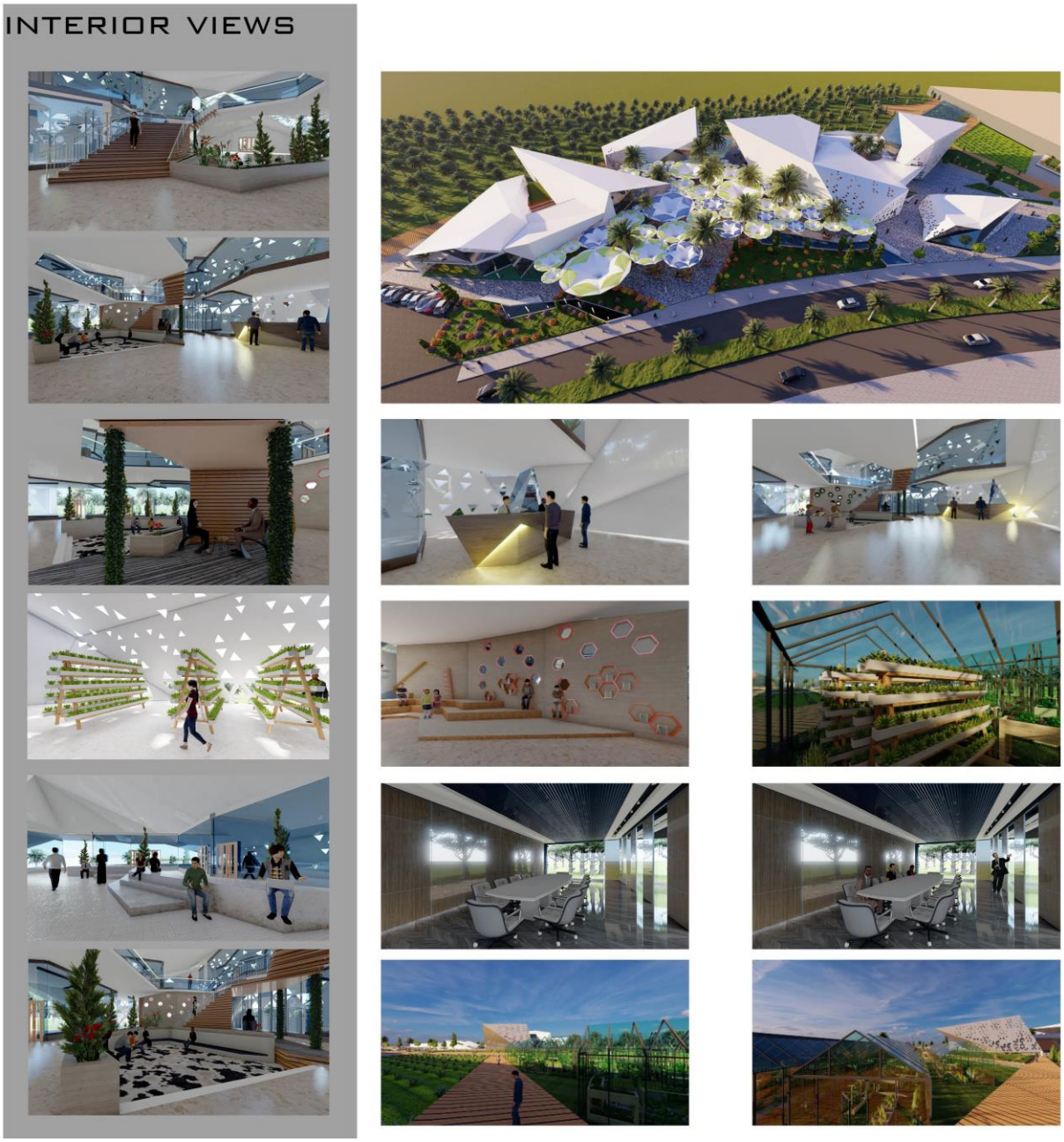


Figure 102 Interior views
source: (Researcher, 2021)

Figure 103 Exterior views
source: (Researcher, 2021)

Conclusion:

In this chapter, we discussed the most important stages of the design of our Training and Incubation hub starting with the objectives and crossing elements. Then we mentioned the applications of the theme in the project finishing with the graphic presentation of the project.

General conclusion

Our research is about a training and incubation hub known too as Agropole, our project is a network of several institutions, which have the same field of science or industry, it coordinate between them thanks to the synergy created due to their presence in the same location

Our work consists preparing a dissertation of Master's degree graduation under the speciality of urban project. It begins with an introductive chapter where we identify the problematic related to our project by treating the theme of spatial flexibility in this kind of projects

In order to collect the most important requirements and informations about the training and incubation hub, knowing its different aspects, history, main services and the technical requirements of each components of the project. Moreover, highlighting the Importance of the spatial flexibility in architectural projects such as training and incubation centres in the dynamic training classes, convivial and open co working spaces, taking into consideration of the interior and exterior relation between spaces that give the project more accessibility and lively atmosphere. The identification of the strategies, which can help in the design of flexible projects, in order to collect the data that can be useful in our design project.

After the collection of the theoretical framework of the project and the theme, we analysed several international projects by extracting the ways that architects design similar projects and theme, the study of all the levels of the conception of the project. Adding to that the analysis of the site ground and the identification of the strengthens and weakness points on it to have a background ideas that helps to guide our intervention.

Finally, gathering all the needed informations and strategies it comes the design process where we applied several method and solutions in order to achieve a flexible training and incubation Hub specialized in agricultural research and facilities. This kind of project needs to receive more attention in our country because they can be a support of an important development in the field of agriculture and other sectors.

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Abstract

Biskra has rich potential in agriculture and presents undeniable development opportunities allowing an agricultural eco-economy that respects the environment. In this regard, a Agropole: agricultural research and training hub in this city ensures the success of this eco-economic revolution, because it is based on the concept of cross-fertilization, that is a fruitful combination of different elements: teaching and scientific research, business projects and financial resources; also on the concept of knowledge transfer and creation of synergies. This would constitute an opportunity for networking peasants, researchers, producers, exporters and young farmers with start-up projects.

Regarding the architectural design of this Agropole, it is based on the use of the spatial flexibility approach that offers many spaces and services that allow a better functionality of those type of projects, while adapting to the environment by using local and sustainable solutions.

Therefore, it is a contemporary project in the service of the development of agriculture in the city of Biskra the capital of an oasis region.

Keywords: Spatial flexibility, Training, Research, Incubation, Agriculture

الملخص

ولاية بسكرة تملك إمكانات غنية في مجال الزراعة ولديها فرص للتنمية التي لا يمكن إنكارها والتي تسمح لها بتطوير اقتصاد زراعي صديق للبيئة. في هذا الصدد، يضمن القطب الزراعي: مركز البحث والتدريب الزراعي في هذه المدينة نجاح هذه الثورة الاقتصادية البيئية، هذا القطب يرتكز على مفهوم الاندماج المتقاطع أي اجتماع القوى، وهو مزيج مثمر من عناصر مختلفة: التكوين والبحث العلمي والمشاريع التجارية مع الدعم المالي؛ أيضا على مفهوم نقل المعرفة، تكثيف الطاقات وخلق التآزر. سيشكل هذا فرصة للتواصل بين الفلاحين والباحثين والمنتجين والمصدرين والمزارعين الشباب حاملوا افكار المشاريع والمؤسسات الناشئة.

فيما يتعلق بالتصميم المعماري لهذا القطب الزراعي، فإنه يعتمد على استخدام نهج المرونة المكانية الذي يوفر العديد من المساحات والخدمات التي تسمح بوظائف أفضل لهذا النوع من المشاريع، مع التكيف مع البيئة باستخدام الحلول المحلية والمستدامة لذلك فهو مشروع معاصر في خدمة تنمية الزراعة في مدينة بسكرة عاصمة منطقة الواحات.

الكلمات المفتاحية :المرونة المعمارية المكانية، البحث العلمي، حضانة المؤسسات الناشئة، الزراعة.