Mohamed Khider University – Biskra
Faculty of Science and Technology
Department of Architecture

MASTER MEMOIR

Domain: Science and Technology
Sector: Architecture and Urbanism
Specialty: URBAN PROJECT
Ref. : .....

Presented by:
DIF ABDENNACEUR

Tuesday, July 11, 2019

The theme:
The architectural envelope and the advanced technology

The project:
The national museum of technology -Hussein Day- Algiers

Board of Examiners:

Bouzaher Soumia	MC (A)	University of Biskra	Chairman
Medouki Mostefa	MA (A)	University of Biskra	Supervisor
Kachef Sarah	MA (A)	University of Biskra	Examiner

College year: 2018 - 2019

DEDICATION

Praise be to Allah for helping to complete this research.

To whom He has given me all that He has until I fulfill His hopes, to He who oversaw my teaching by the sacrifices of the mighty of my dear father, may God prolong his life.

I dedicate this work to the one that flooded me with all the love and tenderness, to which I had patience for everything and nurtured me the right of care and her pleas for success followed me step by step in my dear mother's work. God prolong her life.

To them I dedicate this humble work may perhaps bring something of happiness to my heart and to my brothers who were in all the details of my career and was a good help and support for me.

I also dedicate my best efforts to my teacher Mr. Mostefa Medouki, who guided me in this long way, and to all my loyal colleagues from near and far.

THANKS

Praise be to Allah for his kindness, his kindness and his gratitude.

After thanking God Almighty, I extend my thanks to the two generous parents who helped me and encouraged me to continue the march of science and research and success,

I would also like to express my thanks and appreciation to me, who has honored me by supervising my research notes, Mr. Mostefa Medouki, whose words are not enough to thank him for his great patience and scientific guidance which contributed greatly to the completion of this work and to all the professors of the Department of Architecture. And I especially mention Professor kachef Sarah and Dr. Bouzaher Soumia

I would also like to express my sincere thanks and appreciation to all of my friends who have helped me from near or far to complete and complete this work.

GENERAL INTRODUCTION

list of Contents

General introduction

I: Conceptual study of architectural envelope and advanced technology.

I-The theme Concepts:

II: Analytical study of the museum

III: Applied stages for the completion of the National Museum of Technology project

List of figures

List of figures

List of tables:

Introduction:

The Culture is an essential element in the life of society regardless of its size, potential and degree of development. This culture intervenes in defining the individual's personality traits and patterns of behavior because of the range of values, attitudes and opinions that reflect the current reality. To overcome it by development or change.

Culture is not just the accumulation of information or experience, nor is it just the taste of the arts or its practice. Culture is a way of thinking and a set of visions and patterns of behavior, social custom and heritage. It is the result of material and spiritual values, and a tools to produce, use and transfer these values, as they grow, develop and inherit from a generation to another generation. Culture includes all the heritage of the society and the relationship of this heritage time and place, starting from many of the foundations that constitute the constants of the community and its origins, and within the public cultures there are a different subcultures, which moving in the same circle with the cultural values and civilization.

The technology has become the most important component of the knowledge production in the modern era and the rate of acceleration in the employment of this new technology in the development effort is an opportunity and a threat to all the nations that want to join the developed nations, Where control of technology and its optimal exploitation remains an obsession that is difficult to ignore, The misuse of technology is counter-productive, increasing the depth of information gap between developed and late nations.

Our country is working hard to rectify the shortage recorded in this field and is reflected in the declared policies in modernizing the bodies and institutions and urging them to employ modern technology in their daily dealings with the end beneficiaries as individuals or groups, and we note it the obvious role in the functions of ministries, universities and Public institutions.

One of the most important cultural facilities that play an important role in culture is the museum, which has recently suffered from many problems, the first of which is abandonment, negligence and lack of importance as a cultural, economic, tourist and scientific institution, and does not underestimate the modernity and technological progress in the world.

A. Motivation of project choice:

The researchers gathered the reason why the low tourist culture in Algeria to the absence of museums that would be known as the physical heritage of our country and confirmed that the museums in Algeria are known as a total abandonment of visitors due to the absence of culture of the museum to the Algerians to assume the state in general and the Ministry of Culture in particular the task of educating the Algerian individual In this field, given the utmost importance of the museum for Algerian culture.

And the construction and design of museums depends most on scientific and technological progress and also depends on the interdisciplinary and professions associated with the design and architecture of museums and that Algeria has known a great delay in the art of museums and that the existing

museums do not comply with international standards, whether in terms of building or method of management and how to use it, which push the government to alarm and work in the near future to pay great attention to that field especially since it has a large relationship with the Tourism and directly linked to the physical and material heritage of Algeria.

(Director of N.A.C.A.M.P.C)

As the Minister of Culture pointed out during the international forum, "Museum Design and Museum Management Experience", the problem of visitors and the existence of museums is empty and the absence of a culture of museums in our country. This is what the minister sees as a big problem in how to convince citizens to go to museums and educate them in this important cultural field.
Therefore, we find that the culture sector in Algeria needs to develop and modernize its facilities and keep abreast of the global technological progress. Hence, we proposed the final project of the study of the Master 2 is one of the most important cultural , scientific and tourism facilities, which will be a national museum which is programmed by the state in the medium term North of the municipality of Hussein Dai adjacent to the sablette park in Algiers, which will be an architectural breakthrough in such projects which will be a very important poles of tourism and scientific and cultural, nationally and internationally through its external engineering, which is dynamic envelope, and the exhibition of everything related to advanced technology.

B. Concepts

Where the theme will focus on two basic concepts
The topic will focus on two basic concepts of architectural envelope and its importance on buildings, users and advanced technology and their relationship to the architectural envelope and modern methods of presentation
In the project, we will look at a new type of architectural envelope, the dynamic envelope and its function between the interior and exterior of the building and we touched on the method of presentation, which will be through the latest innovations of advanced technology from the use of three-dimensional simulation systems VR and HOLOGRAMME.

C. Methodologies:

Through the reasons for choosing the project and finding effective solutions to the problems experienced by the cultural facilities in Algeria, especially the museums and reaching the desired goals, we have adopted the following methodology:

1- 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.
2- After the literary research we have extracted the most important technical standards and requirements which will be the reference in the analytical study.
3- analytical study

We analyzed examples of a museum project and other examples for the purpose of the subject according to methodology of I.N.E.S.

Ground Analysis (From the nature of the region to its climate, its urban and architectural character).

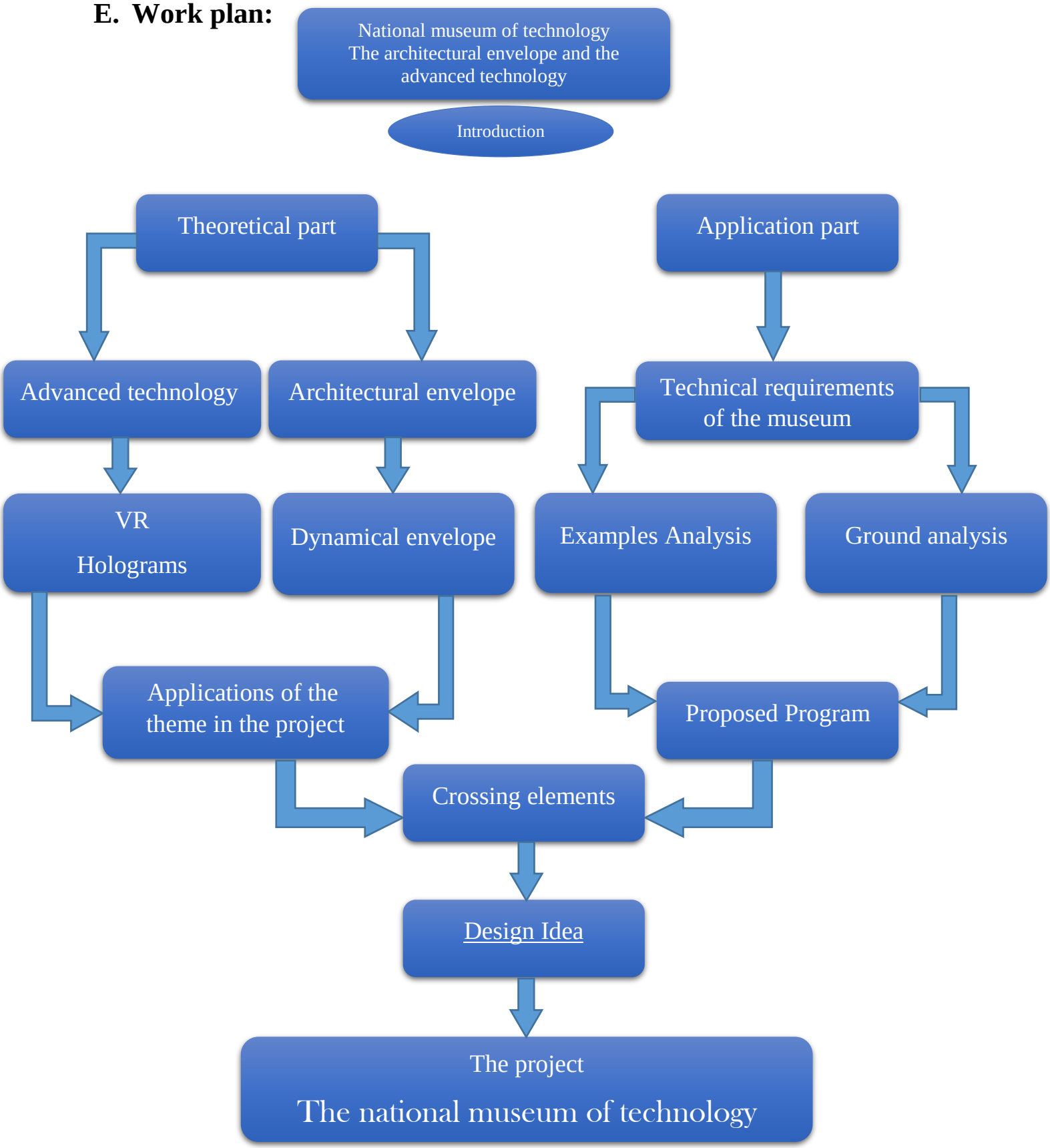
4- We updated the official program of the museum based on the program of the Ministry of Culture and through the conclusions of the analysis of examples and technical requirements.
5- Through previous studies we have developed the crossing elements through which we will include the application of the subject in the project in order to achieve the objectives of the project

D. Memory structure:

And through previously derived information, the memorandum was organized and structured according to the Harvard methodology, which is based on an introduction and three basic chapters ز

1. The beginning is the introduction to clarify and explain the reason for selecting the project with a set of methodology to be used by the study.
2. The first chapter was devoted to the study of the theoretical framework through a documentary research in which all theoretical concepts and definitions that form the basis of the project and the theme.
3. The second chapter is an integral part of the documentary study, which includes the various analyzes and applications that will be in the project.
4. The third chapter, in which we will present all the design procedures and the objectives of the project and the transit elements and design idea of the project with a complete graphic presentation of the project.
5. In conclusion, this research concludes with a general summary that includes highlighting the importance of the subject through the implementation of the objectives set to reach the completion of a project that answers the questions asked before and provides a solution to all the problems that were mentioned earlier.

E. Work plan:


National museum of technology
The architectural envelope and the advanced technology
Introduction
Theoretical part
Application part
Advanced technology
Architectural envelope
Technical requirements of the museum
VR
Holograms
Dynamical envelope
Examples Analysis
Ground analysis
Applications of the theme in the project
Proposed Program
Crossing elements
Design Idea
The project
The national museum of technology

CHAPTER I: CONCEPTUAL STUDY OF ARCHITECTURAL ENVELOPE AND ADVANCED TECHNOLOGY

Introduction:

Architecture is one of the most important field affected by technological development directly and the impact of this development on the human environment and climate indirectly.
In this chapter, we will discuss how architecture influenced and influenced this technological development in terms of design and ideas. At the same time, we will understand the most important methods used in architecture to cope with the environmental developments and challenges which facing the building.
We have talked about the most important element in the construction, which is the architectural envelope where we studied its historical development and function and the most important components and characteristics and how it dealt with the environmental challenges and technical requirements of the internal space of the building.
We also discussed technology as abstract science and what is the advanced technology and how is the impact of advanced technology on architecture.
The purpose of this chapter is to explain the most important things that will apply in our project of dynamic envelope technology, modern exhibition techniques and the most important technological developments.

I-The theme Concepts:

1 The architectural envelope:

1.1 The definition of the envelope:

-A flat paper container with a sealable flap, used to enclose a letter or document.
-A covering or containing structure or layer. (english oxford living dictionaries, 2019)

1.2 The definition of the architectural envelope:

- The architectural envelope allows both to separate the inside of the outside but and to ensure the connection between the building and the urban space. (Helzel, 2005)
- The architectural envelope or ("building enclosure") is what separates a building's interior, conditioned space from the exterior, unconditioned space. (MacDonald, 2016)
- The architectural envelope is the structural barrier between the interior and exterior of a building. It is responsible for maintaining climate control within the interior of a building. Climate control refers to cooling and heating a building. (Schenk, 2019)

1.3 The Evolution of the architectural Envelope:

The first building envelope that protected humans from the elements was probably a cave that provided a degree of privacy and security. The earliest building envelopes were dome-shaped structures that combined wall and roof (Figure 2). At an early stage, however, the two dominant forms of envelope evolved, depending on climate and available materials: the timber frame and the masonry wall (Figure 1). Early shelters in the warm climates of Africa and Asia used timber or bamboo frames clad with leaves or woven textiles. In other regions and climates heavier indigenous materials such as stone, rock and clay baked by the sun were used to provide more permanent shelter and protection from the heat and cold (Figure 3). (Arnold, 2018)

Pic (I-1) Yemeni buildings
Source: (Arnold, 2018)

Pic (I-2) Shelter of straw
Source: (Arnold, 2018)

Pic (I-3) stone wall
Source: (Arnold, 2018)

Roofs evolved independently as waterproof elements with their own set of materials.
Thus, eventually the roof, wall and floor became distinct elements of the building envelope that have continued to this day with very little change in concept, use and even material.
-The Medieval dwelling might have walls of wood, brick or stone, a wood roof structure, a slate tile or thatch roof and a floor of stone or hardened dirt. Such a dwelling can still be found today in many regions of the world.
To take one element of the envelope, **the wall**, the medieval or renaissance masonry wall was simple. Initially the wall was a single homogeneous material stone or brick, but now the historic wall would become adorned: a rough structural stone would be faced on the exterior with a precisely cut and fitted facing of fine stone or marble, and the interior would be faced with smooth plaster. (Arnold, 2018)

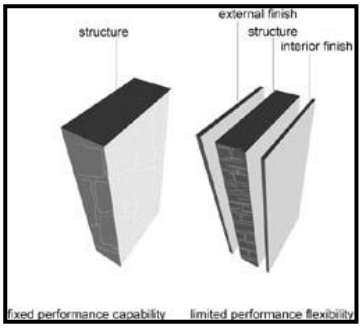


Fig (I-1) earlier walls
Source: (Arnold, 2018)

-The nineteenth century: the big change in the concept of the wall and the real beginning of today's concept of the building envelope occurred with the invention of the steel, (and later, the reinforced concrete) The exterior wall could become a screen against the elements and no longer be needed to support the floors and roof as shown in fig (I-2). (Arnold, 2018)

-The 20th century: When the wall became a nonstructural screen-in and no longer supported the upper floors and roof, it lost the beneficial attributes of mass but gained in providing performance options. More recently the exterior wall has become a major subject of building science studies, largely because of the wall's key role in managing heat gain, heat loss and moisture penetration. As a result, the modern wall now consists of a series of performance "layers". (Arnold, 2018)

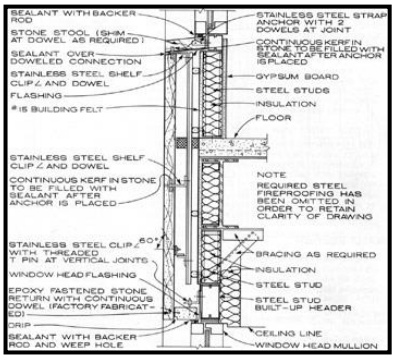


Fig (I-3) the layers of the new wall
Source: (Arnold, 2018)

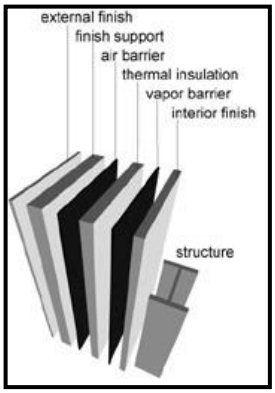


Fig (I-2) the layers of wall
Source: (Arnold, 2018)

1.4 The role of the architectural envelope:

The building's envelope must be designed

1.4.1 To be energy efficiency:

1.4.1.1 By enhancing insulation on opaque walls Fig (I-4):

1.4.1.2 By choosing thermally efficient glass walls Fig (I-5):

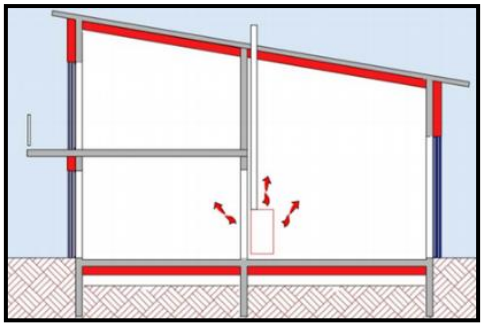


Fig (I-5) position of the glass
Source: (wagner, 2012)

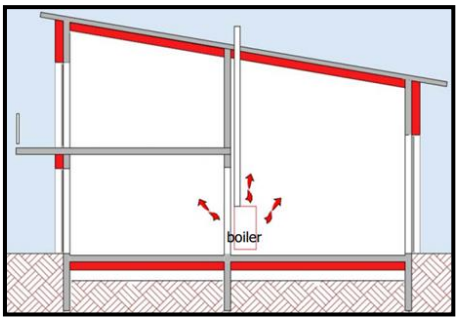


Fig (I-4) the insulation
Source: (wagner, 2012)

1.4.1.3 By treating thermal bridges:

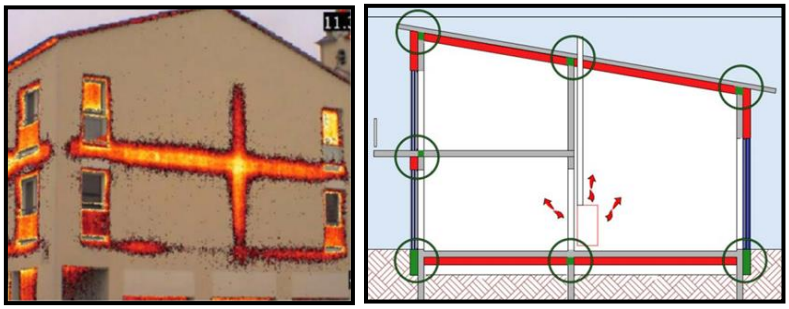


Fig (I-6) the thermal bridges
Source: (wagner, 2012)

1.4.1.4 4- By achieving airtightness:

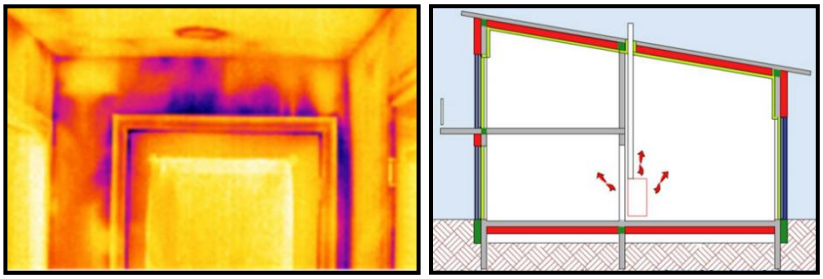


Fig (I-7) airtightness details
Source: (wagner, 2012)

1.4.2 To optimize renewable resources:

Offered by the 4 natural elements:

1-the sun, for its heat inputs and light.

2-water, for its cooling characteristics.

3-air, for its motion force.

3-earth, for its thermal properties. (wagner, 2012)

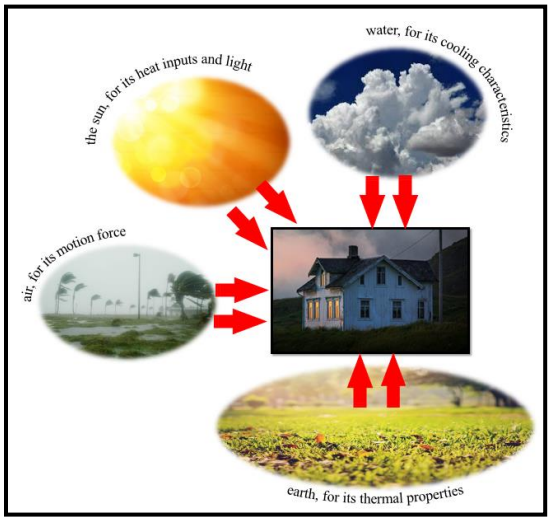


Fig (I-8) the sources of renewable energy
Source: researcher 2019

1.4.3 To increase the aesthetics of the project:

By adding aesthetic details to the facade or making the shape of the project more striking.

Pic (I-4) Snøhetta's Lacy - Norway
Source: (HOOPER, 2018)

Pic (I-5) Bird's Nest stadium
Source: (RANA, 2017)

Pic (I-6) The Petersen automotive museum
Source: (RANA, 2017)

1.5 Envelope design and construction is affected by:

• Building location and climate;
• Building function;
• Building codes; and,
• The availability of materials and onsite resources.
• Culture (MacDonald, 2016)

1.6 Building envelope components:

Building elements commonly associated with envelopes or enclosures include:
• Floors.
• Ceilings/Roofs.
• Walls.
• Windows, and Doors.
• Air leakage/ventilation.

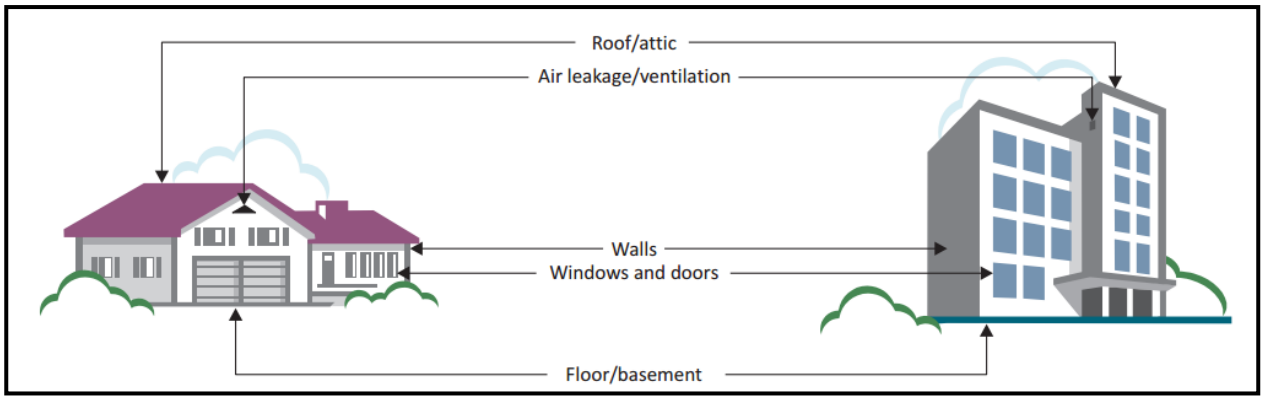


Fig (I-9) envelope components
Source: (MacDonald, 2016)

1.7 The objectives of the architectural envelope:

Tab (I-1) The Petersen automotive museum
Source: (mark f. warren ,CCP,LEED UP, 2011)

To Control	To Eliminate	Structural Performance
Heat Flow	Rain Penetration	Durability
Air Flow	Moisture Build-up	Security
Noise	Aesthetics	Reliability
Fire	Value	Aesthetics
Light	Constructability	Value

1.8 Type of the architectural envelope:

1.8.1 According to the composition:

1.8.1.1 Double skin envelope:

The double skin envelope is a system consisting of two glazed skins separated by a volume of air. The main glass envelope is usually insulated. The air gap between the two glazings acts as insulation against extreme temperatures, wind and noise. The solar protections are usually located between the two skins (Poirazis, 2004)

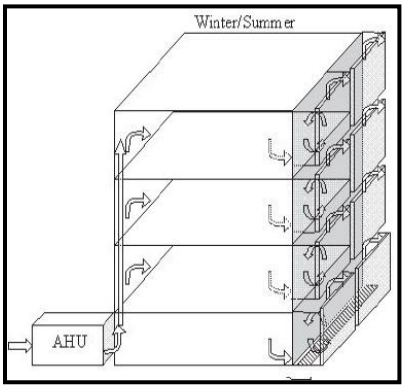
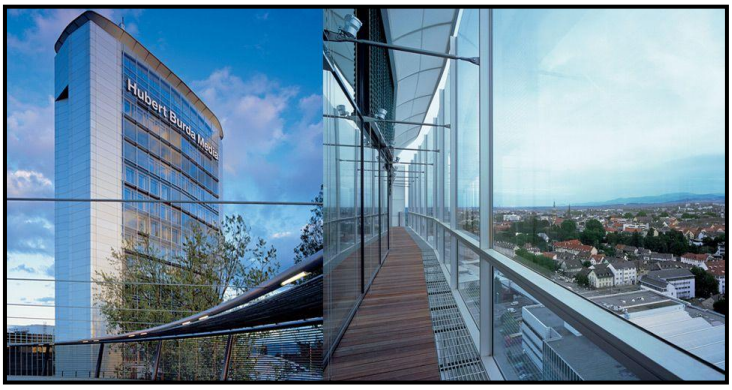


Fig (I-10) air circulation
Source: (Poirazis, 2004)



Pic (I-7) Sanierung BURDA Hochhaus - Offenburg
Source: (GARTNER, 2017)

1.8.1.2 Ventilated envelope:

The ventilated envelope is an exterior construction system. It is a floating coating on an air chamber, and a thermal insulation between the natural stone and the support wall. The separation between the coating and the enclosure wall causes the formation of an insulating layer, allowing the free flow of air through this inner tube and therefore involving obvious advantages in terms of energy saving. This system consisted essentially of four layers: (tareb, 2014)

-Outer wall
-Thermal insulation
-Air cavity
-External cladding

Pic (I-8) ventilated envelope
Source: (GARTNER, 2017)

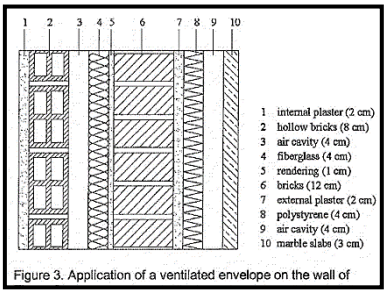


Fig (I-11) ventilated envelope on a wall
Source: (Arnold, 2018)

1.8.2 According to the materials:

New approaches in material science and production technologies will help to minimize the embodied energy of the main construction materials such as concrete, glass, gypsum, ceramics or steel, involved in the structure, envelope and other building components of energy efficient buildings (A.hamid, 2013), here are some examples of some of the materials used in the architectural envelope:

1.8.2.1 Cavity wall construction pic(I-9).

1.8.2.2 Brick with its rich colors and textures pic(I-10).

1.8.2.3 Use of a variety of materials pic(I-11).

1.8.2.4 Concrete block backup wall pic(I-12).

1.8.2.5 Wood cladding pic(I-13).

Pic (I-9) Cavity wall
Source: (A.hamid, 2013)

Pic (I-10) wall with brick
Source: (A.hamid, 2013)

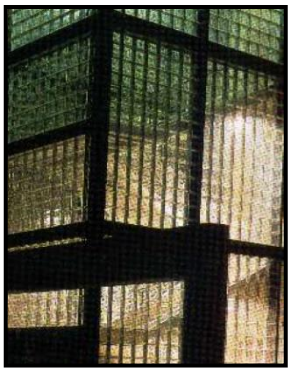
Pic (I-11) Wall with various materials
Source: (A.hamid, 2013)

Pic (I-12) Concrete Wall Source:
(A.hamid, 2013)

Pic (I-13) wood envelope
Source: (A.hamid, 2013)

1.8.2.6 Glass block or glass fronts.

Pic (I-14) certain wall
Source: (A.hamid, 2013)



Pic (I-15) Glass Block Wall
Source: (A.hamid, 2013)

1.9 The dynamic architectural envelope:

Dynamic facades "facades with the ability to respond to their environment by either typological change of material properties that alter the overall form or local alteration by regulating their energy consumption to reflect the environmental conditions that surrounds it".

Through the use of dynamic facades, the buildings have the ability to react to the climate conditions with improved energy efficiency in the building. Facades that respond to the environment are considered as part of the building's envelope in a primarily different way. Dynamic facades actively adapt to their behavior over time in response to changing environmental conditions and performance requirements. The term "dynamic" in architecture has been described as the ability of artificial and natural systems to adapt to varying environmental conditions. Also, this term is used to describe the interaction between external environmental conditions and the façade systems. Thus, environmental conditions can encompass a range of different elements such as daylight, wind and heat. However, the term "environmental conditions" are associated with solar radiation, daylight and heat. (Nady, 2017)

1.9.1 Parameters for designing dynamic architectural envelope:

- Sun control.
- Natural ventilation.
- Day lighting.
- Connection to outdoors.
- Thermal insulation.
- Moisture control.
- Structural efficiency.
- Material choices.
- Possibility of energy generation.

(Nady, 2017)

1.9.2 Types of dynamic envelope:

Pic (I-16) Kiefer Technic Showroom
Source: (Nady, 2017)

1.9.2.1 User Control Dynamic Façade.

The user control system is an automated system that provides solutions for some time to convey the actuated and responsive reactions to passive processes. (Nady, 2017)

Pic (I-17) Al Bahr dynamic facades
Source: (Nady, 2017)

1.9.2.2 Light Control Dynamic Façade.

In this type of façade, automated shading and daylighting control systems are integrated and operate appropriately for all environmental conditions. (Nady, 2017)

Pic (I-18) the dynamic patterns in the façade of Henning Larsen's-Source: (Nady, 2017)

1.9.2.3 Energy Control Dynamic Façade.

Another application for dynamic facades is saving energy in buildings and controlling energy performance in buildings. (Nady, 2017)

Pic (I-19) Brisbine domestic Terminal Carpark-
Source: (Nady, 2017)

1.9.2.4 Wind Responsive Dynamic Façade.

Wind as a natural element itself is strong enough to provide a dynamic pattern of motion without wasting any energy. Brisbine domestic Terminal Carpark in Australia has installed 250,000 aluminum plates to create this wind-powered façade. (Nady, 2017)

1.9.2.5 Façades Designed to Manage Water.

A fundamental role for high-performance buildings is the management of water. It is imperative that roofs and facades effectively manage rainfall through material selection and articulated detailing from top to bottom. (Nady, 2017)

2 The advanced technology:

2.1 The definition of the technology:

-Scientific knowledge used in practical ways in industry, for example in designing new machines.
-The most modern methods and machines, especially electronic ones; the use of these in industry.

(english oxford living dictionaries, 2019)

2.2 The Origin of the Word Technology

2.2.1 It's Greek :

-The word technology comes from two Greek words, transliterated techne and logos, Techne means art, skill, craft, or the way, manner, or means by which a thing is gained. Logos means word, the utterance by which inward thought is expressed, a saying, or an expression. So, literally, technology means words or discourse about the way things are gained. (evanscherr, 2014)

2.2.2 Medieval Times:

The term technology did not exist in the middle Ages. Writers of the time instead used the word mechanical arts when referencing crafts and art with a physical aspect such as architecture, weaponry, agriculture, commerce and theatre. (evanscherr, 2014)

2.2.3 The Renaissance

- Teknologie, from 1775, meant a system of classification for the practical arts until it was abandoned in 1840.

In the 1800's, German engineers made the word technik a central part of their self-definition and elaborated on a discourse that related the word to philosophy, economics and higher culture. In fact the word technik meant the "totality of tools, machines, systems and processes used in the practice arts and engineering." (evanscherr, 2014)

2.2.4 Present Meaning:

It was somewhere between 1820 and 1910 that the word technology acquired its present meaning. The word, however, remained unstable until the later of the half 20th century where it evolved into vague abstraction that was further complicated in the 1990's when newspapers, stock traders and bookstores made technology a synonym for computers, telephones and ancillary devices.

(evanscherr, 2014)

2.3 The Advanced Technology:

-We live in a rapidly changing world. This offers unprecedented opportunities, but it also presents us with complex problems, such as the need for energy-efficient transport and new sources of clean energy. The Advanced Technology is the way how to combine various disciplines to create multidisciplinary solutions to these problems. Its broad approach brings together a range of

engineering and natural science disciplines, giving us the scope to come up with innovative and unexpected solutions to new problems without being confined to a single area of science.

-What is “advanced”? It is whatever technology you have and use today that was not available to others in the past.

So 20,000 years ago pressure flaking stone arrow heads was “advanced technology” if previously people in your group where using a striking tool to make the stone sharp.

There was a time when agriculture was an “advanced technology”.

Today we think of any new kind of electronics as “advanced”. But it never lasts long and is no longer advanced when the next thing comes along. (evanscherr, 2014)

2.4 The technology in the architecture:

2.4.1 Evolution of technology in architecture:

-During the 19th century, the influence of the "revolution" on architecture appeared, and with the development of the building materials industry including glass, iron and steel, reinforced concrete and other materials.

-During the 20th century, the direct effects of technology on architecture, whether in terms of materials or methods of construction and means of implementation, and others, which appeared through many of the architectural trends that prevailed throughout the century, starting with the direction of architecture (modernity) and architecture (international model) It is followed by architecture (late modernity), to postmodern architecture, architecture (employing advanced techniques), architecture (deconstruction) and others.

-During the end of the 20th century, witnessed steady progress in the fields of computer science that control all aspects of life through the so-called "digital revolution", which changed the shape and style of life, and changed the form of life in various fields, , Where the use of computer programs through several areas, perhaps the most important contribution to the output of new architectural configurations; known as the (digital forms), through the creation of models three-dimensional simulation to simulate the reality in which the details of space accurately,

-In the past two decades, the world has witnessed an unprecedented revolution in the fields of digital technology development, application and adaptation to the development of new languages and vocabulary for architectural formations

These languages and these new vocabulary have varied between the use of deconstruction forms, Or "hybrid" types, and other architectural orientations such as "new modernism", "virtual architecture" and other trends, which could not have been developed and pushed forward without the advances in digital technologies. (haiba, 2013)

2.4.2 The most important contemporary architectural trends:

2.4.2.1 Deconstructive Architecture:

It means disassembling the architectural block into a group of identical and unmatched units, then rearranging them and assembling them in a different and different way, contrary to everything that is traditional and customary. What distinguishes this architectural trend of architecture is to break the differences between painting and sculpture and to re-mix them and melt them into a new and contemporary architectural crucible. (haiba, 2013)

Pic (I-20) Ray and Maria Stata Center
Source: (haiba, 2013)

2.4.2.2 Architecture of basic engineering vacuum shapes:

The architectural configuration of the buildings since ancient times was associated with basic architectural forms such as ball, cone, cylinder, pyramid, cube, prism and other forms, which are easy to grasp and absorb, and with the digital revolution and its applications in the fields of architecture and design, the innovative treatments of these basic geometric shapes were designed to achieve various purposes and objectives, ranging from activating the efficiency of the functional building or upgrading the efficiency of its climatic and environmental treatments. (haiba, 2013)

Pic (I-21) London city hall
Source: (haiba, 2013)

2.4.2.3 Hybrid architecture (Corrugated shape):

The architecture of the shape is one of the trends of contemporary architecture, which was adopted in its inception on the digital techniques and applications in the fields of architecture, and it is called (wave architecture), which uses computer programs to develop digital waveforms, as well as flexible forms of elasticity that could not be obtained by means of design and painting Tradit. (haiba, 2013)

Pic (I-22) Experience Music Project, Seattle
Source: (haiba, 2013)

II-The project Concepts:

1 The culture :

1.1 The definition of the culture:

1.1.1 According to UNESCO:

The set of distinctive, spiritual and material, intellectual and emotional traits that characterize a society or social group. In addition to arts and letters, it includes lifestyles, human rights, value systems, traditions and beliefs.

1.1.2 According to oxford:

The customs and beliefs, art, way of life and social organization of a particular country or group.

(english oxford living dictionaries, 2019)

1.1.3 According to Anthropologist Edward H. Taylor:

that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.

1.1.4 According to Malek Ben Nabi(2000):

Summary of habits, talents, traditions, tastes, behaviors and emotions that is a face of civilization.

1.2 The type of the culture

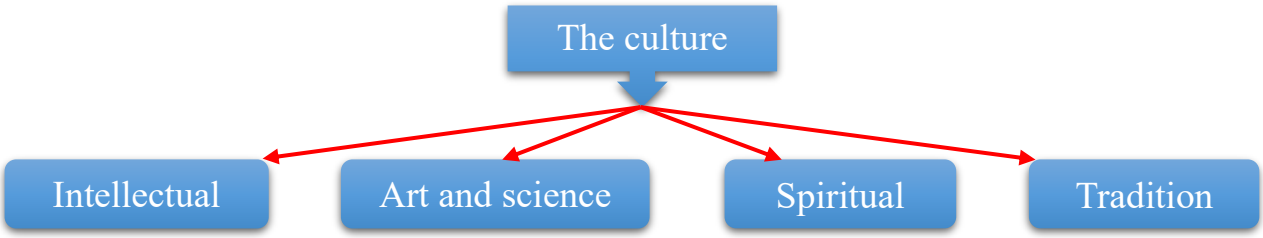


Fig (II-1) cultural types
Source: (culture, 2008)

1.3 The Cultural facilities:

1.3.1 Definition According to Claude Mouillard:

A cultural facility is an institution, also a non-profit organization, which links creative works with the public, in order to promote heritage conservation, artistic creation and training and, more generally, the dissemination of works of art and spirit, in a building or group of buildings specially adapted to these missions.

1.3.2 The classification of cultural facilities:

Picture (I-1) Victoria & Albert Museum- United Kingdom.
Source: (archdaily.com, 2018)

Picture (I-2) max show center- china
.Source: (archdaily.com, 2018)

Picture (I-3) Stuttgart City Library-Germany
Source: (archdaily.com, 2018)

Picture (I-4) Saint-Nazaire Theatre –France.
Source: (archdaily.com, 2018)

Fig (II-2) classification of cultural facilities
Source: researcher 2019

1.4 The culture around the world:

Each country conceives its culture in conformity with the national characters which are clean, but it appears that the definition of culture is directly related to ideology or the dominant belief of the nation concerned. As a result, culture is built according to:

- Characteristics.
- Needs.
- The aspirations of society.
- The converge.
- National cohesion.
- The affirmation of the nation (emma, 2015)

1.5 The Algerian culture:

After independence, Algeria launched policies aimed at researching and revaluing the cultural identity of Algeria, especially Arab-Islamic race, and transmitting a clear and precise image of Algerian culture to rest of the world, by the organization of congresses, seminars and festivals both on the national territory and in other countries like:

The year of Algeria in France, Algiers capital of Arab culture, Tlemcen capital of Islamic culture ... .Etc. (culture, 2008)

1.6 The foundations of Algerian culture:

- Islamic foundation
- Arab Foundation
- Amazigh foundation

The Algerian state has endeavored to build and develop its cultural facilities and is clearly involved in the

- Establishment of the Directorate of Cultural Property.
- Establishment of the National Center for Archaeological Research.
- Establishment of the National Center for the Conservation of Cultural Property.
- Establishment of the National Manuscript Center.
- Establishment of a national cinema center. (culture, 2008)

2 The museum:

2.1 Museology:

2.1.1 According to Georges Henri Rivère[1]:

An applied science, the science of the museum. It studies the history and role in society, specific forms of research and conservation, physical presentation, animation and dissemination, organization and operation, new or musical architecture, sites received or chosen, the typology, the deontology

2.2 Museography:

The term museography first appeared in the 18th century and is older than the word museology. It has three specific meanings:

- Currently museography is essentially defined as the practical or applied aspect of museology, that is to say the techniques which have been developed to fulfil museal operations, in particular with regard to the planning and fitting out of the museum premises, conservation, restoration, security and exhibition.
- In French the use of the term museography identifies the art (or the techniques) of exhibitions. For some years the term expography (exhibit design) has been proposed for the techniques involved in exhibitions, whether they be in a museum or in a non-museal space.
- Formerly and through its etymology, museography referred to the description of the contents of a museum. Just as a bibliography is one of the fundamental stages of scientific research, museography was devised as a way to facilitate the search for documentary sources of objects in order to develop their sys- thematic study. (Mairesse, 2011)

2.2.1 Definition:

2.2.1.1 <u>According to oxford:</u>

A building in which objects of historical, scientific, artistic, or cultural interest are stored and exhibited. (english oxford living dictionaries, 2019)

2.2.1.2 <u>According to ICOM[2]:</u>

Male name from the Greek word "mouseîon" whose meaning is "temple" or "sanctuary of the Muses" - Is a noncommercial, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of man and his environment.

[1] Born in 1897 and died in 1985, George-Henri Rivière is a French museologist. He participated in the reorganization of the Museum of Ethnography Trocadero of Paris in the late 1920s. From 1937, he designs and directs the National Museum of Popular Arts and Traditions. Having participated in the founding of the (ICOM), he also became its first director in 1948.

[2] international council of museums

2.2.1.3 According to the executive decree "N° 07-160 of May 27:
any permanent institution with cultural and / or scientific collections of property whose preservation and presentation of public interest and organized for the purpose of knowledge, education, culture and enjoyment. (culture, 2008)

2.3 The History of museums:

Derived from the word ‘Mouseion’ in Ancient Greek, the word ‘museum’ refers to the temples devoted to goddesses named Moses and the hill separated for Moses in Athens in Greek Mythology. The same word is also transferred to Latin, other western and world national languages as ‘Museum’. In Ancient Greek, there are nine daughters of the God Zeus and his wife Mnemosyne. All these nine daughters are believed to live in this temple named Museion. The first foundations of museums are established during this period, when artistic creativity is attributed to Mnemosyne and when it is started to put all beautiful, unique, attractive and legendary objects into Museion.

Museum concept–which dates back to antique Greek temples, progressed with the initiation made by bourgeois who exhibited their own art works in a part of their houses during the late 17th century. Progression of museums -which were first designed for exhibition and preservation- can be separated into three subtitles: pre-modern architecture, modern architecture and post-modern architecture. (ATAOĞLU, 2016)

2.3.1 Pre-Modern Architecture:

Traditional museum plan typology of pre-modern architecture can be classified as palace-museums and temple monument museums. Traditional museum buildings are generally constructed with re-use of historical buildings after the restoration. Of those buildings transformed into museums.

Pic (II-5) the Uffizi Gallery- Italy
source: (archdaily.com, 2018)

2.3.2 Modern Architecture:

In terms of producing the necessary architectural designs; unprecedented structural needs that astonished the architects occurred in the 19th century. Buildings of world exhibits pioneered the 20th century museums. Transparent and glass structures like Cristal Palace designed by Joseph Paxton for the first world fair later demonstrated their influence on the museum buildings constructed in the mid-20th century. With the effect of Modern Architecture and Bauhaus; museum architecture started to move away from 19th century neoclassic museum architecture. With the museum designs made by pioneers of the modern architecture like Le Corbusier, F.L. Wright, Mies van der Rohe, Louis Kahn-a new era started and museum architecture underwent a radical change in the 20th century.

Pic (II-6) Ahmedabad Museum- India
source: (archdaily.com, 2018)

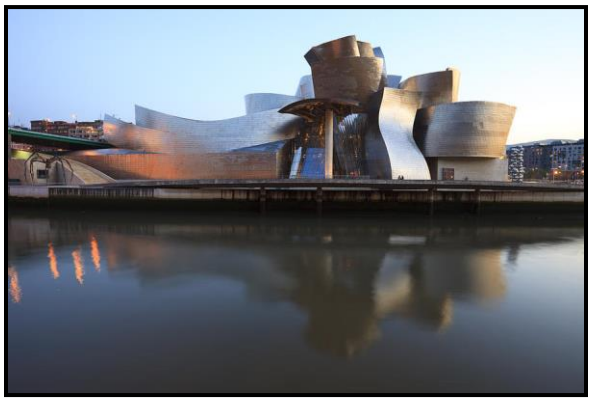
Pic (II-7) Solomon R. Guggenheim Museum-New York
source: (archdaily.com, 2018)

2.3.3 Postmodern Architecture:

Museum buildings continued to increase in number during 1950s and 1980s became a turning point in the development of museum architecture. New constructions with novel advancements in design and function that challenged the general typology were created. Museums was turned into a culture-center with temporary exhibitions and shows, meeting and conference halls, research and study units, libraries, hobby spaces that enabled participation from all ages, workshops, cafeterias, restaurants, bars and museum sale-points. Museums whose collections were not visited again became dynamic culture and entertainment centers with continuously organized temporary exhibitions and educational activities. (ATAOĞLU, 2016)

2.3.4 During 1980s:

Were designed in the form of remarkable, iconic, monumental constructions where the architect demonstrated his creativity and which -transforming the city provided an image and identity. Going beyond the typologies in the museums; museum buildings were regarded as art works. During 1980s; architects sought not only for unattempted quests in their museum designs but also never-tried pursuits in indoor spaces and created indoor designs which were difficult to perceive with orthographic tools such as plans and sections. Particularly; in the museum buildings, these radical perceptional and spatial changes and spatial scenarios draw attention in the design of circulation area of indoor sites. (ATAOĞLU, 2016)



Pic (II-8) Guggenheim Museum-Spain
source: (archdaily.com, 2018)

Pic (II-9) MAXXI Museum-Italy
source: (archdaily.com, 2018)

2.4 The Evolution of volumetric composition of museums:

The design of museums has long been a reflection of the spirit of ancient Greek and Roman temples, Renaissance palaces or medieval churches.

Most of the foundations were derived from the Roman architecture, which in turn was taken from the ancient Mesopotamia architecture. Most of the characteristics of the Roman house are similar to those in the Mesopotamia house, especially the Atrium, which is a courtyard surrounded by a corridor around which the rooms are distributed. In addition to the rotunda which is a circular used in the Pantheon temple as a basic void covered with a huge dome, a contemporary example of the Rotunda Center for Visual Art, California.

Pic (II-10) the Pantheon -Rome
source: (evanscherr, 2014)

Pic (II-11) Center for Visual Arts -California
source: (GARTNER, 2017)

2.4.1 Classical architecture (19th century):

The architects adhered to the previous elements (rotunda and atrium) believing that the museum is a temple of beauty, but without any attempt to develop in these elements, despite the developments in the nature of the era.

2.4.2 Museums in the first of the twentieth century:

The remarkable progress in this period contributed to the development of the architectural vision and to the support of museum architecture and the development of inherited elements to solve the new requirements of the museum. For example, the Guggenheim Museum in New York, which used the elements of Atrium and Rotunda.

2.4.3 Museums in the end of the 20th century:

Some architects remained in traditional form of the atrium, such as the Museum of Utica (19561960) by architect Philip Johnson.

However, most of the architects of this period sought in their volumetric and abstract formations to be unconventional while sometimes retaining elements of atrium and rotunda, but in unusual forms, such as the Museum of Art of Georgia (1980-1983) by architect Richard Meyer.

Some architects had a special opinion on the design of the Museum of Modern Art, and a collection of museums far removed from traditional forms and ideas, such as the Guggenheim Museum in Bilbao, Spain, by architect Frank O. Gehry. (zahdi, 1988)

2.5 The creation of museums in Algeria is done by decrees:

In Algeria, according to the Executive Decree No. 11-352 of 7 Dhou El Kaada 1432 corresponding to October 5, 2011 fixing the standard status of museums and museum interpretation centers.

(culture, 2008)

2.6 The Types of museums:

2.6.1 According to the ownership:

- The national public museum.
- The private museum.
- The public museum belonging to local authorities.

(Jorad)

2.6.2 According to the buildings:

- Museums established in historic buildings and palaces
- Museums established in modern buildings

(zahdi, 1988)

2.6.3 (zahdi, 1988)According to the exhibits:

- Art museums
- History Museum
- Archeological museum
- Ethnological Museum
- Science and Technology Museum
- Natural Sciences / history Museum
- Beautiful arts museum

- Open air museum
- Specialty Museum
- Military Museums

(zahdi, 1988)

2.7 The mission of the museums:

According to the same decree No. 11-352, museums are responsible for the following missions:

- Conserve, restore, study and enrich their collections.
- Acquire tangible cultural property.
- Inventory goods.
- Participate in work related to his field.
- Make their collections accessible to the public by any means.
- Gather documentation related to their purpose.
- Disseminate information related to their purpose.
- Perform animation programs (conferences, exhibitions.).
- Study collections and direct scientific research related to their objectives.
- Publish the search result.
- Organize and participate in national and international scientific seminars.
- Exchange museum collections between national and / or foreign museums.

(culture, 2008)

Conclusion:

after we touched on two important elements in the modern architecture, the architectural envelope and advanced technology and explained the importance of each of them to meet the appropriate internal requirements of the museum of lighting and ventilation and temperature, the architectural envelope must control all this, and to reach the best result of our opinion to be this envelope Of the dynamic type that will automatically respond to all external changes with the requirements and internal needs. To provide this type of envelope, the latest advanced technology must be used,

Since the museum is a museum of technology, the most important thing in the exhibition will be entirely related to technology even the exhibition methods everything inside the museum is related to advanced technology.

After discussing the subject of architectural envelope and advanced technology in detail, we have to understand the project in which we will apply these two elements. By understanding all the characteristics and requirements of technical and functional and architectural of the museum and this in order to increase the effectiveness of the museum's internal and external role and reach the desired goals and this is what we will discuss In the next chapter to study everything related to the museum and to know the most important elements in its design.

CHAPTER II: ANALYTICAL STUDY OF THE MUSEUM

Introduction:

Every project or building of value must have a tangible physical structure and spirit or a message to be delivered through it. In this chapter, we will discuss the project of the National Museum of Technology by listing all the details that mean both material and moral, Factors that strongly intervene in the design and construction of this edifice also illustrate and clarify the message that informs it to the fullest extent has been talked about the assets of the museum and the most important areas that are linked from the culture to the science of museums and its origins and development architecturally and intellectually. From the time of the era of the gods to our time and talked about the most important definitions that addressed the museum linguistically and conventionally then we tried to learn about the technical aspects of the museum, which interfere directly in the smooth functioning of the functions and the welfare of users and the protection of holdings as we presented a summary of the most important examples of analysis of examples The project will end with the presentation of the spatial program developed from the official program, the results of the technical studies and the analysis of the examples and the ground.

This chapter is the most important stage in the design of the architectural project. All that we have addressed is a pillar and a general element to reach the ideal design of the museum, which is designed to meet the full needs of visitors and workers and collectibles and to do all the desired functions of cultural and scientific and be the symbol and monument of Algeria

1 Definition:

1.1 The museum:

1.1.1 According to oxford:

A building in which objects of historical, scientific, artistic, or cultural interest are stored and exhibited.

1.1.2 According to ICOM

Male name from the Greek word "mouseîon" whose meaning is "temple" or "sanctuary of the Muses" - Is a noncommercial, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of man and his environment.

1.1.3 According to the executive decree "N° 07-160 of May 27, 2007:

any permanent institution with cultural and / or scientific collections of property whose preservation and presentation is of public interest and organized for the purpose of knowledge, education, culture and enjoyment.

1.2 The mission of the museums:

According to the same decree No. 11-352, museums are responsible for the following missions:

- Conserve, restore, study and enrich their collections.
- Acquire tangible cultural property.
- Inventory goods.
- Participate in work related to his field.
- Make their collections accessible to the public by any means.
- Gather documentation related to their purpose.
- Disseminate information related to their purpose.
- Perform animation programs (conferences, exhibitions.).
- Study collections and direct scientific research related to their objectives.
- Publish the search result.
- Organize and participate in national and international scientific seminars.
- Exchange museum collections between national and / or foreign museums.

(culture, 2008)

2 The functional and Technical requirements of museums:

2.1 Accessibility:

The museum must ensure an ease of mechanical and pedestrian accessibility and a Diversity of roads leading to it.

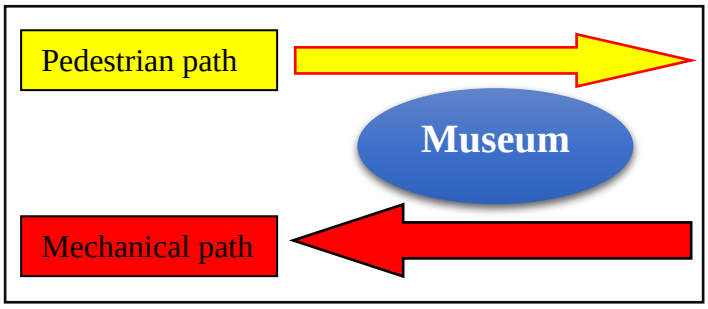


Fig (I-1): Location of the museum compared to the roads
Source: researcher 2019

2.2 Circulation:

2.2.1 According to the users:

2.2.1.1 Public circulation:

Which is one of the most important functions that must be carefully studied and it is done by a logical order for the exhibition halls, and which is related to the purpose of the creation of the museum. Circulation starts from the entrance of the museum, which leads to the entrance, in which all service activities required for visitors. (culture, 2008)

2.2.1.2 Private circulation:

Museums must be equipped in several other entries for staff and administrators and users...

Their circulation is done by corridors and lifts in a private way which does not hinder the traffic of the visitors with the possibility of contact between the two very reduced unless it is necessary.

(culture, 2008)

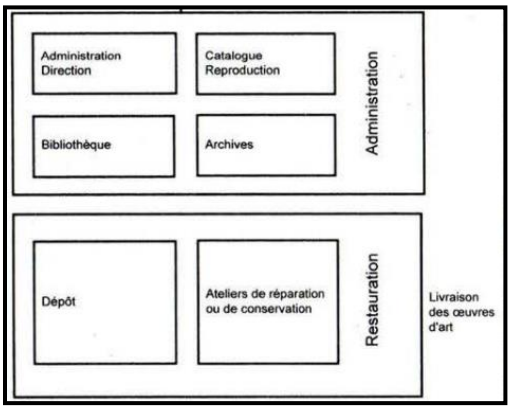


Fig (I-2) Private circulation
source: (neufert, 2010)

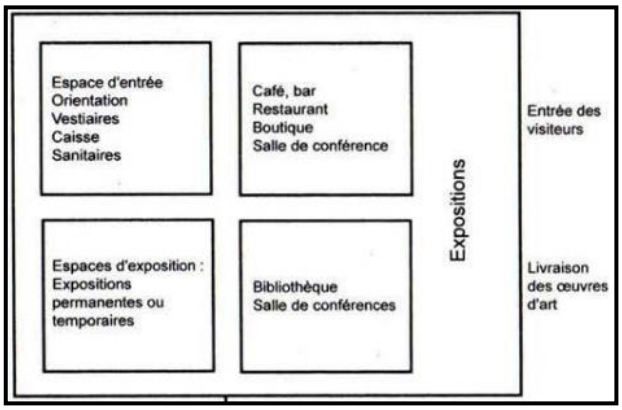


Fig (I-3) Public circulation
source: (neufert, 2010)

2.2.2 According to the type of the paths:

2.2.2.1 Tree type

This principle works according to the idea of a main circulation with subsidiary sectors, the accesses can be carried out in the axis or on the sides.

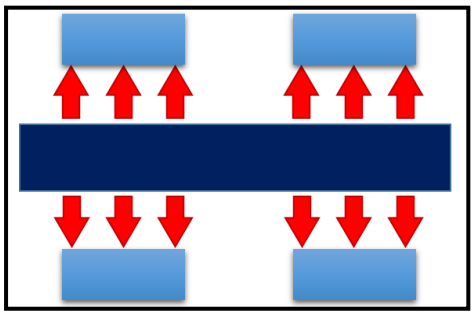


Fig (I-4) tree circulation
source: researcher 2019

Pic (I-1) Orsay Museum-France
source: (Barritt, 2018)

2.2.2.2 block types:

This provision allows the free choice of the course according to the situation of the access points. And his type of movement requires multiple entrance to the museum.

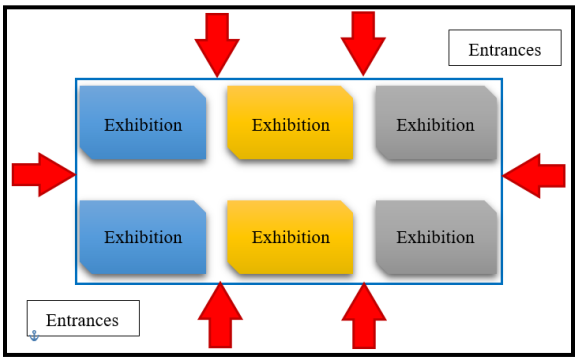
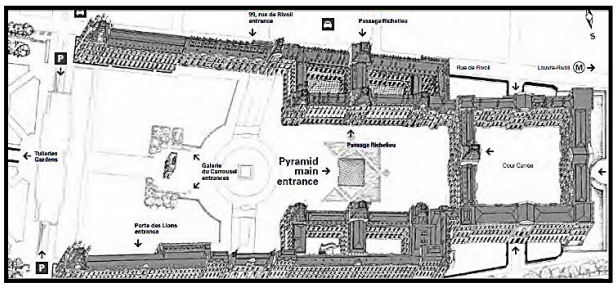


Fig (I-5) block circulation
source: researcher 2019



Pic (I-2) the Louvre Museum-France
source: (Barritt, 2018)

2.2.2.3 Ribbon types

This solution allows to guide the visitor without being aware of it, but has the disadvantage of obliging the visitor to go through the entire exhibition, it is divided into three parts.

- Spiral circuit.
- Broken line circuit
- Rectilinear circuit.

Pic (I-3) Solomon R. Guggenheim Museum-New York
source: (archdaily.com, 2018)

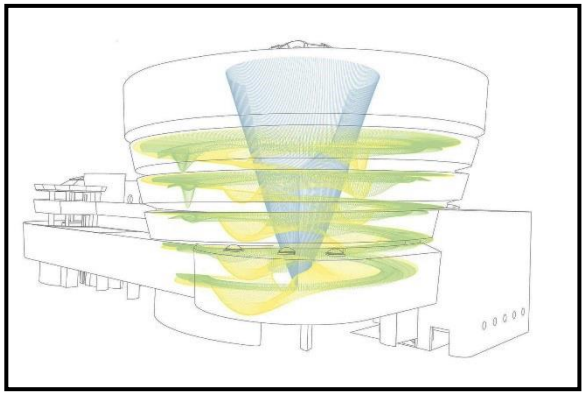


Fig (I-6) ribbon circulation
source: (archdaily.com, 2018)

2.2.2.4 Labyrinth type

A series of space differentiates, although chained to each other, does not impose a constraint of circulation.

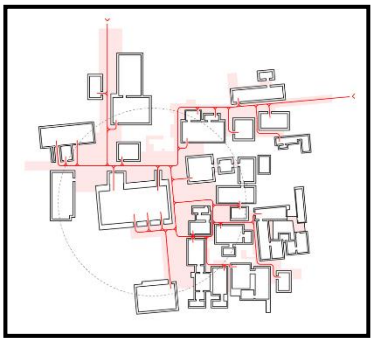


Fig (I-7) labyrinth circulation
source: (archdaily.com, 2018)

Pic (I-4) Louvre museum-Abu-Dhabi
source: (archdaily.com, 2018)

2.2.3 Exhibition conditions of collections:

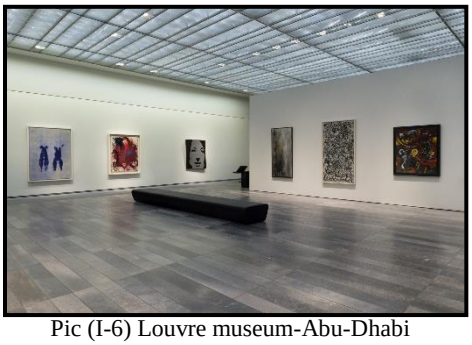
In the exhibition spaces - as elsewhere in the reserves - the collections are threatened by dangers that make them run physical, chemical or organic agents of degradation such as vibrations, atmospheric impurities, light, humidity, and the temperature. To prevent them, provisions are to be taken from the design of the architectural project. (culture, 2008)

2.2.3.1 Exhibition modes:

A. Display on fixed or mobile trunks with varied shapes and sizes based on the floor as in the Museum of Veterinary Medicine in Zurich.

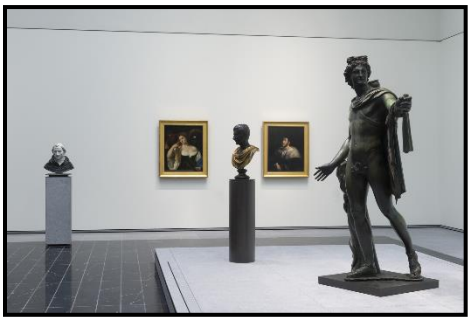
Pic (I-5) Museum of Veterinary Medicine- Zurich
source: (Mahler, 2017)

B. The display on vertical tables as in the museums of literary documents and stamps.



Pic (I-6) Louvre museum-Abu-Dhabi
source: (archdaily.com, 2018)

C. Display on a base based on the ground as in museums of folk traditions or crafts.



Pic (I-7) Louvre museum-Abu-Dhabi
source: (archdaily.com, 2018)

D. Display on suspended supports as in scientific museums.

Pic (I-8) Hong Kong science museum- Hong Kong
source: (Leung, 2019)

2.2.3.2 Exhibition standards:

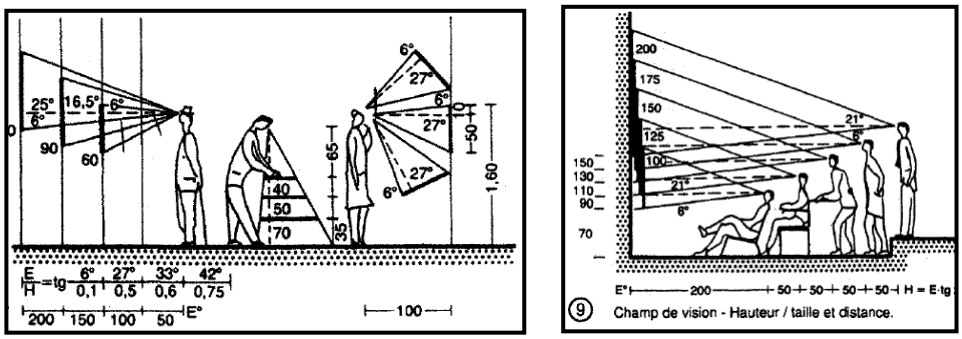


Fig (I-8) Horizontal, vertical and curved display standard
source: (neufert, 2010)

2.2.3.3 Atmospheric impurities:

These are those brought by pollution proper (hydrogen sulphide, sulfuric acid, carbonic acid, etc.in large cities and industrial regions, chlorinated crystals suspended in the air, in maritime regions, etc.), but also dust that dirty, deteriorate by abrasion, carry bacteriological agents.

Pic (I-9) Athelhampton palace -England
source: (archdaily.com, 2018)

2.2.3.4 Lighting:

Whether they are of natural or artificial origin, whether they are visible or invisible, the radiation undergoes, as we know, more or less severe alterations (yellowing, drying, discoloration, destruction) to the objects they strike.

The light sources (fluorescent tubes, incandescent lamps, iodine-cycle lamps, spotlights, controlled daylight) and illuminances, calculated in lux, thus give rise today to precise recommendations: 150 to 200 lx for sensitive objects, paintings in particular; 50 to 80 lx for very sensitive, tapestries, drawings, specimens of natural history, etc. (It should be noted, low thresholds, normal daylight can exceed 10,000 lx).(culture, 2008)

A. Natural lighting:
   - Lateral openings:

The windows in the sidewalls of the gallery provide side lighting. Its strategies rely on apertures located in building's perimeter walls and it is also dependent upon the orientation of the building. Depending upon the need and use of space these windows may be placed at a high level or normal level. Windows on one side give unilateral light whereas the windows on two sides give bilateral lighting. This type of lighting is preferable for sculptures.(Licht, 2018)

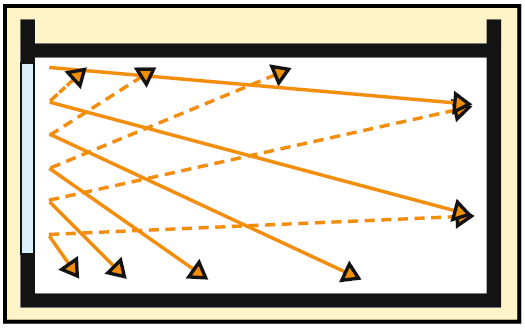


Fig (II-9) Daylight incidence from the side through a window source: (Licht, 2018)

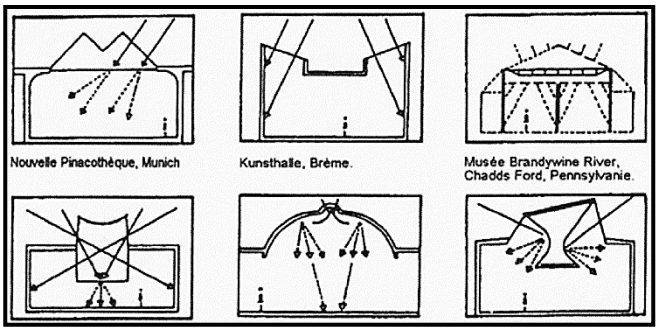


Fig (II-10) Lateral openings source: (neufert, 2010)

- Zenith openings:

Zenithal light, defined by the standard NBR 15215-2, "is considered as the natural light that enters through the upper closures (roofs) of the internal spaces" [3], has enormous capacity in capturing the luminous solar radiation, direct and diffuse from the celestial vault and reflections of the environment. It is a feature that provides greater uniformity of distribution of light than lateral lightning. (هيبة، 2013)

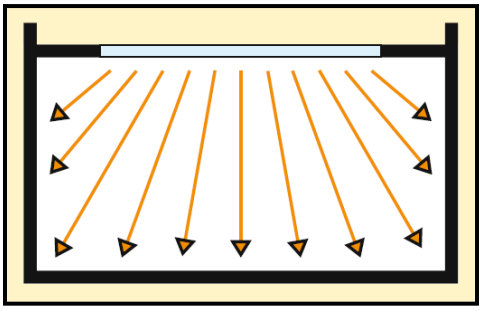


Fig (I-11) Daylight incidence from above through a luminous ceiling source: (Licht, 2018)

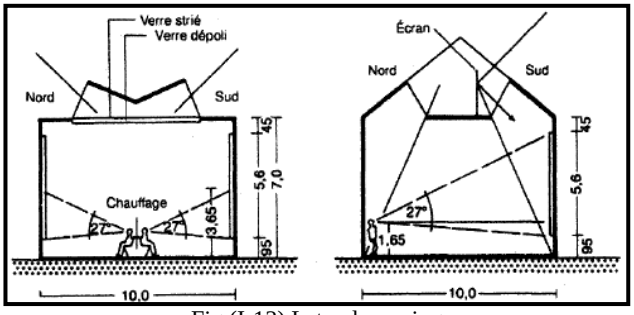
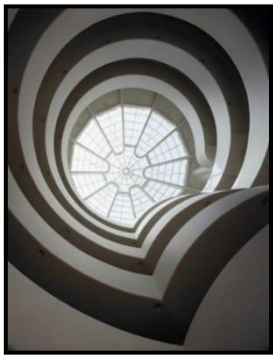


Fig (I-12) Lateral openings source: (neufert, 2010)



Pic (I-10) New York Guggenheim atrium skylight source: (Barritt, 2018)

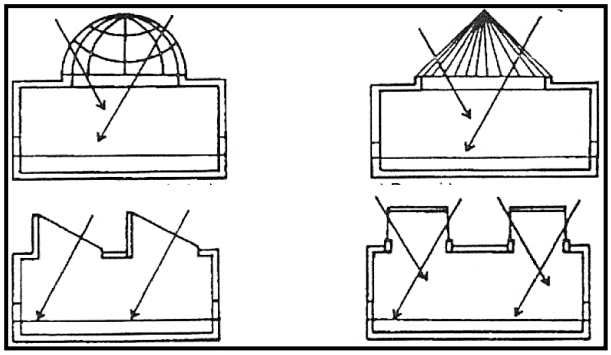


Fig (I-13) Types of roof openings source: (neufert, 2010)

B. Artificial lighting:

The principal requirement is to create optimum conditions for viewing objects, this does not only include the lighting of the object but also general conditions of visual comfort, that is suitable light for orientation and movement, ease of visual adaption to differing light levels required throughout the museum.

The most important lighting systems used in exhibition rooms are:

- Luminous ceilings.

The idea of luminous ceilings stems from a desire to imitate daylight. Luminous ceilings deliver light which is particularly suitable for painting galleries – predominantly diffuse with an opal enclosure, partly directional with enclosures of satinised/ textured glass as shown in Pic (I-11).

- Indirect luminaires.

An impact similar to that of a luminous ceiling is achieved with indirect light bounced off the ceiling and upper wall surfaces into the room. This diffuse, uniform light is predominantly used in rooms where no daylight enters Pic (I-12). It is produced by suspended luminaires radiating light upwards.

- Cove luminaires.

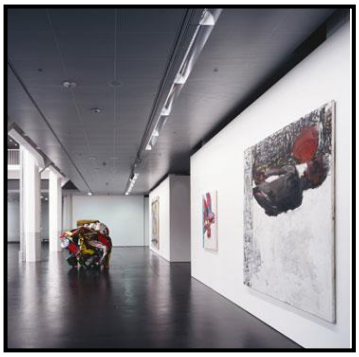
The diffuse light of luminaires installed in the curving transition between wall and ceiling – the cove or coving – is another indirect lighting solution. The cove luminaires most frequently used in modern museum buildings are models with housings which themselves form the coving.

- Wallwashers.

used as individual luminaires or in continuous rows. Installed flush with the ceiling (or with kick reflector protruding from the ceiling) or mounted close to the ceiling Such as illustrated in Pic (I-13). they should illuminate the walls as uniformly as possible this task is performed by reflectors with asymmetrical optics. It is important to ensure good shielding in the direction of the observer.

- Spot lamps.

Reflectors in reflector lamps Pic (I-14) or spots direct most of the light emitted by punctual light sources in a defined beam direction. Spots and downlights with spot characteristics can be fully or partially integrated into a ceiling (or wall) as recessed ceiling spots. Surface-mounted ceiling spots and downlights as well as spots for power track have visible housings.



Pic (I-11) luminous ceilings
source: (Licht, 2018)

Pic (I-12) indirect luminaires
source: (Licht, 2018)

Pic (I-13) Wallwashers distribute their light asymmetrically.
Source: (Licht, 2018)

Pic (I-14) the directional light of spot lamps raises the brightness for exhibits
Source: (Licht, 2018)

- Artificial lighting must be:

-Properly position of the lighting sources
-Reduce the visitor's drop shadow
-Avoid reflective glare
-Highlight walls and works
-Enlighten boxes without dazzling

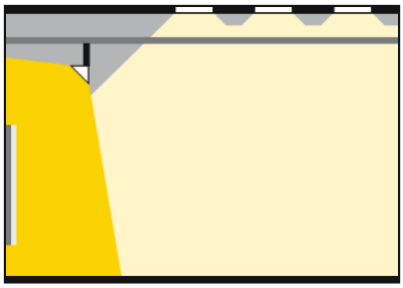


Fig (I-14) Directional lighting for the wall, diffuse lighting for the room
Source: (Licht, 2018)

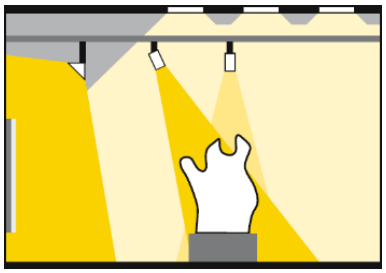


Fig (I-15) Supplementary directional lighting for objects in the room
Source: (Licht, 2018)

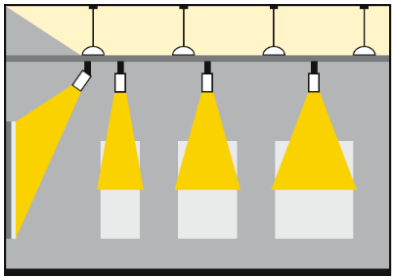


Fig (I-16) Indirect and direct components produce diffuse and directional lighting respectively
Source: (Licht, 2018)

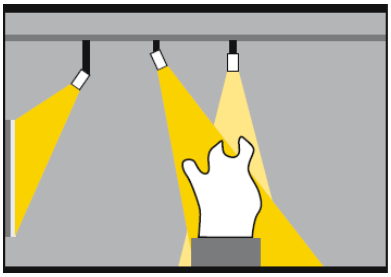


Fig (I-17) solely directional light
Source: (Licht, 2018)

- Difference between natural lighting and artificial lighting

Table (I-1) natural and artificial lighting
Source: (Licht, 2018)

DAY-LIGHTING	ARTIFICIAL LIGHTING
Superior color rendition	Light is based on a single color
Continuous spectral curve	Intermittent spectral curve
Lively natural environment	Can be manipulated as per need
U-V radiation corrodes sensitive objects displayed	It is non-corrosive
It is a planning constraint	Freedom in planning

2.2.3.5 Humidity and temperature:

Dangerous, too, for the collections when they are not controlled, these phenomena constitute a whole, because of their close natural relation. It is also known that it is not good conservation without a relatively constant climate atmosphere sudden fluctuations, hygrometric or thermal, are much more dangerous than slow variations of the same amplitude. In general, the standard of conservation for relative humidity is 55 ± 5%; for the temperature: 18 ± 2 °C. (culture, 2008)

Archeological Materials	
Negligible Climate-Sensitive Materials	30% – 65%
Climate Sensitive Materials	30% - 55%
Significantly Climate Sensitive Materials	30% - 40%
Metals	<35%
Natural History Materials	
Biological specimens	40% - 60%
Bone and teeth	45% - 60%
Paleontological specimens	45% - 55%
Pyrite specimens	<30%
Paintings	40% - 65%
Paper	45% - 55%
Photographs/Film/Negatives	30% - 40%
Other organics (wood, leather, textiles, ivory)	45% - 60%
Metals	<35%
Ceramics, glass, stone	40% - 60%

Fig (I-18) Relative Humidity Optimum Ranges for Various Materials Housed in a Park's Museum Collection.
Source: (Floray, 2005)

Temperature and relative humidity must monitoring so that we know what the environment in your storage and exhibit spaces is like over time.

The Monitoring helps to:

- Set a baseline of temperature and humidity to see if the storage space is adequate.
- Identify variations in the temperature and humidity throughout collections areas.
- Monitor equipment to be sure it is working right.
- Help develop strategies to improve the environment.
- Identify whether your strategies are working to improve the environment. (Floray, 2005)

Monitoring equipment:

Pic (I-15) Assman Psychrometer
Source: (Floray, 2005)

Pic (I-16) Thermo-Hygrometer
Source: (Floray, 2005)

Pic (I-17) Electronic data loggers
Source: (Floray, 2005)

2.2.4 The visitor's entrance (The lobby):

Transitional zone between the daily life and the museum place, the entrance hall is at the same time place of contact, time of introduction to the visit and zone of exit. It is a place where the visitor learns about the activities of the day, but also where he is resting, before or after his visit, where he makes contacts with other visitors, where he can talk about what he wants see or what he saw. (culture, 2008)

2.2.5 Amphitheatre:

An auditorium will often be desired, whose capacity and equipment will depend on the cultural policy of the museum; it can thus be presented in the form of a more or less versatile room (conferences, films, concerts, theatrical, choreographic, etc.). Preferably located on the ground floor or in the basement, opening directly on the general reception (having openings on the outside that the regulatory emergency exits), with a particular control, it must meet a number of technical requirements (acoustics and lighting in particular) . (culture, 2008)

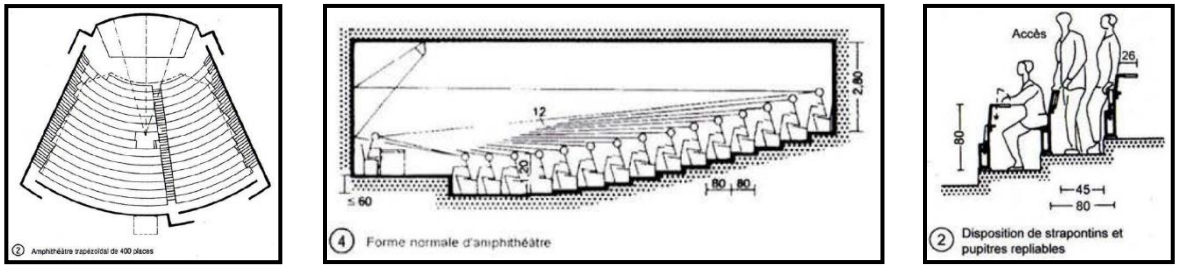


Fig (I-19) Amphitheatre standards
Source: (neufert, 2010)

2.2.6 Coffee and restaurant:

A restaurant or cafeteria, or both, are on the hospitality program, their location - before or after the checkpoints: both advantages and disadvantages, in both cases well weigh, especially from the point of view of safety -, their service links, their aeration and the evacuation of odors, the storage of materials, foodstuffs and products will be studied with as much care as all that falls directly from the preparation of meals and the comfort of consumers. (culture, 2008)

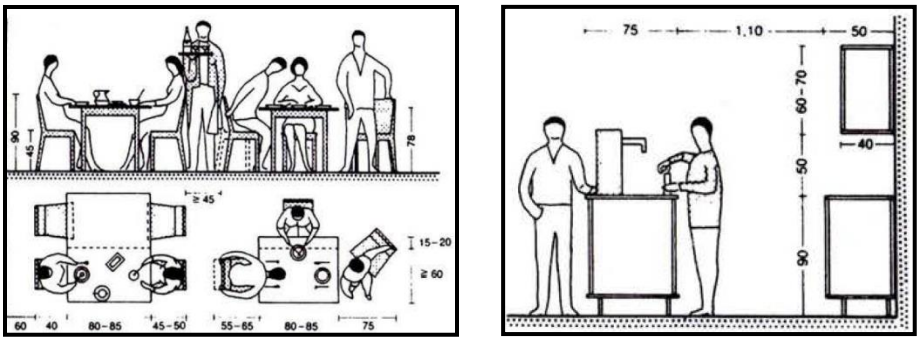


Fig (I-20) Coffee and restaurant standards
Source: (neufert, 2010)

2.2.7 7D cinema:

We could feel in the 7D cinema the effects such as wind blowing, rain spraying, snow flying, lightning blinking, fog simulation, bubble flying, air blowing, leg sweep, seat vibration, back vibration, etc. At the same time, we would experience the exciting motion of the dynamic seats, which drive us being in a fantasy wonderful world. (Amusement, 2018)

Fig (I-22) theater chair of 7D cinema
Source: (Amusement, 2018)

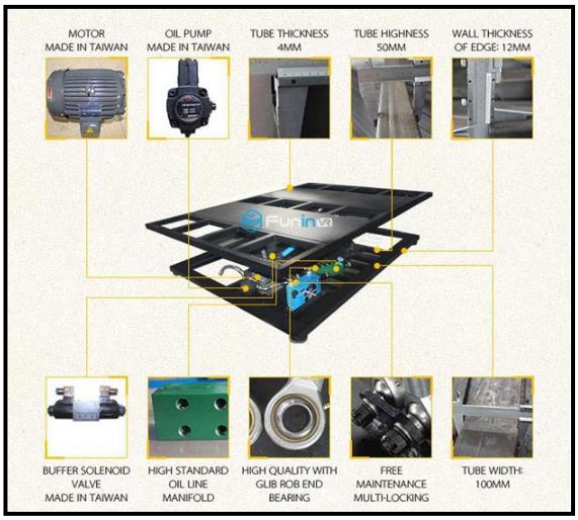


Fig (I-23) Platform feature of hydraulic dynamic technology
Source: (Amusement, 2018)

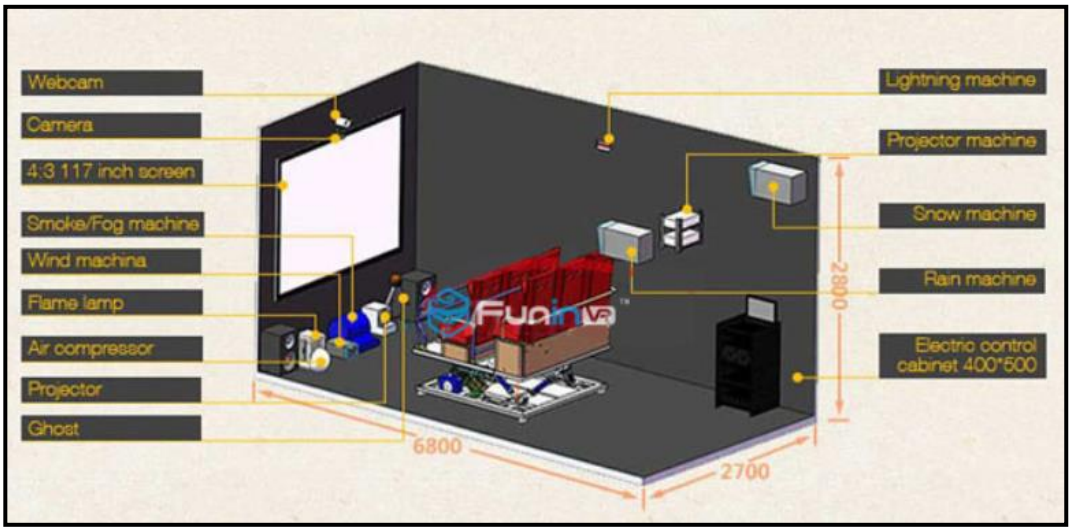


Fig (I-21) the components of 7D cinema
Source: (Amusement, 2018)

There are many equipment included in 7d theater Master System + projection system + sound system +6 DOF dynamic seat system + environment + interactive simulation system effects tools into six parts. The main control system is mainly in the computer software, controls the operation of the entire theater. Projection systems, including the screen, projector. Dual projection technology, 7D and 5D can easily be converted to play. (Amusement, 2018)

3 Analysis of examples:

The analysis tables have been developed according to a method which depends on the classification the most compatible examples in relation to the conditions related to the museum according to international standards and neufert and the analytical study.

An analysis according to the INSE approach which contains two levels of analysis are:

- ✓ The external level which study the urban integration. Accessibility. Circulation and mechanical and pedestrian flow and volumetry as well as facades
- ✓ The interior levels which study the spatial and functional organization. Horizontal and vertical circulation and project structure

We analyzed four museums projects but the comparison is made according to the two best projects which are the most appropriate with technical requirements (Alkam & Dali, 1989).

3.1.1 Technical cards:

Table (I-2) technical card of romanite museum-Source: researcher 2019

romanite Museum		
 Pic (I-18) romanite museum Source: archidaily.com	Location	Niâmes, France
	Project Year	2018
	period	from 2014to 2018
	Architects	Elizabeth de Portzamparc
	Area	9100.0 m2

Table (I-3) technical card of V & A museum-Source: researcher

Victoria & Albert Museum		
 Pic (I-19) V & A museum Source: archidaily.com	Location	1 Riverside Esplanade, Dundee DD1 4EZ, United Kingdom
	Project Year	2018
	period	from 2015 to 2018
	Architect in Charge	Kengo Kuma, Yuki Ikeguchi, Teppei Fujiwara
	Architect	Kengo Kuma
	Area	8500.0 m²

Table (I-4) technical card of Louvre Abu Dhabi-Source: researcher 2019

Louvre Abu Dhabi		
 Pic (I-20) louver Abu Dhabi Source: archidaily.com	Location	Saadiyat Cultural District, Abu Dhabi, United Arabe Emirats
	Project Year	2017
	period	from 2013 to 2017
	Architect in Charge	Jean Nouvel
	Architects	Ateliers Jean Nouvel
	Area	97000.0 m2

Table (I-5) technical card of Etihad museum-Source: researcher 2019

ETIHAD MUSEUM		
 Pic (I-21) Etihad museum Source: archidaily.com	Location	Dubai - United Arab Emirates
	Project Year	2016
	period	from 2014 to 2018
	Architects	Moriyama & Teshima
	Area	25000.0 m²

Table (I-6) technical card of GreenPix -Source: researcher 2019

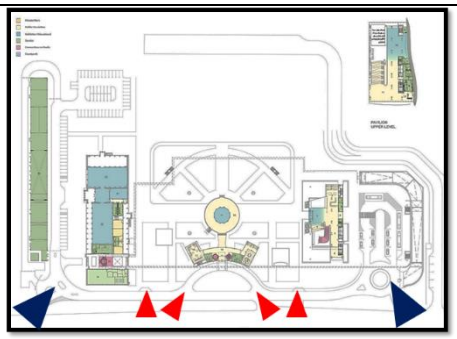
GreenPix - Zero Energy Media Wall		
 Pic (I-22) Greenpix media wall-Beijing Source: archidaily.com	Location	Xicui Road, Beijing, China
	Project Year	June 24, 2008
	Client	Mr. Zhang Yongduo, Jingy Corporation
	Architects	Simone Giostra & Partners Architects
	Area	2300.0 m2

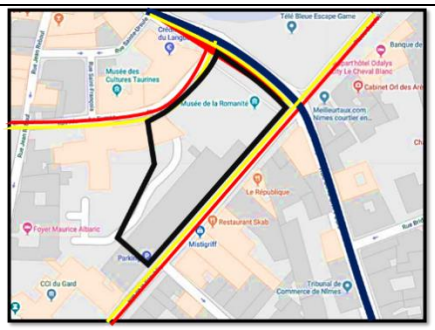
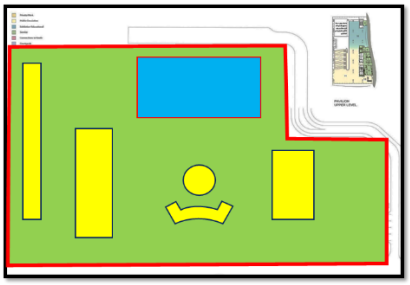
Table (I-7) technical card of Al Bahar Towers -Source: researcher 2019

Al Bahar Towers		
 Pic (I-23) Al Bahar Towers Source: archidaily.com	Location	Abu Dhabi, U.A.E
	Project Year	2012
	Client	Abu Dhabi Investment Council
	Architects	Simone Giostra & Partners Architects
	Area	2300.0 m2

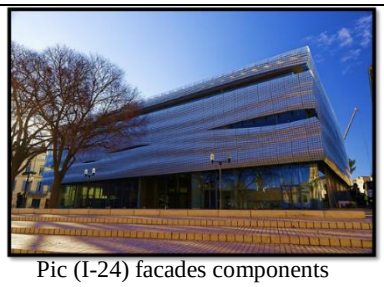
4 Synopsis Analysis of project examples:

Table (I-8) synthesis of examples analyses -Source: researcher 2019

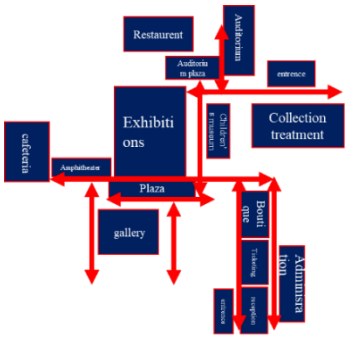
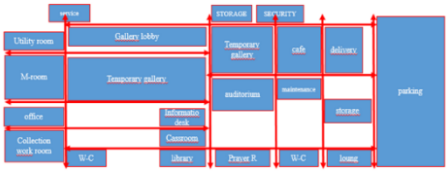
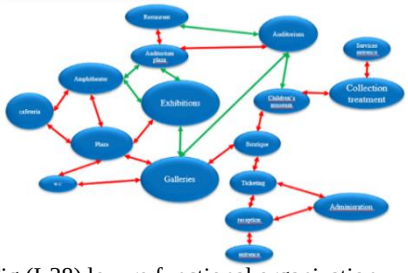
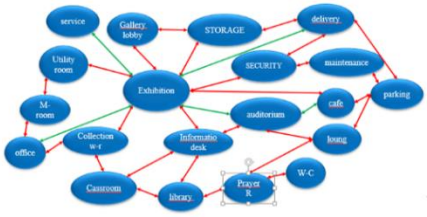
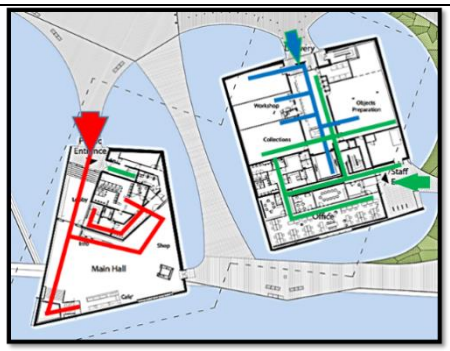
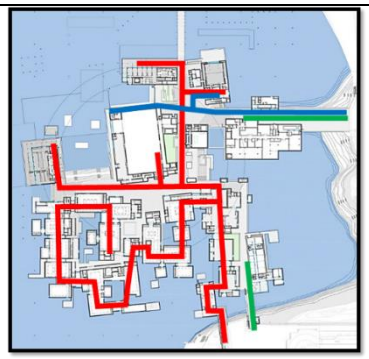
	Victoria & Albert Museum	ETIHAD MUSEUM	synthesis
1-Urban integration	 Fig (I-24) adjacent parcels Source: researcher 2019 -the project is obedience compared to adjacent roads Matching -the project is disobedience compared to the form of adjacent parcels	 Fig (I-25) adjacent roads Source: researcher 2019 -Note that the project is Adjacent to the town	The museum must have a good accessibility and it must be a Visible monument (different)
	Victoria & Albert Museum	Museum of romanite	
2- accessibility	 Fig (I-26) type of adjacent roads Source: researcher 2019 -From the city to the project the accessibility is directly and	 Fig (I-27) type of adjacent roads Source: researcher 2019 -From the city to the project the accessibility is directly and	The museum must have a good accessibility and must be easy to reach Diversity of roads leading to the project
	Louvre Abu Dhabi	ETIHAD MUSEUM	
3- The entrances to the area	 Fig (I-28) main entrances Source: researcher 2019 -the operating mode of the ground entrances was separation	 Fig (I-29) type of entrances Source: researcher 2019 -the operating mode of the ground entrances was separation	-The entrances must be separated according to users and functions function shouldn't be cross each other's Visitors entrance must be away from the others entrances

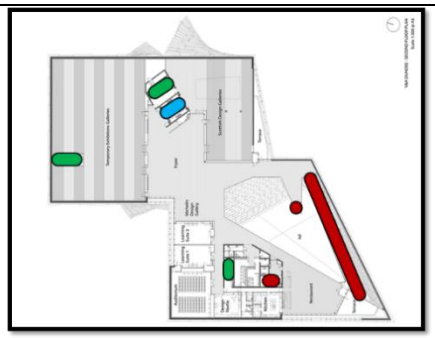
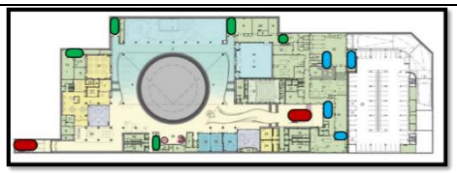
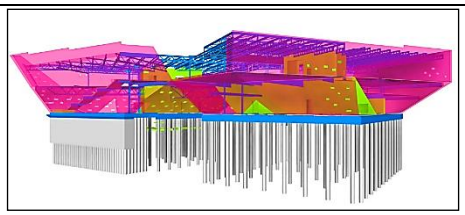
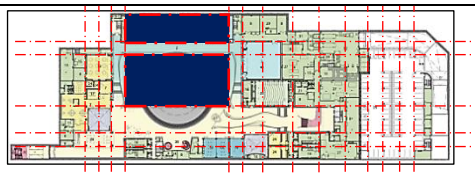
	Museum of romanite	ETIHAD MUSEUM	synthesis
4- the flow	 Fig (I-30) type of the flow Source: researcher 2019 -There is an intersection between the mechanical path and the Pedestrian path	 Fig (I-31) type and direction of the flow Source: researcher 2019 -There is High mechanical flow rate in the area coming from two axes	-The intersection between mechanical and pedestrian flow is acceptable -The flow ratio should be high in the area
	Victoria & Albert Museum	ETIHAD MUSEUM	
5- built and not built	 Fig (I-32) built and no built Source: researcher 2019 The built up area is estimated at 40% of the total area of the project land	 Fig (I-33) occupation of the ground Source: researcher 2019 The built up area is estimated at 25% of the total area of the project land	Prefaces of the project must be landscaping The building Positioning must located after in-depth study
	Victoria & Albert Museum	Louvre Abu Dhabi	
6-The volumetry	 Fig (I-34) project composition Source: researcher 2019 The composition of the project is a simple form and a complecated form following The Linear axis principale	 Fig (I-35) composition principale Source: researcher 2019 Dome: main(bulk) volume Concrete building : secondary volume Complex volume + dome The Linear axis principale	-The complicated form of the project a special look -the forme of the museum must be special

4.1 The Facades:

	Museum of romanite	Victoria & Albert Museum	
1-Rhythm	 Pic (I-24) facades components Source: archdaily.com -All facades of the project are fully homogeneous in their components (glass)	 Pic (I-25) facades rythme Source: archdaily.com -All the facades of the project are characterized by full homogeneity in its components	the rhythm of the facade makes the project more attractive
	Louvre Abu Dhabi	Museum of romanite	
2-The Empty and filled	 Pic (I-26) the empty and the filled Source: archdaily.com -The percentage of empty walls does not exceed 10% Proportionality in color and characterized by gradation -The color used is gray and white and there is homogeneity in the colors -The texture is smooth	 Pic (I-27) the outer envelope Source: archdaily.com -The envelope makes the empty and filled reading difficult -The color used is gray and white and there is homogeneity in the colors -The texture is smooth	-The empty and the filled is up to the exterior nature and the interior function In the museum we need to control the natural light
	Louvre Abu Dhabi	Victoria & Albert Museum	
3-The entrances	 Pic (I-28) louvre entrance Source: archdaily.com -there is no volumetric fit of the entrances with the facades -The main entrance is characterized by the presence of pergola	 Pic (I-29) V & A museum Source: archdaily.com -Note that there is no volumetric fit of the entrances with the facades -All entrances are marked behind the cover	The main entrance must be clearly attractive

4.2 Internal study:

	Louvre Abu Dhabi	ETIHAD MUSEUM	
1-Spatial organization	 Fig (I-36) louvre spatial organization Source: researcher 2019 -all spaces are positioned linearly -Organized linearly and knotty	 Fig (I-37) etihad spatial organization Source: researcher 2019 -all spaces are positioned linearly -Organized linearly	The relation between galleries of the museum must be connected linearly and directly
	Louvre Abu Dhabi	ETIHAD MUSEUM	
2-Functional organization	 Fig (I-38) louvre functional organization Source: researcher 2019 Strong relation weak relation	 Fig (I-39) louvre functional organization Source: researcher 2019 Strong relation weak relation	-The storage and the exhibitions strong - the galleries and the auditorium weak - the galleries and the security strong
	Victoria & Albert Museum	Louvre Abu Dhabi	
3-horizontal movement	 Fig (I-40) H circulation Source: researcher 2019 the movement is integrated only in the entrances And the visitors movement is totally separated	 Fig (I-41) h circulation Source: researcher 2019 VIP circulation visitors circulation Worker circulation	the visitors must be separated from the others circulation -Collections circulation and the workers can be crossed

	Victoria & Albert Museum	ETIHAD MUSEUM	
4-vertical movement	 Fig (I-42) V circulation Source: researcher 2019 collections circulation visitors circulation Worker circulation -The vertical movement is homogeneous in the Project	 Fig (I-43) V circulation Source: researcher 2019 -the multiplicity of vertical movement zones and methods (stairs, elevator , ramp) -Separation in the spaces of vertical circulation	-The simplify of the vertical movement for all the categories -All the methods of the vertical movement must be use
	Victoria & Albert Museum	Museum of romanite	
5-Structural System	 Pic (I-30) concrete walls Source: archdaily.com The structural system of the building generally depends on the bearing walls of the special reinforced concrete with a Metal construction roof	 Pic (I-31) concrete structure Source: archdaily.com The structural system of the building generally depends on the bearing walls of the special reinforced concrete	The use of the bearing system aims to create large spaces for the exhibition spaces
	Victoria & Albert Museum	ETIHAD MUSEUM	
Functional unit Construction Unit	 Fig (I-44) structure system Source: archdaily.com	 Fig (I-45) structure system Source: archdaily.com one functional unite(exhibition)=one structurale unite	It is preferable that the exhibition spaces have no structural obstacles

5 Analysis of the theme examples:

5.1 Greenpix wall:

is a groundbreaking project applying sustainable and digital mediatechnology to the curtain wall of Xicui entertainment complex in Beijing, near the site of the 2008 Olympics.Featuring the largest color LED display worldwide and the first photovoltaic system integrated into a glass curtain wall in China, the building performs as a self-sufficient organic system, harvesting solar energy by day and using it to illuminate the screen after dark, mirroring a day's climatic cycle. (ANWAR, 2017)

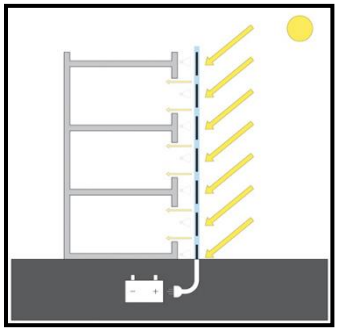


Fig (I-46) photovoltaic system
Source: (archdaily.com, 2018)

Pic (I-32) photovoltaic system
Source: (archdaily.com, 2018)

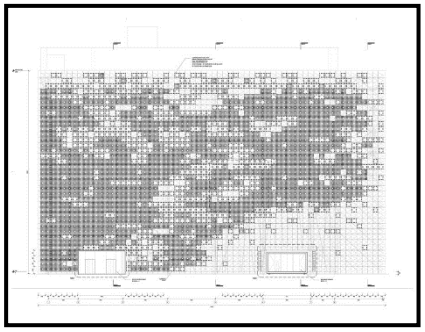


Fig (I-47) front view
Source: (archdaily.com, 2018)

5.2 Al Bahar Towers

The shading screen is computer-controlled to respond to optimal solar and light conditions. The mashrabiya shading devices are grouped into sectors and are operated through sun tracking software that controls the opening and closing sequence according to the sun's angle. Each shading device comprises a series of stretched PTFE (polytetrafluoroethylene) panels and is driven by a linear actuator. The actuator is responsible for opening and closing once per day based on a pre-programmed sequence to prevent direct solar radiation. Under overcast conditions or high wind conditions, a series of sensors integrated on the building envelope will send its logged signals to the control unit to open all units. Figure 3 shows a detailed 3D model of an individual shading device with the actuator, sleeves, arms, and fabric mesh. The system is updated every 15 minutes using a light meter and an anemometer on the roof. In case of weather events, the automated program gets overridden. (Shady, 2017)

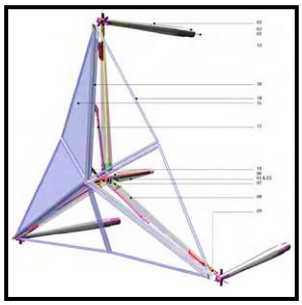
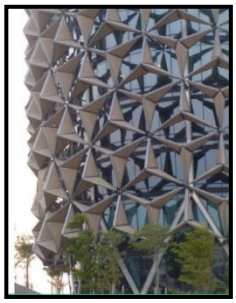


Fig (I-48) 3D model of a shading device
Source: (Shady, 2017)



Pic (I-33) front view
Source: (Shady, 2017)

Pic (I-34) the strut sleeves
Source: (Shady, 2017)

5.3 Theme Applications in the project:

The subject of two important terms which is the architectural envelope and the second is advanced technology

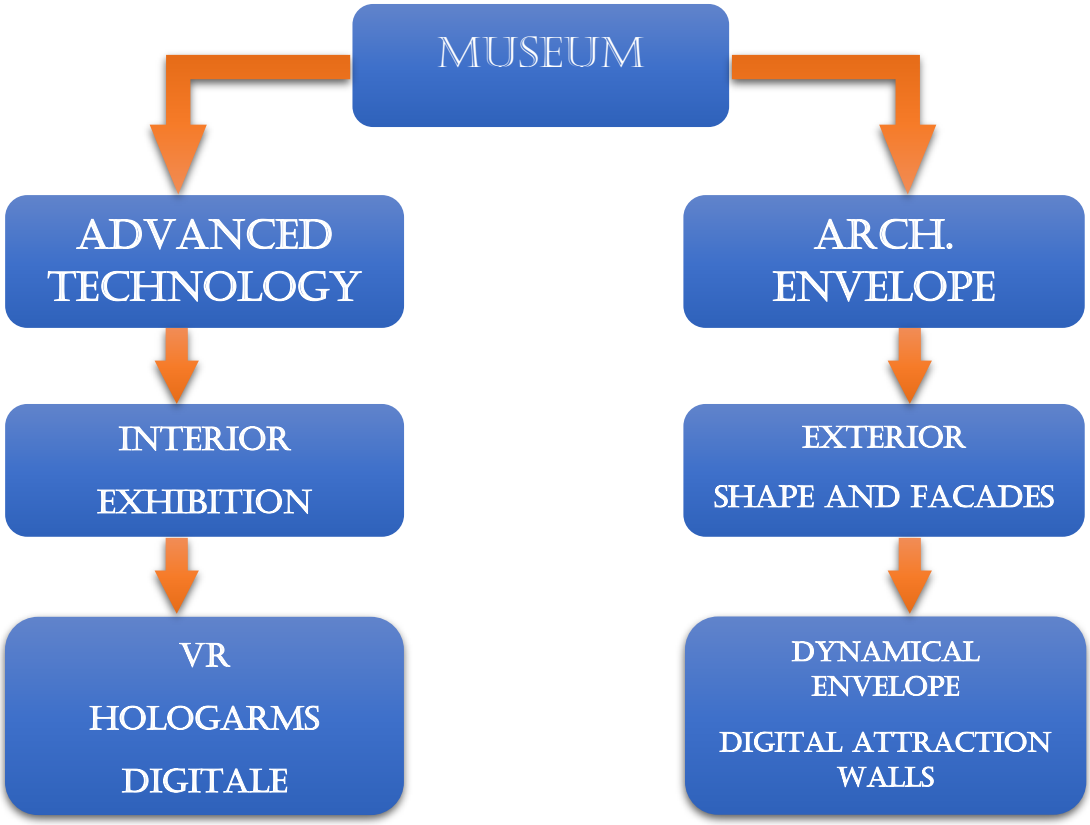


Fig (I-49) relation between the project and the theme
Source: researcher 2019

5.4 Virtual Reality

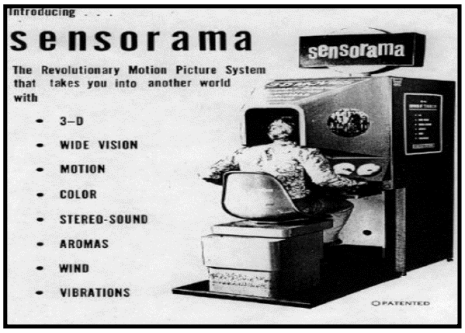
5.4.1 Definition:

- Virtual Reality is electronic simulations of environments experienced via head mounted eye goggles and wired clothing enabling the end user to interact in realistic three-dimensional situations. (Mazuryk, 2006)
- The term (virtual worlds) typically refers to three-dimensional realities implemented with stereo viewing goggles and reality gloves. (Mazuryk, 2006)
- VR is a mediated environment which creates the sensation in a user of being present in a (physical) surrounding. (Mazuryk, 2006)

5.4.2 History of Virtual Reality

5.4.2.1 Sensorama (invited in 1957, Morton Heilig)

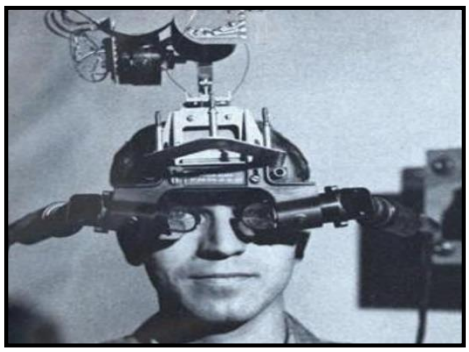
Sensorama is a machine patented in 1962. The system of Sensorama consisted of multi sensors that could make a chromatic film that previously recorded to be augmented by clear sound, smell, the wind and related vibration. The Sensorama was the first way to explore the system of VR, pic(I-35) shows the Sensorama machine.



Pic (I-35) Sensorama simulator device
Source: (Daghestani, 2017)

5.4.2.2 The Ultimate Display (invented in 1965, Ivan Sutherland)

Sutherland tried to suggest a definitive solution for the VR. The suggestion aimed to make system consists of interactive graphics, with sound, smell, and force feedback as the construction of an artificial world. Pic(I-36) shows the proposed ultimate display. The ultimate display suggests using like a Head Mounted Display (HMD) to be as a window for the VR.



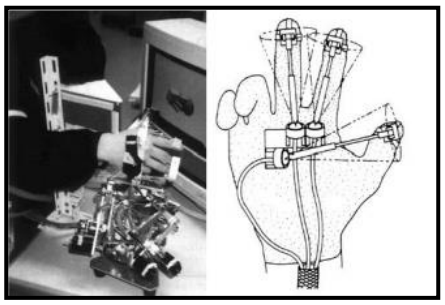
Pic (I-36) the ultimate display
Source: (Daghestani, 2017)

5.4.2.3 The Sword of Damocles:

The Sword of Damocles is neither system nor the early concept of the VR. It considered as the first hardware of VR. The first Head Mounted Display (HMD) constructed by Sutherland. It contains sounds as stereo updated due to the position and navigation of the user. (Daghestani, 2017)

5.4.2.4 GROPE:

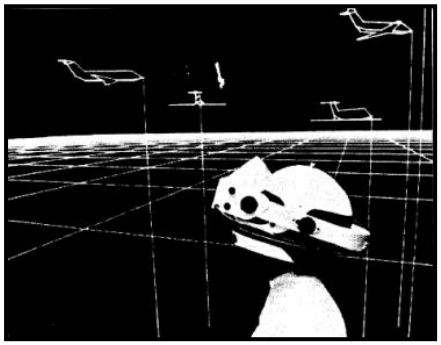
GROPE is "The first prototype of a force-feedback system realized at the University of North Carolina (UNC) in 1971". According to the notion of Sutherland's system, the UNC developed a system to force feedback devices and allow users feel simulated computer force. Pic(I-37) shows the example of a force feedback device. (Daghestani, 2017)



Pic (I-37) Master Manipulator
Source: (Daghestani, 2017)

5.4.2.5 VIVED (created in 1984):

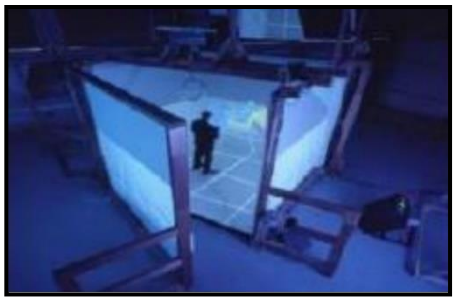
VIVED is an abbreviation of "Virtual Visual Environment Display" that created at NASA Ames with a stereoscopic monochrome HMD. VIVED was created to allow a person to describe his digital world for other people and see it as 3D space. Pic(I-38) shows an example of VIVED. (Daghestani, 2017)



Pic (I-38) VIVED
Source: (Daghestani, 2017)

5.4.2.6 CAVE (invented in 1992):

CAVE is "a VR and scientific visualization system." It uses stereoscopic pictures on the walls of the room instead of using HMD. In CAVE system, the user has to wear LCD shutter glasses "active shutter glasses". Pic(I-39) shows the general structure of the CAVE. It consists of three walls and one door as the fourth wall "flat screens" with projectors to form four projection surfaces. (Daghestani, 2017)



Pic (I-39) Cave Automatic Virtual Environment
Source: (Daghestani, 2017)

5.4.3 System Architecture in Virtual Environments:

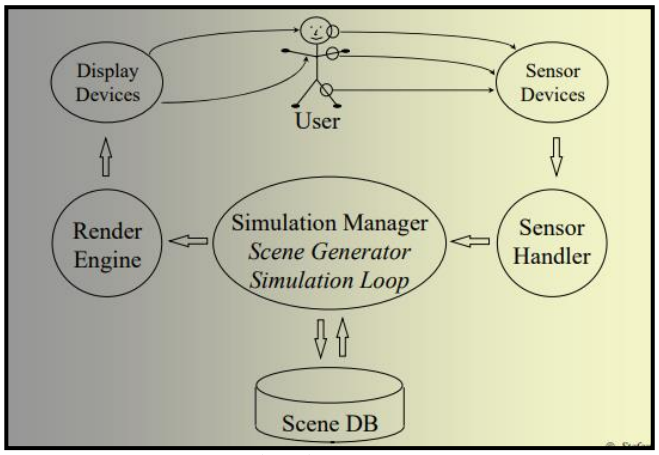


Fig (I-50) VR system
Source: (Seipel, 2018)

5.4.4 Type of VR systems and hardware:

The different types of the VR systems are classified according to different usage of technological supply. The different types of VR systems that use various technological devices and perform different functions are shown through the following explanation:

5.4.4.1 Immersion Systems (Fully-immersive):

The immersion type of VR systems requires the user to wear a data glove and HMD that tracks the user's head movements that then changes the view: This type of VR system encases the audio and visual perception of the user in the virtual world and cuts out all outside information so that the experience is fully immersive,The examples of using full immersion of VR are shown in pic(I-40). (Daghestani, 2017)

Pic (I-40) simulator in full immersion VR
Source: (Daghestani, 2017)

5.4.4.2 Non-Immersive system

The non-immersive system is often called desktop virtual reality (without any input devices) and based on the displayed screens as it is a window to the virtual world without additional devices such as HMD, and it is sometimes called Window on World (WoW) systems. Examples of desktop VR systems represented in pic(I-41). (Daghestani, 2017)

Pic (I-41) desktop VR system
Source: (Daghestani, 2017)

5.4.4.3 Semi-Immersive system:

The third type of VR systems also called hybrid systems. The semi-immersive is a development desktop VR and include additional devices such as Data Gloves. It keeps the simplicity of the desktop VR system, but with a high level of immersion and using physical models. In semi-immersive, the displayed virtual environment is set up onto the recognized real environment. For building semi-immersive system, the requirement is displaying, tracking sensors, and user interfaces. An example of using hybrid systems is shown in Fig(I-51) (Daghestani, 2017)

Fig (I-51) Example of semi-immersive
Source: (Daghestani, 2017)

5.4.5 The differences between the types of immersion VR system:

The following Table 1 displayed the main differences among the three types of immersion VR system:

Tab (I-9) differences between the types of immersion
Source: (Daghestani, 2017)

	Fully-immersive	Semi-Immersive	Non-immersive
Resolution	High	High	Medium - Low
Sense of mersion	Low-Non	Medium - High	Low
Interaction	Low	Medium	High
Price	Lowest cost	Relatively Expensive	Very Expensive

5.4.6 Applications of VR:

- Medicine.
- Engineering and Architecture.
- Data Visualization.
- Augmented Reality.
- Designing.
- Construction progress monitoring.

(Daghestani, 2017)

5.5 Holograms:

5.5.1 Definition:

5.5.1.1 **Holography**:

The science of making holograms which are usually intended for displaying three dimensional images. It is a physical structure that diffracts light into an image. A holographic image can be seen looking into an illuminated holographic print by shining a laser through a hologram and projecting an image on the screen. (e-monsite, 2019)

5.5.1.2 Holograms:

A three-dimensional image formed by the interference of light beams from a laser or other coherent light source. (english oxford living dictionaries, 2019)

Etymologically, hologram means "whole writing". In Greek holos means "whole" and gramma "writing". By definition, therefore, it designates a technique by which an image is written in volume. A 3D photograph in short! As often, it was first a dream before being a reality. The very idea of an image in volume was mentioned by Jules Verne in his collection the Castle of the Carpathians (Janda, 2007)

5.5.2 The history of the holograms:

- It is the British physicist of Hungarian origin, Dennis Gabor, who discovers in 1948, the principle of holography, which earned him the Nobel Prize for Physics in 1971. He invented holography (1947-1949) at the Thomson-Houston laboratory in England.
- In 1962, Dr. Yuri N.Denisyuk, physicist of the Soviet Union, develops a reflection hologram that can be seen in white light. In 1967, he made the hologram of a person. This hologram is called a "pulsed holographic portrait" because of the use of the pulsed ruby laser for recording.
- In 1968, Stephen Benton developed the first hologram by visible reflection in white light. This one is christened rainbow hologram because it uses all the colors of the rainbow. This hologram has quickly become popular: it is the one found on bank notes.
- In 1972, Lloyd Cross developed the integral hologram by combining the knowledge of holography with cinematography to produce a three-dimensional image that seems to be moving. (e-monsite, 2019)

5.5.3 Type of holograms:

5.5.3.1 Holograms by transmission:

The hologram by transmission is the most common. The laser light register the hologram and transcript it. The object is illuminated by two beams from the same laser. Each beam plays a very important role in the realization of the hologram. One can capture the shapes of the object and the other acts as a spot. (Essam, 2014)

5.5.3.2 Holograms by reflection:

The reflection hologram has the great advantage of being visible white light (sunlight or a standard lamp). In addition to visible white light, installation is easier to achieve because it does not require much equipment compared with the hologram transmission.
The equipment required is as follows: anti vibration table, a laser, a lens, a reflecting mirror, a holographic film or plate, an object and a shutter. (Essam, 2014)

5.5.3.3 Rainbow hologram:

The rainbow hologram is simply the most widespread and more present in our daily lives. The rainbow hologram has the distinction of being restored by the white light so the angle of view appears with several colors. We can easily see it on our credit cards, in advertising, gadgets (collectible cards, for example) or in software. (Essam, 2014)

5.5.4 Application of the holograms:

5.5.4.1 Holographic Interferometry

As the holographic recording process is dependent on the interference pattern generated due to the two coherent, monochrome optical waves, the holographic image is the comparative shape between these two waves. The holographic interferometry utilizes this property to enable static and dynamic displacement of objects with optically rough surfaces to be measured to optical interferometry precision. (Ratan, 2015)

5.5.4.2 Data Storage:

Holograms are being extensively researched for high capacity data storage devices for entertainment and computing purposes. Though there are technical and material challenges to holographic data storage, they could yield capacities of a trillion bits per square centimeter. (Ratan, 2015)

5.5.4.3 Security:

Complex holograms are much more difficult to reproduce compared to static images. For this reason, holograms are often placed on valuable items to reduce the chances of forgery. Common security applications of holograph include labels on credit cards and images embedded in government currency. (Ratan, 2015)

5.5.4.4 Hologram Making Recent News:

Recently thousands of people protested against a draconian law which endangered civil liberties in Spain. To challenge the legislation passed, the activists called on people all over the world to volunteer to become a hologram in the protest. It has been world's first holographic protest. (Ratan, 2015)

5.5.5 Holograms in the Future:

The general public is fascinated by holograms. However, holograms are major business. It is suggested that by 2020 the market for genuine, display holograms will be worth $5.5 billion. Here are some of the incredible ways holograms are currently used.

- Military Mapping
- Medical
- Art

Holograms used to be the stuff of science fiction that was “coming to a theater near you”. However, the practical uses of holographic technology have eclipsed the film industry and become a commonplace feature in our everyday lives. (Rooms, 2018)

Pic (I-42) architecture use of the holograms
Source: (Rooms, 2018)

Pic (I-43) medical use of the holograms
Source: (Rooms, 2018)

6 Ground Analysis:

6.1 Location of the state:

The city of Algiers is located on latitude 36.73° north, and longitude 3.09° east of the Greenwich line At 113 meters above sea level. It is characterized by its excellent land and sea location. It is located on the edge of the north-eastern slopes of Mount Buzaria, overlooking the Mediterranean Sea, North and Northwest winds. Its bay extends from the head of Rais Hamido to Ras Tammanfust in the form of a 31-km arc.

Fig (I-52) Algerian map
Source: (a Mairie d'Alger Centre, 2018)

6.2 State limits:

-The Mediterranean Sea to the north.
-Blida State to the South
-Boumerdes to the East (Wadi Harrach)
-Tipaza to the West

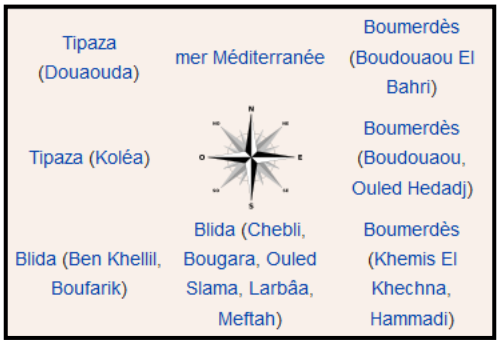


Fig (I-53) the strut sleeves
Source: (a Mairie d'Alger Centre, 2018)

6.3 Weather Study:

The warmest month of the year is August, with an average temperature of 25.2 ° C. January is the coldest month, with temperatures averaging 11.5 ° C

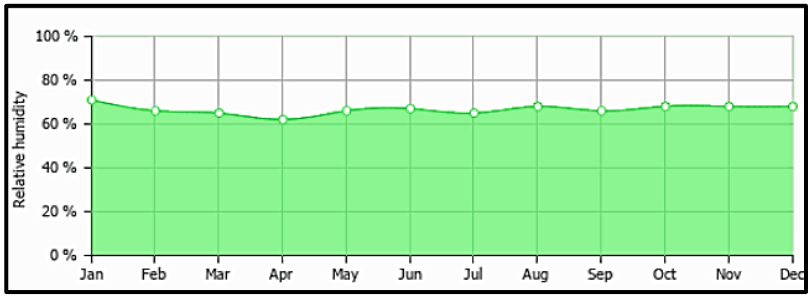


Fig (I-54) the strut sleeves
Source: (Weather Princeton, 2019)

-On average, January is the most humid.

-On average, April is the least humid month.

-The average annual percentage of humidity is: 67.0%

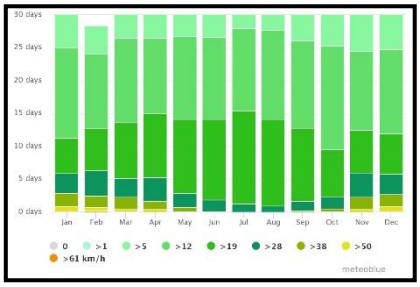


Fig (I-55) Wind speed
Source: (Weather Princeton, 2019)

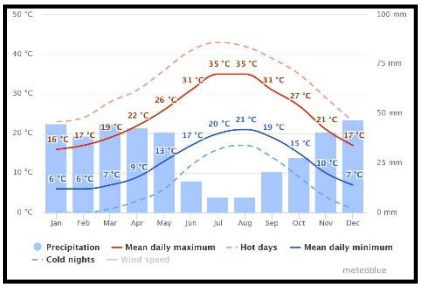


Fig (I-56) temperatures and precipitation
Source: (Weather Princeton, 2019)

6.4 Location of the ground:

The ground is located on the northern side of Hussein Dai in the capital north of the double road leading to the north of the capital, west of great Algiers mosque, Hilton hotel, commercial complex Ardis and Wad Al Harrach and the parking of sablat, making the site accessible nationally and locally.

The mechanical accessibility is good where the ground is located adjacent to the highway No. 11 and adjacent to the car park of sablette and near the footpaths.
So we can say that the roads leading to the land are regular and structured.

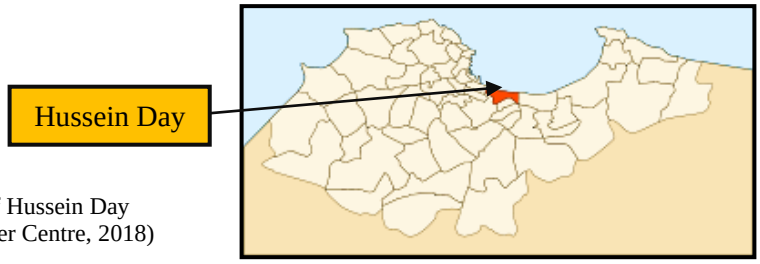


Fig (I-57) location of Hussein Day
Source: (a Mairie d'Alger Centre, 2018)

Fig (I-58) the most important monuments surrounding the area
Source: researcher 2019

6.5 Reasons for choosing a floor:

- The land is planned by the government to build a national museum.
- The land is located in an urban area planned to be the new tourist and urban pole of the state of Algeria.
- The land makes the project of great national and continental importance.
- The site's attractions are the most important destinations of the Ardis Market and the Sablat Resort.

6.6 Ground morphology:

-The ground is irregularly shaped close to the pentagon.

-It is estimated at 38,000 square meters.

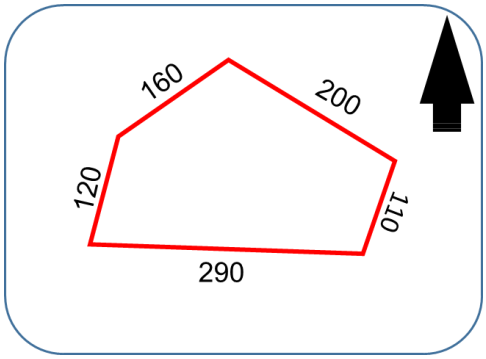


Fig (I-59) Dimensions of the surface (m)
Source: researcher 2019

6.7 The surrounding space:

The ground is flat the accessibility is directly (mechanical or pedestrian) and there is a Panoramic views to the sea the parking also all these factors gives the project site the Strengths to be a very suitable site for a museum.

6.8 The surrounding architectural style:

When we talk about the architectural style for a national museum located in a capital like Algiers, we must take the entire territory of the capital, its history and its style in consideration, why not all over the country.

Fig (I-60) the surrounding space
Source: researcher 2019

6.9 Topography:

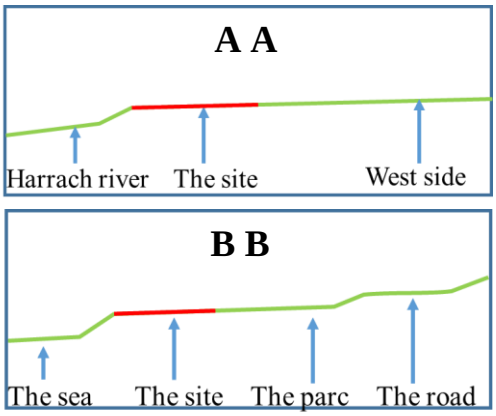


Fig (I-61) ground sections
Source: researcher 2019

Fig (I-62) the project ground
Source: researcher 2019

6.10 Solarization study:

The site is exposed to sunlight all day without any protection and especially the west side and this is what needs to be found a solutions to control the sun rays With Taking in consideration the project interfaces that must be the facade of the capital.

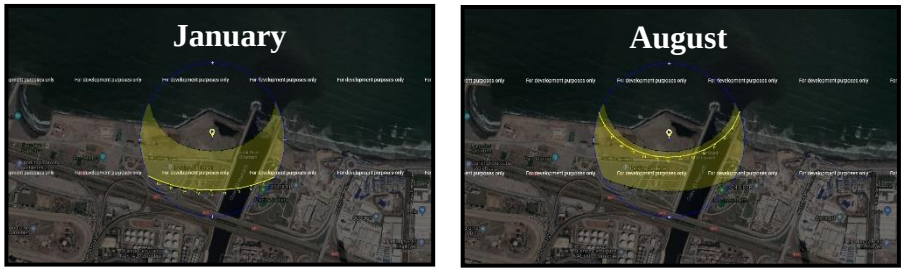


Fig (I-63) sun path
Source: (Tools for consumers , 2018)

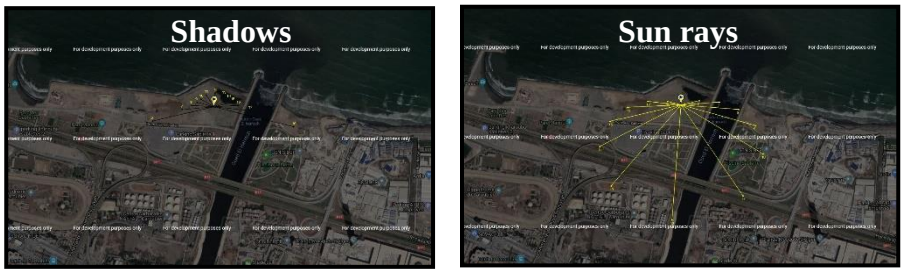


Fig (I-64) sun path
Source: (Tools for consumers , 2018)

6.11 Wind study:

From the wind rose of the capital we note that there two dominant direction of the winds from the north east and the east north east and the west and the west south west.

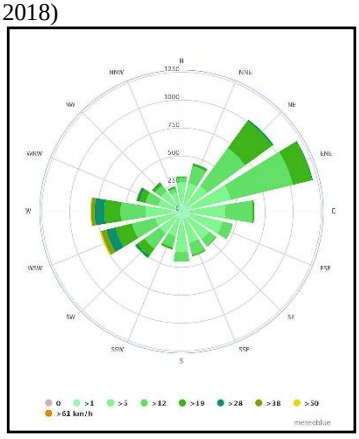


Fig (I-65) Wind rose
Source: (Weather Princeton, 2019)

7 Surface programs of the National Museum of Technology:

This program is the program developed through the official program of the Ministry of Culture in addition to the technical requirements and analysis of examples and analysis of the ground and the architectural and urban programming.

Table (I-10) Surface programs of the National Museum of Technology -
Source: researcher 2019

Administration……..295m			
Spaces	Unitary Surface	nbr	Total Surface
Services entrance	20	1	20
Director office	25	1	25
Accountant office	25	1	25
Secretary office	15	1	15
Meeting room	40	1	40
Archive	50	1	50
VIP room	45	1	45
Washrooms	20	1	20
Lounge	55	1	55

Visitors……..….1800m			
Entry hall	300	1	300
Information and reception	110	1	110
Ticketing hall	80	1	80
Boutique	120	1	120
Plaza	220	1	220
Prayer room	60	1	60
Classroom	50	2	100
Library	120	1	120
Cafeteria	100	1	100
Storage	20	1	20
Restaurant	250	1	250
Kitchen	80	1	80
Storage	30	1	30
Workshop	50	1	50
Lounge	80	1	80
Washrooms	40	2	80

Exhibition…….……4635			
Permanent exhibition gallery	1250	1	1250
Temporary exhibition gallery	800	1	800
Amphitheatre	250	1	220
Auditorium	500	1	500
Public media library	210	1	210
Holograms Animation	350	1	350
7D 9D Animation + VR	200	1	200
Introductory and animation	225	1	225
Robotic exhibition	100	1	100
Pixel hall	100	2	200
Children's hall	145	1	145
Collection…….860			
Delivery bay	100	1	100
shipping and receiving	180	1	180
Storage	150	2	300
Collection workroom	160	1	160
restoration workshop	120	1	120

Service…….865			
Security office	80	2	240
Building maintenance room	75	1	75
Electrical room	40	2	80
Service room	90	2	180
Multipurpose room	50	1	50
Fire command room	40	1	40
Technical room	120	1	120
Garbage room	20	2	40
Water control	40	1	40
Used Surface……..8120m			
Circulation surface…….1220(15%)			

The total surface of the project…….9340m

Conclusion:

After we discussed in this chapter everything related to the museum, from the cultural intellectual affiliation to the science that falls within it through the most important definitions and the functional and spatial characteristics and after mentioning the most important conclusions extracted from the analysis of the examples and the ground we can say that the study phase has been done and we have all The points we need in the design of the museum from standards and laws and methods of applying the techniques of the subject in our design of the museum

And from the most important laws and standards that we have extracted from our study is the full physical integration of our project to the good study of the mechanical and pedestrian connectivity and the absolute clarity of the entrances of the ground and the project and the external design of the

project ground is very importance like the internal design and the most important extracted from the exterior study is the project's mentality, which must give an impression on the difference and the intellectual and architectural importance through its unusual shape and its vague facades that give the desire to explore this building and know its function while not forgetting the nature and the surrounding environment Which affects the project and is affected by either internally As for any project dedicated to the public, the welfare of the users must be studied carefully and the project message should be delivered to them with ease and clarity. We should not forget the importance of preserving of the exhibits from the hour of their entrance to the museum, to the storage to display and its techniques to maintenance.

With the most important applications of our subject in the project, which will be on the level of the outer envelope and exhibits.

From here we have got all that we need to pass directly to the design phase of the National Museum of Technology aims and objectives that we will discuss in the next chapter.

Chapter III: Applied stages for the completion of the National Museum of Technology project

Introduction:

After we discussed and explained everything related to the architectural envelope and advanced technology and after the analytical study of the museum and mentioned all the related definitions and characteristics and technical and functional Requirements and after the extraction of the spatial program of the National Museum of Technology we have gathered all we need to cross to 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 to design a museum which achieve all its objectives and showing how to translate the design idea at the external and internal level of the museum and to show how the most important elements of the theme are applied in the project

To clarify what we said earlier this chapter will contain the most important objectives and elements of the theme which will be applied in the project and also the most important objectives of the project with a sequential mention of the transition elements, the internal and external behavior of the project and the design stages and the basic design idea in the project shape, facades and various internal functions

With 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

Through this chapter we aim to show how to incorporate technology in the museum internally and externally, where the latest technology will be used in the exhibition and the exhibits and in the external envelope of the museum which will control itself automatically according external to the climate changes and internal requirements, and we seek to change the idea of the old museums and give New look for museums and a new approach to architecture towards the widespread use of advanced technology and driving the tourism sector through a world-class museum

1 Objectives of the theme:

- ✓ Using dynamic envelope 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.
- ✓ Using VR technology widely to introduce visitors to interesting experiences that are almost real they would not have been able to experience it without this technique.
- ✓ The use of hologram technology to transfer museums and exhibits from the two-dimensional to the three-dimensional and to display some of the items that cannot be brought and displayed in the museum.
- ✓ Using the pixel wall inside the museum to give a modern look to the museum and for the purpose of advertising and awareness about the use of the museum and even in guiding visitors and the definition of areas and their characteristics And of course it is used for entertainment.
- ✓ Use the pixel screen outside the museum to attract attention broadcast important ads and to host concerts and major cultural and artistic festivals

2 Objectives of the project:

- ✓ Create a tourist and cultural pole at the national and international levels for that the design should be unusual and in line with the latest artistic and architectural expressions.
- ✓ Design a Project in line with scientific and technological progress and global standards by working through the latest technology and ICOM recommendations.
- ✓ Helping to fill the needs of the capital and the state in such projects. According to the Algerian legislator, each citizen has an area of 0.01 m 2 of museum that produces a national need for 74 museums of a contemporary national museum.
- ✓ The most important element to be taken into account is that the project should be based on the Algerian-Arab Islamic identity through the inclusion of the Islamic architectural elements and the inclusion of the traditional urban character of the capital, taking into account the customary and traditions
- ✓ Changing the people's view of the museums and promoting and cultivating the culture of their visits.
- ✓ Change the way of the design and construction of projects and stimulate the use of technology widely.

3 Crossing elements:

3.1 Techniques and details of topic applications in the project:

3.1.1 The dynamical envelope:

3.1.1.1 electrochromic glass

electrochromic glass (Dynamic Glass) allows users to control the amount of heat or light that passes through the glass at the flick of a switch, giving them the ability to regulate temperatures or create privacy at the flick of a switch fig (III-3). (John, 2010)

3.1.1.2 programmed Sun blocker:

They are elements of the architectural envelope that move automatically vertically pic (III-1) and horizontally fig (III-1) according to the movement of the sun and the internal requirements of light and heat where they are connected with thermocouples and Thermal sensors which control their movement.

fig (III-1) horizontal elements
Source: (RANA, 2017)

Pic (III-1) vertical elements
Source: (Arnold, 2018)

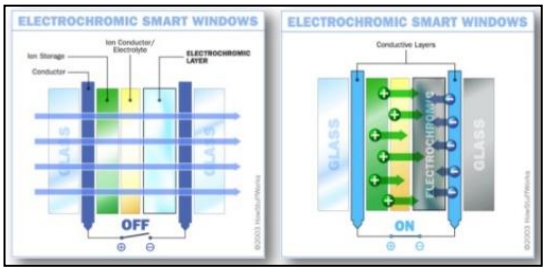


fig (III-2) VR exhibition
Source: (John, 2010)

3.1.2 The VR technology:

Fully immersed in 360 degrees, you can look around, and you feel like you're there. That's the power of virtual reality, especially on room-scale and Vive that we have to work from. The power is that we can take the user anywhere in the entire universe throughout all of time for a Scientific and historical experiences.

Visitors to the museum, will step into a six-foot-long by six-foot-high box, put on an Oculus Rift headset and begin "operating" a new exciting experience in 4-D, accompanied with surround sound, air cannons shooting steam into their face and a quaking floor beneath their feet.

Pic (III-3) VR exhibition
Source: (Larsen, 2017)

Pic (III-4) VR box
Source: (EXHIBITS, 2018)

Pic (III-5) VR Hamlet and remote control
Source: (Strohanova, 2017)

3.1.3 The hologram technology:

Hologram Table (pic 16), which is the first time that we've been able to represent 3D holograms for more than one user simultaneously With this technology, the simple glasses allow you to still see the real world and still see each other. As you collaborate, or you're experiencing the three-dimensional model you're looking at. (HIGGINS, 2018)

The Pepper's Ghost (pic 15) technique is used inside a museum's showcase, at a small scale The Pepper's Ghost effect is an apparition of something that does not effectively exist but appears as if it was just in front of our eyes. It is an illusion of reality. (Pietroni, 2018)

The pyramid hologram (pic 17) has a difference of form. He has many faces! By multiplying the windows, he makes sure to be observable from several angles, a pyramid on a base can attract the eye of any passerby, no matter where it comes from. It is therefore the ideal device to a masterpiece or precious things in 3D.

fig (III-3) Euclideon's Hologram Table
Source: (HIGGINS, 2018)

Pic (III-7) three-dimensional globe
Source: (Technologies, 2018)

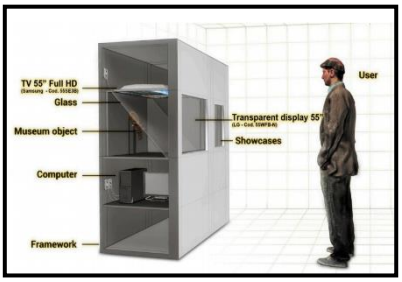


fig (III-4) Technical scheme of digital holograms for museums
Source: (Pietroni, 2018)

3.1.4 The pixel screens:

3.1.4.1 LCD[1] Videowalls:

LCDs deliver high definition visuals – all the way up to 4K ultra HD – that look great from any distance and usually from wide viewing angles (pic 18). They also make it possible and relatively easy to introduce touch interactivity by adding overlays or sensor frames around the perimeters.

These LCD videowalls are aggregations of individual displays, all snugged together in different configurations to create much larger visuals – invariably as rectangles of different dimensions. They most typically get arranged in a variety of clusters, such as 2 wide by 2 high, or 3 high by 6 wide. (eBook:, 2017)

Pic (III-8) LCD show Source: (EU, 2019)

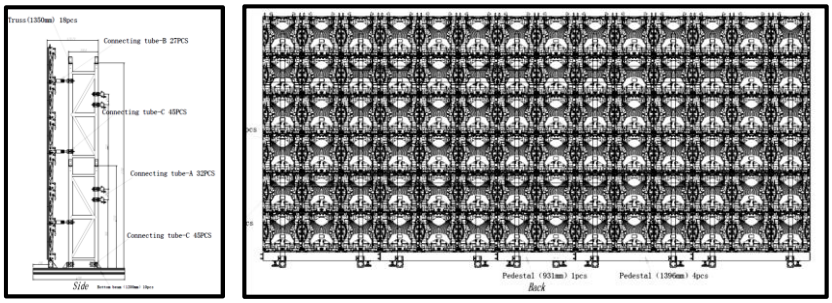


fig (III-5) rear and side view of the LCD wall Source: (EU, 2019)

3.1.4.2 LED[2] Videowalls:

Direct-view LEDs have been around for many years, but it's only been in the last three years that they've gained much attention or use. The jump in interest is because of something called pixel pitch (pic 21) – this mean the distance in millimeters between the LED light clusters. (eBook:, 2017)

Pixel wall which will initially be used for entertainment Anyone can play around with the code to create their own super-sized display made from any number of pixels. What exactly passes for a pixel in this situation is limited to the user's imagination.

Pic (III-9) LED Screens in L.A. Source: (Staff, 2018)

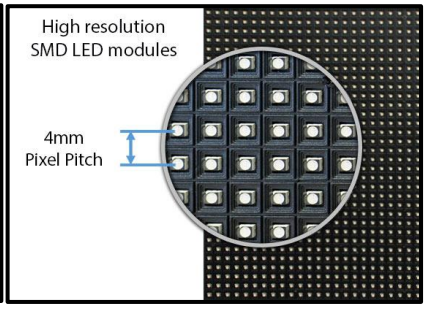
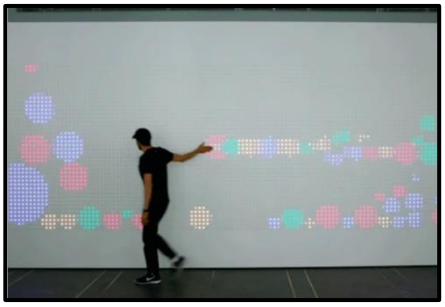


fig (III-6) pixel pitch Source: (Chip, 2018)



Pic (III-10) pixel wall Source: (DEBCZAK, 2016)

[1] liquid crystal display.
[2] light-emitting diode.

3.2 Compartmental study:

3.2.1 External study:

3.2.1.1 Solarisation:

-The site is exposed to sunlight during all the day without any protection.

-The use of afforestation initially to protect the project from harmful sunlight.

-Programming the dynamical envelope to fully control the amount of light entering the project

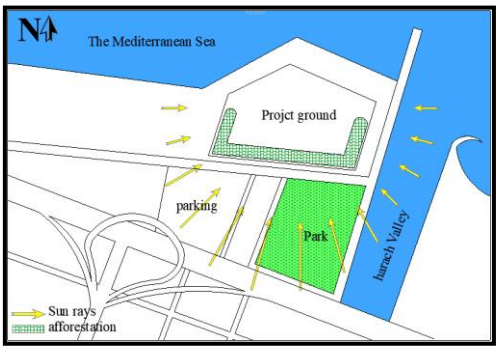


fig (III-7) sun rays paths
Source: researcher 2019

3.2.1.2 The wind:

-The site is not protected against the wind and totally exposed to it.

-Program the dynamic envelope to fully control the amount and speed of the air entering the project and create streams that help to reduce moisture

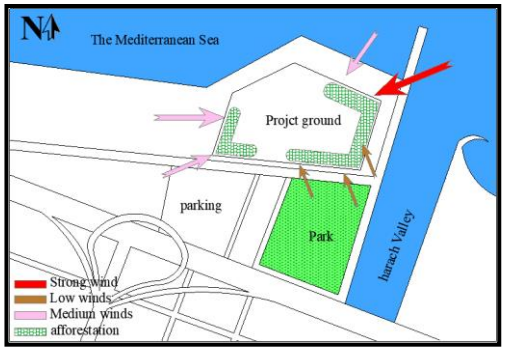


fig (III-8) wind direction
Source: researcher 2019

3.2.1.3 Physical problems:

-Topography of the ground is flat and without any obstacles.

-The safety distance between the project, the sea and the valley should be taken in consideration.

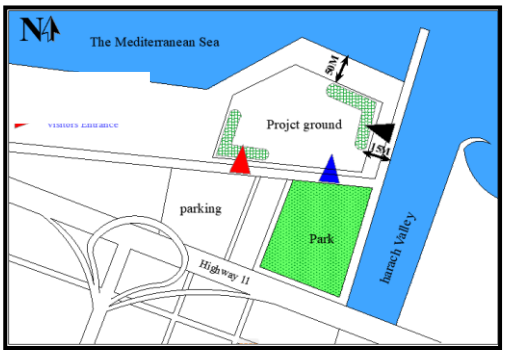


fig (III-9) physical factors of the ground 1
Source: researcher 2019

3.2.1.4 Accessibility and the flow:

-The mechanical connectivity of the city to the project is excellent for the presence of the project floor near Highway 11 and the parking of sablette.

-In the case of the start of sea transport through the sea or Wadi Harrach, it would be good for the project's accessibility, which will provide good and effective marine accessibility for the project.

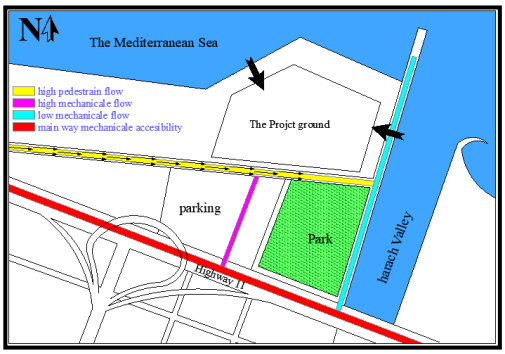


fig (III-10) physical factors of the ground 2
Source: researcher 2019

-The pedestrian accessibility is so weak because there is one pedestrian passage connecting the city and the Sablette Park and it is very far from the project ground this is a problem that hinders visitors from coming to the museum, which necessitates finding a solution to it by creating a pedestrian passage near to the project ground and cross Highway 11.

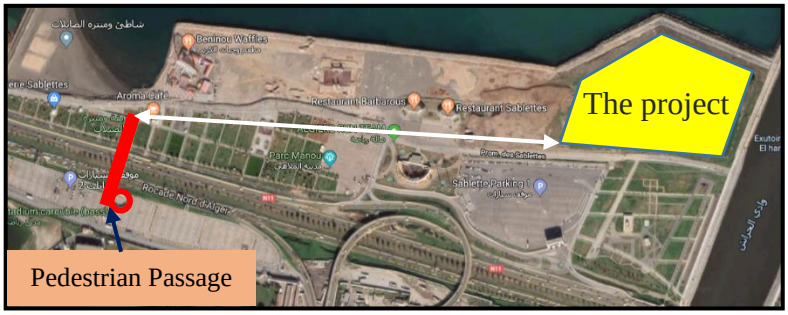


fig (III-11) The pedestrian accessibility
Source: researcher 2019

3.2.2 Internal study:

3.2.2.1 <u>The most important sections in the museum are:</u>

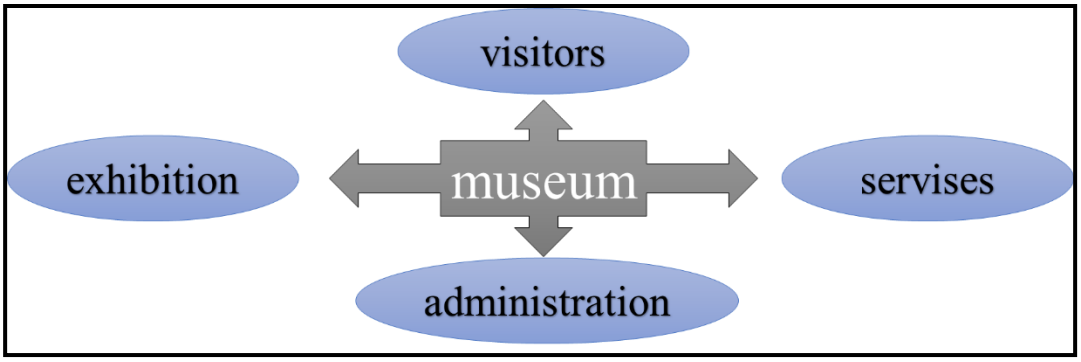


fig (III-12) important sections in the museum
Source: researcher 2019

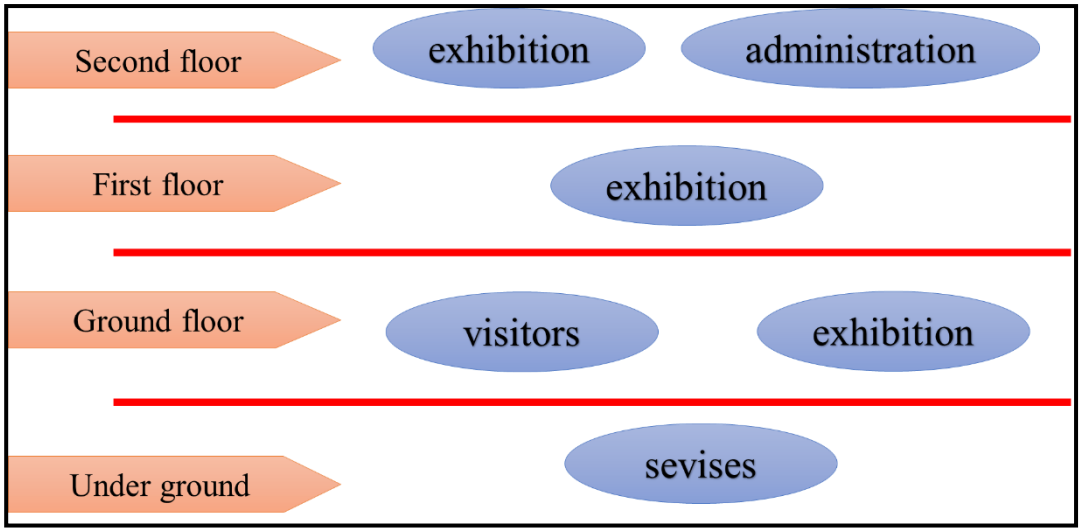


fig (III-13) important sections in the museum
Source: researcher 2019

3.2.2.2 Distribution of the most important spaces on the floors:

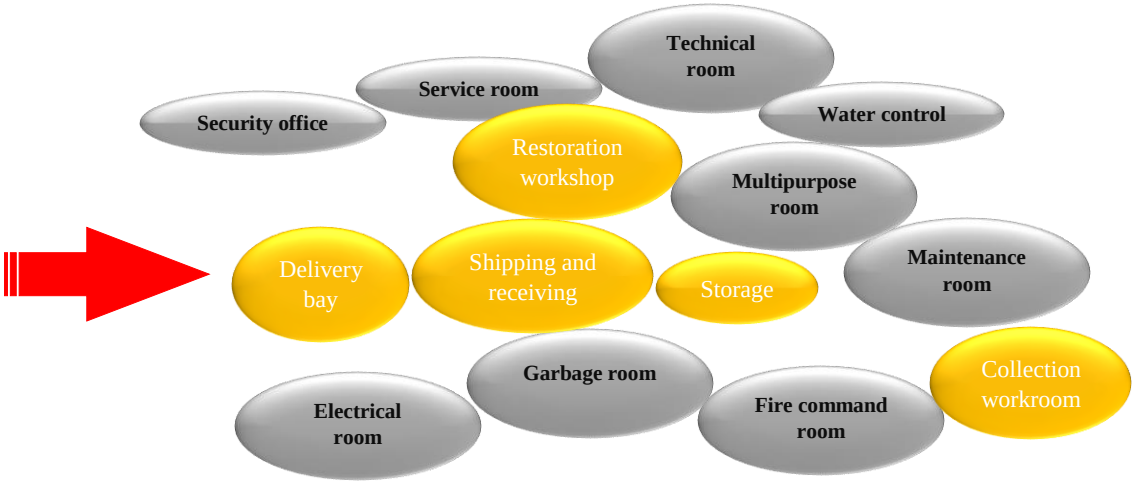


fig (III-14) under ground floor
Source: researcher 2019

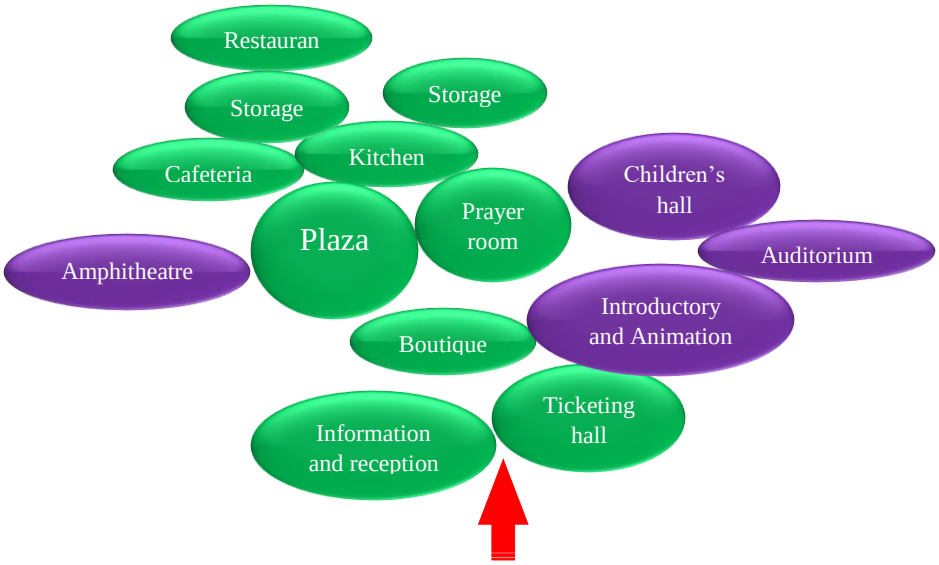


fig (III-15) ground floor
Source: researcher 2019

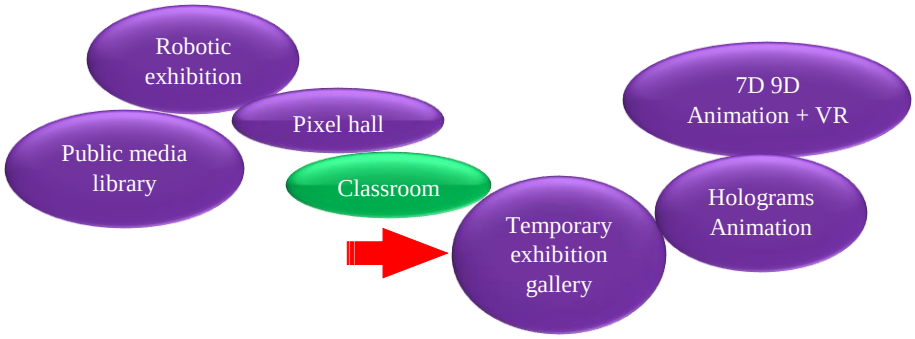


fig (III-16) first floor
Source: researcher 2019

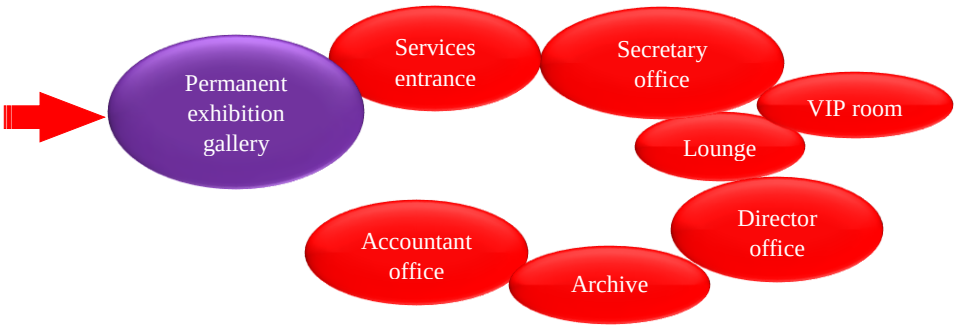


fig (III-17) second floor
Source: researcher 2019

3.3 Design Idea:

The basis and source of the idea is the nucleus and the movement of electrons around it and we chose it because it is always considered an icon and representative of technology and modern science.

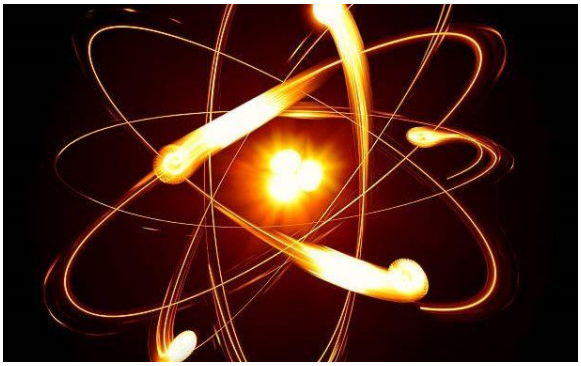


fig (III-18) second floor
Source: (Technologies, 2018)

After the electrons' paths were balanced with the positive energy of the atom, the optical axes from the proximal surroundings of the project intervened to change the paths, and create the main lines of the project shape, and also create the dynamic elements of the project.

fig (III-19) surroundings of the project Source: researcher 2019

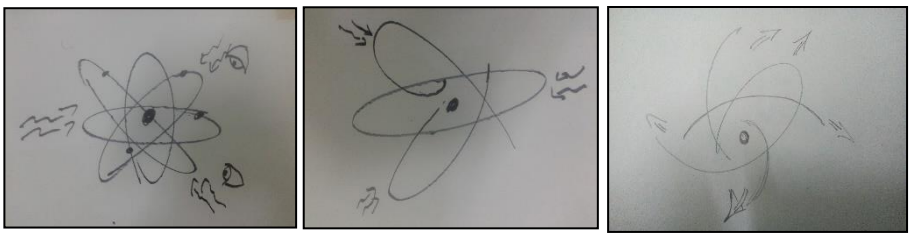


fig (III-20) how the optical axes changes the paths Source: researcher 2019

3.3.1 Design Idea of the façades:

The basic idea of the facades depends on the inclusion of the basic idea with the main entrance given a force where all the main lines of the interface are beginning and ending on it.

With the treatment of the sky line to match the mountain region and with the sea to give the project a modern look, the dimensions of the Grand Mosque were taken as relative references to the dimensions of the project in Length and height.

The vertical element was used to draw attention and parallels between the Great Mosque minaret and the Ferris wheel of sablette

As for the treatment of the openings, the dynamic elements of the architectural envelope were used to comply with external conditions and internal requirements. The facades were designed on two axes

-North-south, where electrocrometric glass was used and dynamic elements moved up and down.

-East-west used elements moving left and right according to the movement of the sun.

Use double cover to reduce moisture control.

Pic (III-10) the vertical elements
Source: (a Mairie d'Alger Centre, 2018)

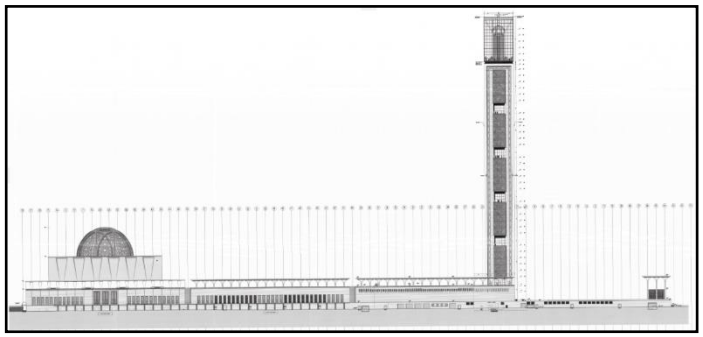


fig (III-21) the north elevation of the great mosque
Source: D.U.C.H Algiers

4 Graphic presentation of the project:

Project introduction:

The project is located in Algiers, specifically in the municipality of Hussein Day in the west of Wad El Harrach where the general form is not understood and ambiguous, which makes the project prominent and well known
The project contains an underground floor and 3 other floors where all the conservation and maintenance facilities are located on the underground floor, the other areas are distributed to other floors according to their requirements while the administrative sector is located on the second floor away from the public.

4.1 Site plan:

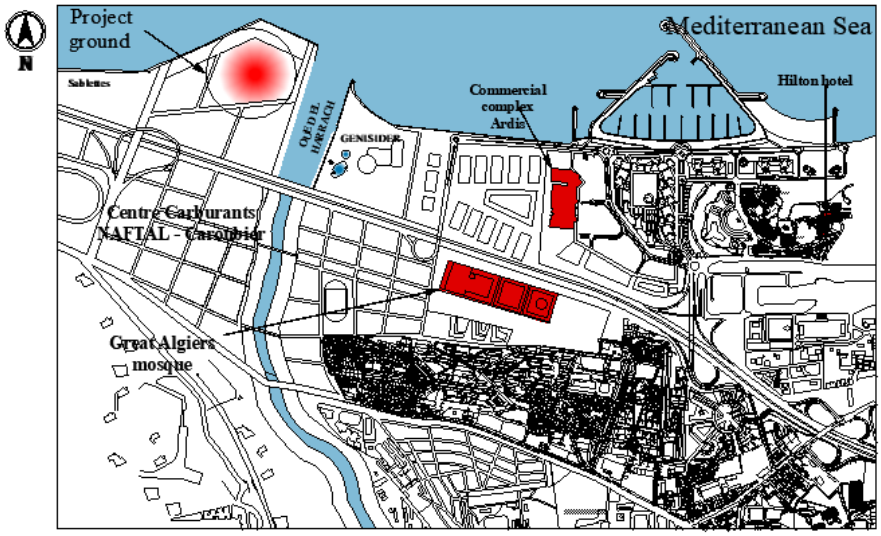


fig (III-22) Site plan
Source: researcher 2019

4.2 Vicinity plan:

fig (III-23) Vicinity plan
Source: researcher 2019

4.3 Under ground floor:

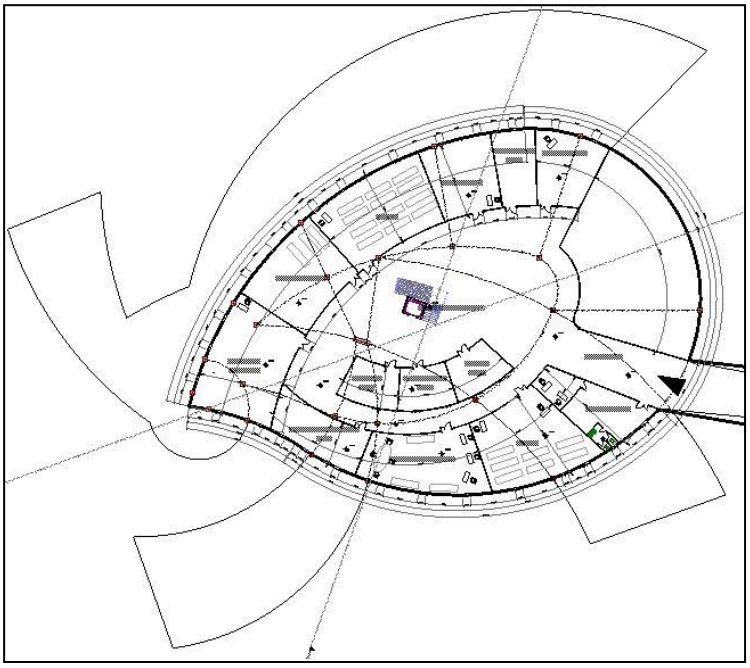


fig (III-24) Under ground floor plan
Source: researcher 2019

4.4 Ground floor :

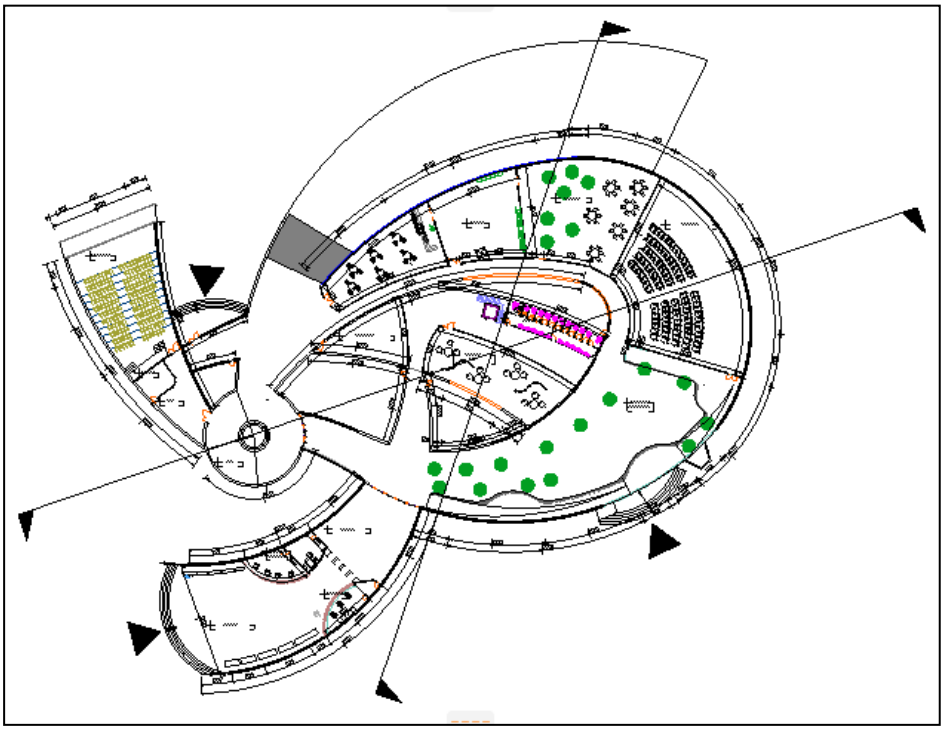


fig (III-25) Ground floor plan
Source: researcher 2019

4.5 First floor plan:

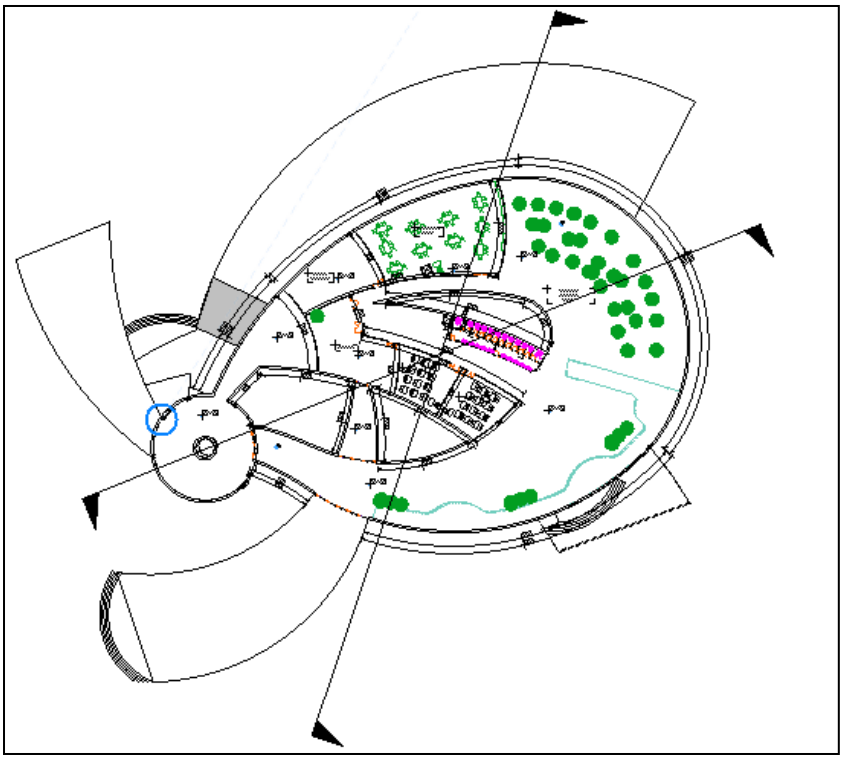


fig (III-26) First floor plan
Source: researcher 2019

4.6 Second floor plan:

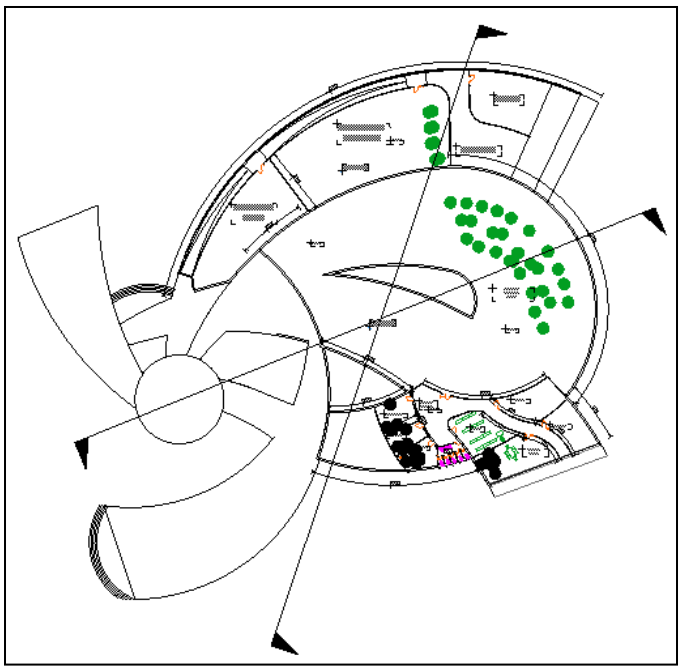


fig (III-27) Second floor plan
Source: researcher 2019

4.7 The facades:

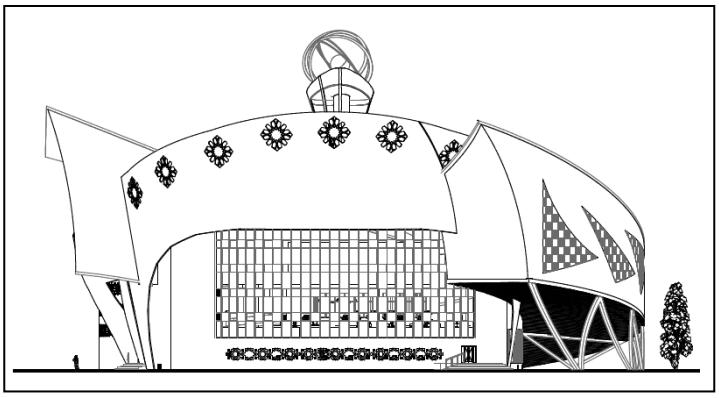


fig (III-31) Eastern facade Source: researcher 2019

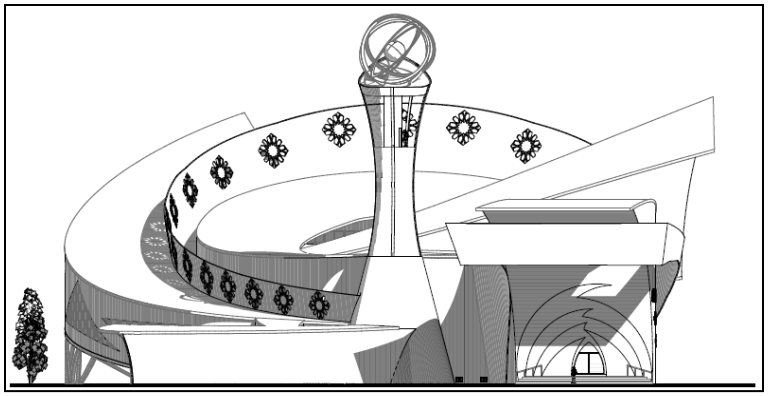


fig (III-29) West facade Source: researcher 2019

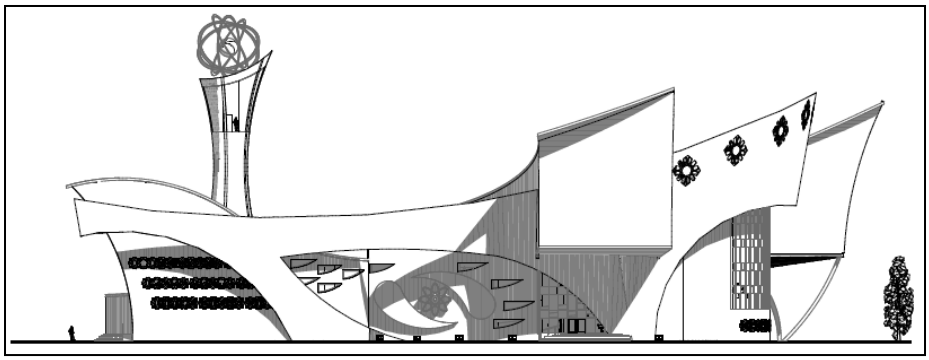


fig (III-30) South facade Source: researcher 2019

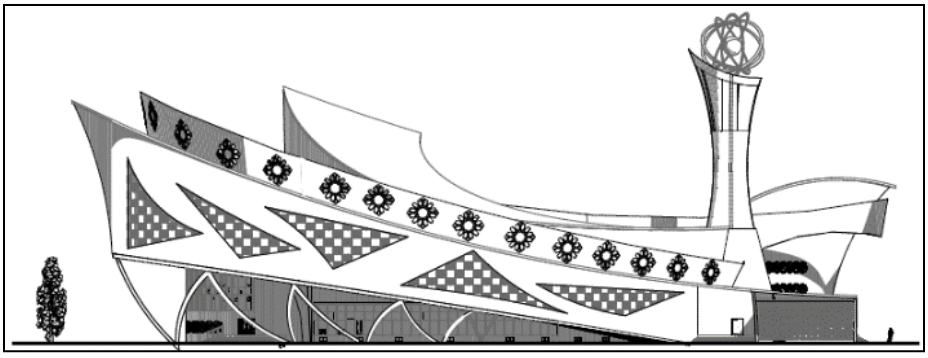


fig (III-28) northern facade Source: researcher 2019

4.8 The Sections:

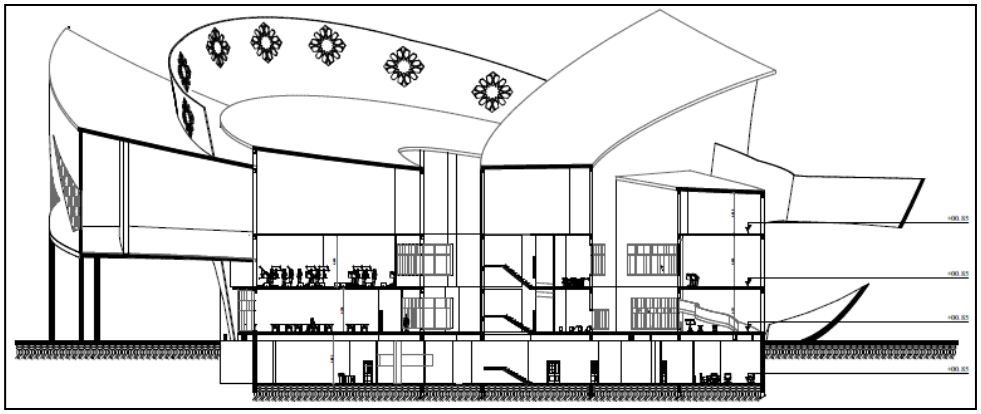


fig (III-32) section AA Source: researcher 2019

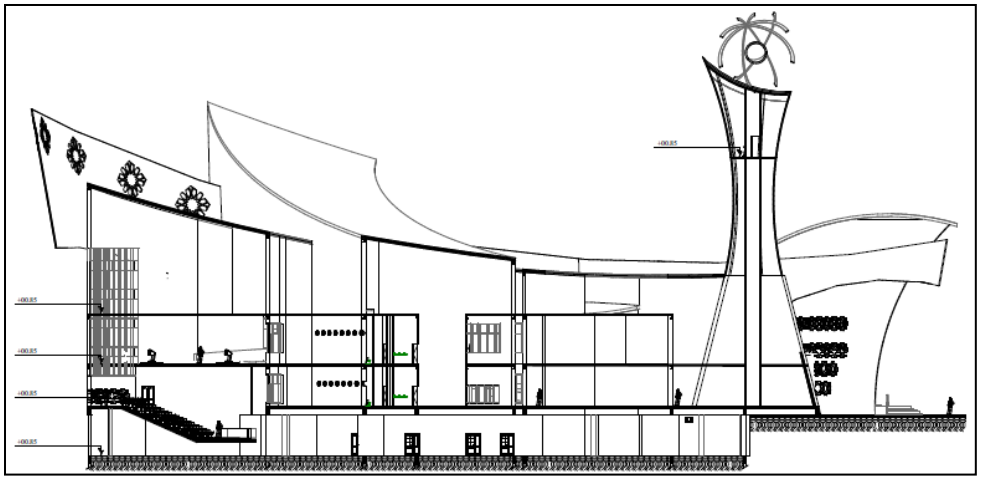


fig (III-33) section BB Source: researcher 2019

4.9 The Views:

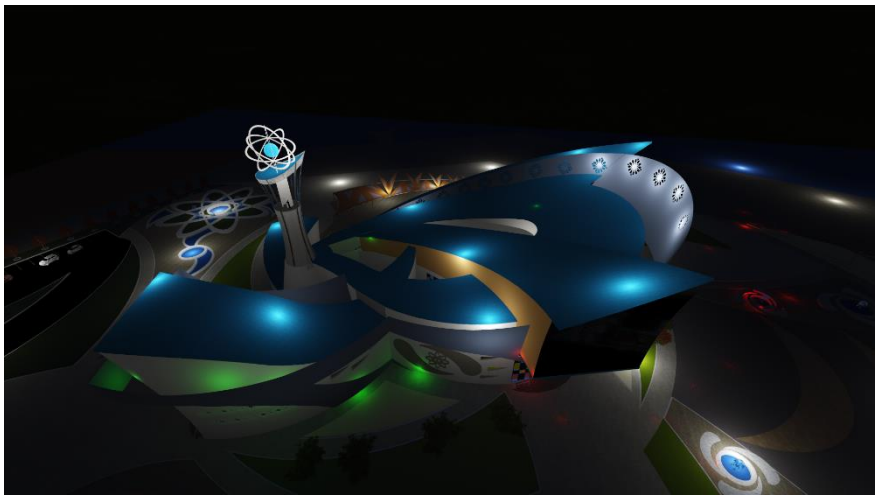


fig (III-34) Exterior view Source: researcher 2019

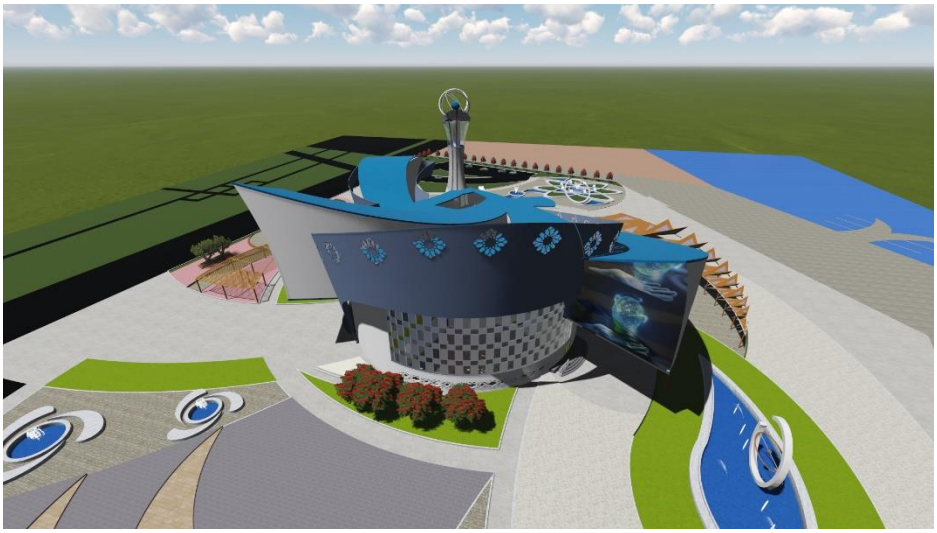


fig (III-35) Exterior view Source: researcher 2019

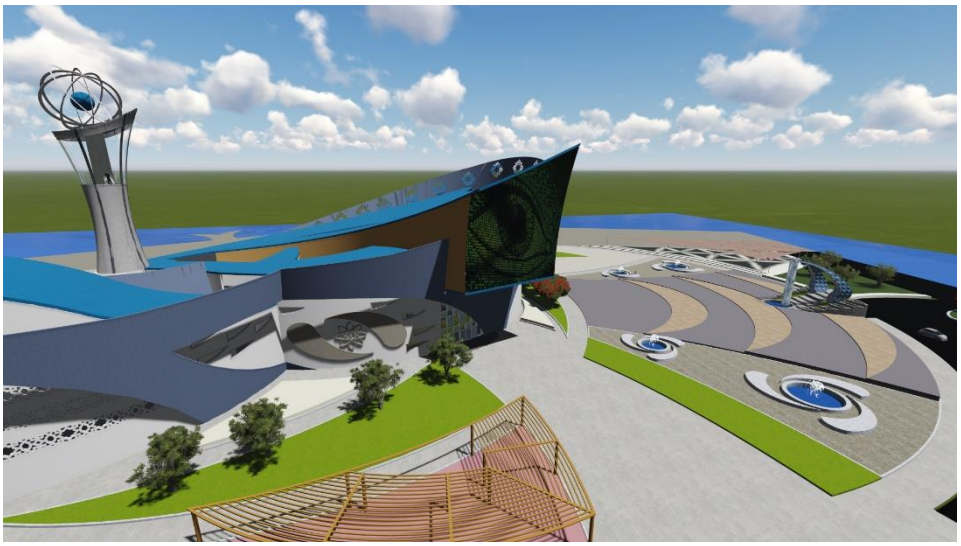


fig (III-36) Exterior view Source: researcher 2019

fig (III-37) Internal view Source: researcher 2019

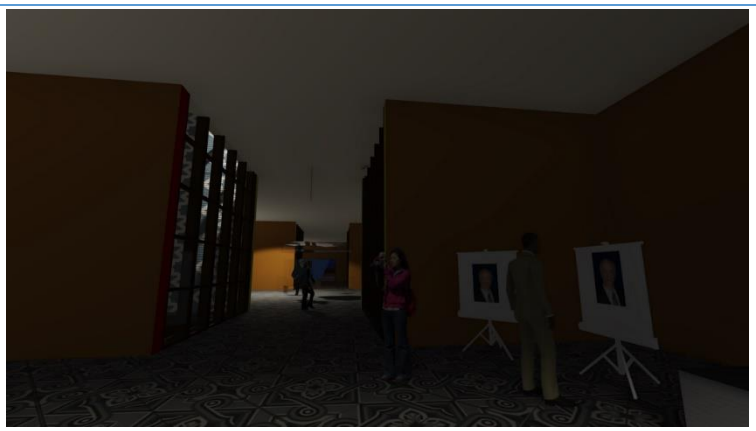


fig (III-38) Internal view Source: researcher 2019

fig (III-39) Internal view Source: researcher 2019

Conclusion:

After the completion of the conceptual and analytical study of everything related to the subject and the project we have extracted all the need for the design of the National Museum of Technology project

In this chapter we discussed the most important stages of the design of the museum starting with the objectives and applications of the subject and the objectives of the project Then we mentioned the elements of transit, which include study of the internal and external behavior of the project and the general design idea and the design idea of the facades and then the graphic presentation of the entire project from plans facades sections and Interior and exterior views, and some details of complex architectural elements

After following the previously established crossing elements and incorporating the subject techniques into the project, we were able to change the museum from a traditional project (a traditional museum) to a modern architectural masterpiece based on technological techniques. It brings attention and makes people come to visit it through its unusual dynamic form and envelope we have also been able to minimize energy use and control the amount of light and air within the project

The most important goal has been to change the concept of the museum and move it from the historical museum, which presents everything related to history, customs and traditions to the modernity and modern 3D digital display methods, especially the VR system, which can introduce the visitors in a new experience, which can even a part of this experience

With the widely use of 2D and 3D digital technology we have brought a largest number of visitors, attracted by passion and love of new knowledge in advanced technology.

GENERAL CONCLUSION

The importance of technology in our time and its impact on all areas of life made it the destination and goal of all and to acquire it and control it and use it to develop and update all fields of life in the life of the individual and groups of economy, culture, education and medicine. Technology is used to increase its effectiveness and improve its functions and it was necessary to architectural architecture and it is considered one of the most important fields and to join the technology in line with modernity and scientific progress and to develop the internal space in which a person lives to suit his needs and modern requirements and do not forget also In keeping with the environment to be positive and not negative

In order to find the best ways and means to integrate advanced technology and architecture, we offer this work and the systems of the stages of the first entrance, through which we were able to understand and know the reasons for choosing a national museum project of technology, the most important of which is on the development of tourism and the dissemination of the culture of museums and The first chapter covers all concepts related to the architectural cover, advanced technology and its most important applications, and the most important thing concerning the museum, starting with the culture and museum science, to the definitions of the museum. The second chapter dealt with the most important The system and the technical requirements of the museum and we analyzed the examples of the project and the subject and we discussed the most important applications of the subject in the project and we presented a comprehensive analysis of the ground and culminated in the recent launch of the official program of the National Museum of Technology

From this chapter we extracted the most important standards, rules and technical requirements for the design of the project

And the third chapter is the applied chapter in which the objectives of the project and the elements of transit and a complete graphic presentation of the project and this chapter was presented by showing how to integrate and integrate advanced technology and architectural envelope with a museum project

And for the good functioning of this work we followed the methodology of I.N.E.S that helped us to reach and achieve the goals we sought to achieve from this subject and the project and one of the most important of these goals

- Setting up a world tourist destination in Algiers

- Changing the old view of the museums and giving a new perspective that fits the modern era and technological development

- Designing a project on the latest scientific and technological progress

- Establishing a culture of museum visits to the Algerian people

- Building an environmentally friendly building

- Algeria's need for museums

After a thorough examination of this project, we will propose the following recommendations

- Stay away from expensive traditional designs and not environmentally friendly

- The use of advanced technology to facilitate the integration of developed countries and the improvement of architecture

- Study the needs and requirements of users for each project according to its function and characteristics

In the end we find the necessity of using technology in future architectural projects, which would raise the level of tourism and culture in the country and the use of technology in museums in order to get them out of the idea that museums are historical facilities only and that their function is storage and display only, but are places of science Entertainment and highlighting the culture of societies. It should be remembered that contemporary museums have become economic and tourist facilities.

BIBLIOGRAPHY

a Mairie d'Alger Centre. (2018, 11 23). Récupéré sur www.apc-algercentre.dz: http://www.apc-algercentre.dz/

A.hamid, A. (2013). *Types of Building envelopes.* CAE Department, Drexel University.

Alkama & Dali, (1989). Fiche technique de la phase analyse. Biskra : I.N.E.S d'architecture.

Amusement, Z. (2018, 06 01). *Zhuoyuan Amusement Rides 7D Interactive Cinema*. Retrieved from xd-cinema.com: https://www.xd-cinema.com/zhuoyuan-amusement-rides-7d-interactive-cinema/

ANWAR, M. F. (2017). *INTELLIGENT BUILDING FACADES.* Delhy: MOHAMMAD FAHAD ASLAM.

archdaily.com. (2018, 10 26). Retrieved from www.archdaily.com: https://www.archdaily.com/

Arnold, C. (2018, 11 18). *Building Envelope Design Guide - Introduction*. Retrieved from www.wbdg.org: https://www.wbdg.org/guides-specifications/building-envelope-design-guide/building-envelope-design-guide-introduction

ATAOĞLU, N. C. (2016). NEW DESIGNS IN CIRCULATION AREAS AND MUSEUMS THE CASE OF THE QUAI BRANLY MUSEUM. *Uludağ University Journal of The Faculty of Engineering, Vol. 21, No. 1,*, 117-129.

Attia, S. (n.d.). pp. 2-45.

Barritt, P. (2018, 04 08). *Alamy Stock Photo*. Retrieved from www.alamy.com: https://www.alamy.com/stock-photo-musee-dorsay-d-orsay-art-gallery-and-museum-interior-paris-france-18401400.html

Chip, S. (2018, 10 17). *LED Signs Pixel Pitch and Resolution*. Retrieved from chipshow.com: http://www.uschipshow.com/news/led-signs-pixel-pitch-and-resolution.html

culture, m. (2008). *Normalization of cultural infrastructures and facilities.* Direction des Etudes Prospectives de la Documentation et de l'Informatique.

Daghestani, L. F. (2017). Environments and System Types of Virtual Reality Technology in STEM: A Survey. *International Journal of Advanced Computer Science and Applications*, 77-89.

DEBCZAK, M. (2016, 06 07). *An Interactive Wall at Google Is Made From Thousands of Arcade Buttons*. Retrieved from http://mentalfloss.com: http://mentalfloss.com/article/81204/interactive-wall-google-made-thousands-arcade-buttons

eBook:. (2017). *The Ultimate Videowall Guide.* America: WHP-LFD-ULTIMATEVIDEOWALL-FEB17J.

emma. (2015, 06 18). *Customs and Traditions From Around the World*. Retrieved from www.mobal.com: https://www.mobal.com/blog/travel-talk/destination-guides/customs-and-traditions-from-around-the-world/

e-monsite. (2019, 01 05). *Les différents types d'hologrammes*. Récupéré sur tpehologrammertv.e-monsite.com: http://tpehologrammertv.e-monsite.com/pages/tpe/les-hologrammes/page-2.html

english oxford living dictionaries. (2019, 01 23). Retrieved from en.oxforddictionaries.com: https://en.oxforddictionaries.com/english

Essam, E. B. (2014, 01 11). *Holograms*. Retrieved from www.institut-numerique.org: https://www.institut-numerique.org/4-holograms-52d0f22a380c5

EU, C. (2019). *LED DISPLAYS AND MORE.* BELGIUM: EU network catalogue.

evanscherr. (2014, 02 2014). *Scherrology*. Retrieved from evanscherr.wordpress.com: https://evanscherr.wordpress.com/2014/02/16/origin-technology/

EXHIBITS, V. (2018). *LAFAYETTE SCIENCE MUSEUM | VR EXHIBIT DESIGN*. Retrieved from voxxexhibits.com: https://voxxexhibits.com/casestudies/lafayette-science-museum-virtual-reality-integration/

Floray, S. (2005). *NPS Museum Handbook.* Washington, DC: National Park Service.

GARTNER, J. (2017, 08 26). *gartner*. Retrieved from archiexpo.com: http://www.archiexpo.com/prod/josef-gartner/product-58213-992545.html

Hart, C. (2016, 12 19). *Bridging Realities—The Official Blog of Stambol Studios*. Retrieved from medium.com: https://medium.com/stambolstudios/ar-vr-at-the-museum-817c81987455

Helzel, M. (2005). *Enveloppes de bâtiments en acier inoxydable.* Luxembourg: ISBN 2-87997-107-1.

HIGGINS, S. (2018, 06 03). *Euclideon's Hologram Table at SPAR 3D '18*. Retrieved from spar3d.com: https://www.spar3d.com/news/related-new-technologies/euclideon-hologram-table-spar18/

HOOPER, E. (2018, 12 25). *Snøhetta's Lacy Envelope in Oslo's Barcode District*. Retrieved from archpaper.com: https://archpaper.com/2014/01/snohettas-lacy-envelope-in-oslos-barcode/

Janda, M. (2007). *Digital Hologram Synthesis.* Czech: DCSE.

John. (2010, 09 28). *What is Electrochromic Glass?* Retrieved from smartglassinternational.com: http://www.smartglassinternational.com/what-is-electrochromic-glass/

Larsen, L. (2017, 08 11). *VR simulation lets you visit the Berlin Wall – before it fell*. Retrieved from www.digitaltrends.com: https://www.digitaltrends.com/virtual-reality/vive-studios-vr-museum-exhibits-help-you-experience-history/

Leung, K. (2019, 03 07). *Plans for bigger Hong Kong Science Museum*. Retrieved from www.scmp.com: https://www.scmp.com/news/hong-kong/society/article/2189073/plans-bigger-hong-kong-science-museum-be-finished-end-year

Licht, F. (2018). *Good Lighting for Museums,Galleries and Exhibitions.* Stresemannallee 1960596 Frankfurt am Main Germany: Fördergemeinschaft Gutes Licht (FGL).

MacDonald, J. (2016). *Guide to better building envelopes for large buildings.* new found land labrador.

Mahler, M. (2017, 10 31). *Museum of Veterinary History* . Retrieved from www.vet.uzh.ch: https://www.vet.uzh.ch/en/fakultaet/museum.html

Mairesse, A. D. (2011). *Key Concepts of Museology.* Armand Colin.

mark f. warren ,CCP,LEED UP. (2011). building envelope for the everyday CxA. *NATIONAL CONFERENCE BUILDING COMMISSION.* WSP FLACK .

Mazuryk, T. (2006). *Virtual Reality History, Applications, Technology and Future.* Austria: Institute of Computer Graphics.

Nady, R. (2017). Dynamic Facades Environmental Control Systems for Sustainable Design. *Renewable Energy and Sustainable Development*, 118-127.

neufert, e. (2010). *Les éléments des projets de construction.* paris: dunod.

Pietroni, E. (2018, 10 28). Bringing the Illusion of Reality Inside Museums. *MPDI*, p. 43.

Poirazis, H. (2004). *Double Skin Façades for Office Buildings.* Lund: KFS AB.

RANA, M. (2017, 01 09). *INTERNATIONAL ARCHITECTURE*. Retrieved from http://architectboy.com: http://architectboy.com/bird-nest-stadium-national-stadium-beijing-china/

Ratan, A. (2015). *Holography Working Principle and Application.* Dhirubhai Ambani: researchgate.

Rooms, C. (2018, 01 06). *What Can We Expect from Hologram Technology in the Future*. Retrieved from www.clean-rooms.org: https://www.clean-rooms.org/what-can-we-expect-from-hologram-technology-in-the-future/

Schenk, S. (2019, 01 28). *Building Envelope: Definition, Types & Design*. Retrieved from study.com: https://study.com/academy/lesson/building-envelope-definition-types-design.html

Seipel, S. (2018). *An Introduction into Virtual Reality Environments.* Stefan Seipel.

Shady, A. (2017). *Evaluation of adaptive facades:The case study of Al Bahr Towers in the UAE.* HBKU Press.

Staff, P. (2018, 09 05). *SNA Displays Relies on Christie Terra for Massive LED Screens in Downtown L.A.* Retrieved from plsn.com: http://plsn.com/featured/featured-slider/sna-displays-brings-massive-led-screens-to-downtown-los-angeles-development-with-support-from-christie-terra/

Strohanova, C. (2017, 9 03). *How Museums Can Stay Relevant and Make Money on Virtual Reality Technology*. Retrieved from jasoren.com: https://jasoren.com/vr-in-museums/

tareb. (2014). *INTEGRATION ARCHITECTURALE.*

Technologies, A. (2018, 01 26). *Tomorrow's Technology Today*. Retrieved from http://afriten.co.za: http://afriten.co.za/cheoptics-5-meter-holographic-3d-display-for-exhibits-and-museums-life-size-hologram-display-2/

Tools for consumers . (2018, 11 23). Retrieved from www.sunearthtools.com: https://www.sunearthtools.com/dp/tools/pos_sun.php?lang=en

wagner, A. (2012). *The role of the building's envelope in the conception of sustainable architecture.* Paul Klee.

Weather Princeton. (2019, 01 25). Retrieved from www.meteoblue.com: https://www.meteoblue.com/en/weather/forecast/week/algiers_algeria_2507480

zahdi, b. (1988). *the museums.* damascus: Ministry of Culture.

Contemporary Architecture and Technology: Critical View to the Effects of .(2013) .KHALED mahmoud haiba *Umm Al-Qura Univ.* .Digital Technology on Architectural Trends at the Beginnings of Twenty First Century .78-53 ،*Arch. Vol. 5, No.1 &J. Eng*

Abstract:

The most important characteristic of our time is the rapid progress in all areas due to the technological development. This is why we want to integrate technology and culture together in this research. This work came under the advanced technology and attempts to apply all the relevant technologies and characteristics in the National Museum of Technology in Algiers.

The aim is to take the museums out of the quagmire of history and relics. And supporting the cultural and tourism sector with a facility beyond the borders of the homeland for the world.

In order to achieve these objectives, we have relied on a methodology based on an introduction that explains the reasons for selecting the project, the theme, the structure of the research, and a theoretical chapter in which we discussed the most important concepts related to the architectural envelope and the advanced technology also the museums and an analytical chapter based on extracting the most important technical conditions and requirements that will be included in the design of the project. And an application chapter explaining the objectives of the project and a detailed presentation of the design steps to conclude with a graphic presentation of the project.

By following this structure, we were able to integrate the culture and technology into the museum project, which helped us to perform its tasks perfectly , Where the research work culminated in the completion of the National Museum of Technology in the municipality of Hussein Day in Algiers, an area of 8450 square meters, which added to the capital a cultural and tourist landmark because of its attractive technological envelope, which gives a contemporary concept of the museum project.

Keywords: Museum - Architectural envelope - Advanced technology – Algiers – VR – holograms

ملخص :

إن أهم ما يتميز بها عصرنا الحالي هو التقدم المتسارع في جميع المجالات و يرجع هذا الى التطور التكنولوجي الذي أصبح أهم حديث وموضوع على الاطلاق وهذا التقدم قد لا يرى منه الناحية الإيجابية لكن له سلبيات من أهمها عدم التوافق مع ثقافات الشعوب .

ولهذا أردنا دمج التكنولوجيا والثقافة معا في هذا البحث ، حيث يندرج هذا البحث ضمن التكنولوجيا المتقدمة لمحاولة تطبيق كل ما يتعلق بها من تقنيات وخصائص في المتحف الوطني للتكنولوجيا في الجزائر العاصمة و الذي يهدف إلى إخراج المتاحف من مستنقع التاريخ والاثار إلى مواكبة العصرنة والتقدم ودعم القطاع الثقافي والسياحي بمرفق يتعدى حدود الوطن للعالمية.

وللوصول لتحقيق هذه الاهداف وأخرى فقد إعتمدنا على المنهجية التي تقوم على مدخل يوضح اسباب اختيار المشروع والموضوع وهيكلة البحث وفصل نظري تطرقنا فيه لاهم المفاهيم المتعلقة بالتكنولوجيا المتقدمة و الغلاف المعماري والمتاحف وفصل تحليلي يقوم على استخراج اهم الشروط والمتطلبات التقنية التي ستدخل في تصميم المشروع وفصل تطبيقي نوضح فيه اهداف المشروع وعرض مفصل لخطوات التنظيم ليختتم بعرض غرافيكي للمشروع .

وباتباعنا لهذه الهيكلة استطعنا ان ندمج الثقافة والتكنولوجيا في مشروع المتحف والذي ستساعده في اداء مهامها على اكمل وجه ، حيث توج هذا العمل البحثي بإنجاز المتحف الوطني للتكنولوجيا في بلدية حسين داي بالجزائر العاصمة بمساحة تقدر ب 8450 متر مربع الذي يظيف للعاصمة معلما ثقافيا وحضاريا وسياحيا بامتياز بحكم غلافه التكنولوجي والذي سيقدم مفهوما معاصرا لمشروع المتحف .

الكلمات المفتاحية: متحف – الغلاف معماري – تكنولوجيا متقدمة – الجزائر العاصمة – الواقع الافتراضي – الصور المجسمة.