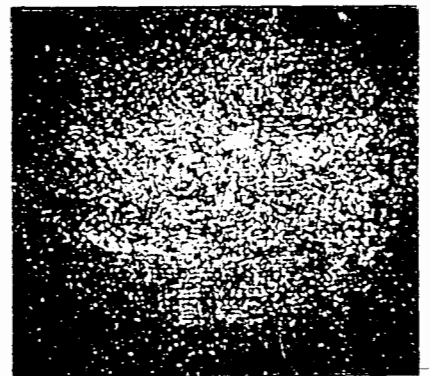# THE NATIONAL CENTER
FOR
TECHNOLOGY & INDUSTRY

BEIRUT

CHUCRY ABOU SAAB
CLASS OF 1997

AMERICAN UNIVERSITY OF BEIRUT
FACULTY OF ENGINEERING AND ARCHITECTURE
DEPARTMENT OF ARCHITECTURE AND DESIGN

A535-FINAL PROJECT RESEARCH
Advisor: Prof. GHANDOUR, Marwan

THE NATIONAL CENTER FOR TECHNOLOGY AND INDUSTRY
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Chucry ABOU SAAB
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ARCHITECTURAL

OBJECTIVES

THE NATIONAL CENTER FOR TECHNOLOGY AND INDUSTRY

ARCHITECTURAL OBJECTIVES

Dealing with a center for technology sets forth a challenge of the effect of this continuously changing field on architecture.

The most simplistic approach in reacting to technology in architecture is the limited intervention of some use of sophisticated steel structure, long spans, …etc, in "building the machine" architecture.

I would like to deal with another layer, where the effect of technology would be on the level of formulation of the architecture in the facility.

What follows will explain my approach.

A new vision to Technology

"Technology/Science", "technical/social", "internal/external" are some of the contradictions that were serious to the integrating inventors and engineers in the past.

Nowadays, these dichotomies are fading, and technical, scientific, cultural, social and other categories would really overlap and become soft, where a "seamless web"[1] is formed containing all related fields.

Hence, both science and technology are now seen to be socially constructed cultures, and the boundaries between them considered as a matter for social negotiation and represents no underlying distinction.

This really denies the technological *determinism* of the past, and an emphasis on the social shaping of technology and the meanings attributed to it would be having important implications on the conception of this field.

High flexibility in technology is a major issue deriving from its social construct, with dynamic imbalance and reverse salients in its systems, where technology becomes a *growing network*, and where the components which are functionally related interact harmoniously, change and adapt, for the system to grow and achieve dynamic equilibrium.

The major development in the field of science and technology recently has been the extension of the sociology of knowledge into the arena of the 'hard sciences'. The need for such a 'Strong Program' underlies in treating

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[1] As mentioned in "The Social Construction of Technological Systems"; p.11

all knowledge and knowledge claims as being socially constructed, where the explanations for the genesis, acceptance and rejection of knowledge claims are sought in the Social world rather than the Natural world, with no consideration of scientific truths/falsehood issues.[1]

Hence, technology is seen composed of both a *body of knowledge* and a *social system*, instead of the old traditional vision of technology treated as a 'black box' whose contents and behavior may be assumed to be common knowledge, and where the failure to take into account the content of technological innovation results in the widespread use of 'simple linear models' to describe the process of innovation.

The **EPOR** (The Empirical Program of Relativism) and **SCOT** (The Social Construction of Technology) study the controversial aspect of contemporary science and technology, where interpretative flexibility of findings causes an alteration of variation and selection. This results in a *multidirectional model*, in contrast with the linear models used explicitly in many innovation studies and implicitly in much history of technology. Such a multidirectional view of is essential to any social constructivist account of technology.

Moreover, as Thomas Hughes describes[2], technological systems contain messy, complex problem solving components; and because the components of those systems interact, their characteristics derive from the system as a whole. This will be taken up and elaborated on a bit further.

... Architecture

Architecture would relate to most of these issues.
Rejecting deterministic processes with the very rapid development of technology and the advent of the postmodern era with all its related Chaos theory, science of complexity and the non-linear dynamics ..., architecture itself is seen composed of a body of knowledge and a social/cultural system where high complex, dynamic, chaotic and contradictory systems would be interacting into its genesis and that of urbanism, as pointed out by Nan Ellin.[3]

A real multidirectional discipline, complex and interactive, from its smaller components to its larger systems (internal/external), it adopts a developed dynamic aspect of the new visions to technology.

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[1] As described by Pinch,T. and Bijker,W. ; "The Social Construction of Technological Systems"; p.25
[2] In article "The Evolution of Large Technological Systems" in the book "The Social Construction of Technological Systems"; pp.51-52
[3] In her book, " Postmodern Urbanism" (article : The Postmodern Reflex)

Architecture and the external reference

Towards the middle of the 17th century, algebraization and functionalization of architecture as a whole began to take place. The assumption that architecture can derive its meaning from functionalism, formal games of combinations, the coherence and the rationality of style, or the use of type as a generative structure in design, helped this functionalization, where architecture theory was transformed into a set of operational rules, into a tool of exclusively technological character.

Today, with the development of science and technology, and the new visions regarding these fields, theory in any discipline is generally identified with methodology [1] , and has become a specialized set of perspective rules concerned with technological values, that is, with 'process' rather than ultimate objectives, a process that seeks maximum efficiency.

This idea reinforces the notion of systems -including of course technological ones- and architecture that are seen composed of a body of knowledge which corresponds to the structure of the system itself, and an external system or reference.

Here, as Peter Rowe points out[2] , design ideas appropriated from outside the immediate context of a specific problem are *often* highly influential in the making of design proposals. Sometimes, references are made to objects already *within the domain of architecture*. More often, however, an analogy is made with objects and organizational concepts that are farther afield and *outside architecture.*

Technological systems

Elaborating on the "New vision to Technology" stated above, a brief description of the functioning of Technological Systems is carried out.

Technology could be read on mainly two levels in technological systems:
-object-embodied technology ; that is the level of physical objects or artifact
-process-embodied technology ; referring to activities and processes in the functioning of systems

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[1] As pointed out by Alberto Perez-Gomez: Architecture and the Crisis of Modern Science
[2] In his book: Design Thinking ; p.35

However, an additional level can be introduced also, it is that of a
-person embodied technology ; referring to what people know as
well as what they know to do
(know how).

As we have described earlier, technological systems contain messy, complex problem-solving components, where, at some lower levels some systems can be considered as 'hardware', and at larger scales they can be conceived to have 'software' components where the different pieces are not necessarily mechanically interconnected. To give a rather *simplistic* example, at some low level, a turbojet engine or an airplane are considered to be 'hardware' components. On the large scale of the system, an air transportation system has got organizational and even sociotechnical components (software); and includes, (at least) airplanes, airports, maintenance facilities, ground access, NAV/COM and air control systems, and an immense variety of specialized and coordinated personnel, plus, of course, some crowd of totally uncoordinated passengers.
Technological systems contain both physical artifacts and organizations where every artifact -either physical or non-physical- interact with other artifacts, all of which contribute directly or through other components to the common system goal. Here, each component derives its characteristics from the whole system. Moreover, if a component is removed from a system or if its characteristics change, the other artifacts in the system will alter characteristics accordingly: all components in the system interact, change, and adapt for the proper functioning of the system. Until this is achieved and the dynamic equilibrium reached, components are considered as reverse salients and the system seen in dynamic imbalance.

The Center

The facility provides services as to supporting and promoting industry and technology development in Lebanon. This is ensured due to different 'components' in the facility (technology incubators, information bank, etc...) considered as sub-systems that develop and perform, each, a specific role and task. Yet, high interaction is present and crucial between these various departments, all of which contribute directly to the common goal of the center.
Another layer of relations is that of the facility with external facilities in Lebanon and abroad, through information gathering and audio-visual link in service of various departments in the building.

A parallel

In the light of the issues raised, and with common criteria of Technology and Architecture depicted, the National Center for Technology and Industry is seen in parallel to a large *Technological System* where the logic of the functioning of the facility is seen as that of that system.

Here,   1-object-embodied technology is seen as the use of up-to-date high technology construction and materials

2-process-embodied technology carries the analogy set, where a architecture embodies a certain process, that might be attributed as an external system/reference

3-person-embodied technology explores a design approach in the light of the issues pointed out in (2), and the process of the formulation of the facility (its genesis).

This analogy would add another layer on the meaning of the building. But most of all, it directly affects the design process and the architectural conception of the facility where spatial conception and relationships(and therefore, the form-giving mechanism) would acquire a new dimension and approach, derived from the analysis of the analogy set, beyond the simple functional layout -traditional bubble diagram, etc....- against which most architecture practice is set.

This introduces another perception of architecture and of the process in which it is formulated, where I would also relate to Heuristic reasoning as one dimension of the design process.

Heuristic Reasoning

Related to 'Heuristic Technology' - where subjects learn the application of various problem-solving techniques in order to improve their performance on specific tests- heuristic reasoning in design, according to Rowe, refers to a problem-solving process in which it is unknown beforehand whether a particular sequence of steps will yield a solution or not. Consequently, it involves a decision-making process in which we do not know whether we actually have a solution until the reasoning process is completed.

One way of describing the kinds of heuristics that are employed to constrain problem spaces in architecture is with the type of information they provide.

The process of heuristic reasoning to be followed in my case would be derived from the analogy , and which would relate to Rowe's Heuristics of

environmental relations (where it is made use of a set of principles, often derived empirically, that represent what appear what to be appropriate relations between man and his host environment and/or among components of the building fabric itself. Moreover, special information is typically incorporated about such relations as determinants of form. (In my approach, the analysis of the analogy would help determine such special information). This kind of heuristic is apt to be highly problem-oriented. The principle involved creates a bridge between a perceived problem and an ensemble of form-giving characteristics representing its potential resolution.

As I mentioned earlier, this design process and that of the functioning of the building would set another dimension in dealing with the genesis of the facility, in contrast to the application where simple traditional "bubble diagrams in the arrangement of spaces in accordance with given formulae about human behavior, rarely moves beyond the constraints of the problem as a given."[1]

[1] Rowe, Peter ; 'Design Thinking' ; p.85

The design process approach & the conception of space/relationships

In this section I will try to develop an approach to the design process of the facility as well as its functioning logic.

The center consists mainly of the professional section, the public one and the main administration with all their respective sub-departments (see Program).
In the conception of spaces and relationships with respect to technological systems , I devised a method of analysis composed of several steps (in no particular order -- non-linear/multidirectional):
(These will be detailed and explained)

1-Analyzing different components of departments stated in the program; and considering these departments as HARDWARE components on this scale [Technological incubators - AV/Media section - Information bank - Financial bank - Exhibition ...etc..]- 'Bonds' of different natures and on many levels will be developed.

2-Sorting out spaces in terms of the nature of the activities carried out within.
Classifying these in categories of activities, the categories are considered components of a SOFTWARE set on that scale.

3-Analyzing relationships/bonds between components as seen parts of software and hardware sets.

4-Hence, a network is created
  a-nature of bonds and location between the Software & Hardware sets and their spatial interpretations derived (& types of spatial interaction)
      b-implications/opportunities of issues such as flexibility, 'reverse salients' in space manipulation,etc.. , add to the space/relations conception derived from technological systems logic.

These points would all feed into each other so that the whole process would formulate a *multidirectional* and *complex* model of my approach.

Detailing the approach (The approach is non-linear)

1- Setting the main sections of the building, as defined in the program, to be considered as HARDWARE category components on that level.

'Bonds' would be devised on many levels in working out the design process. These will be explained in the following points.

At this level of hardware, the bonds between the 'hardware sets' and their components would be conceived as administrative and physical relation/computer link relation/visual relation that derive from the analysis of major functions and relations as to how the center functions.

(for basic administrative bonds and basic relations bonds see diagrams in section about program formulation)

These hardware components are:

High Tech dept   **Comm.Media dept**   **Other sectors dept**

Technology incubators
Professional relation section
Office spaces
Support
....

Information bank
Mediatech terminals
Documentation
Support: service terminals
          dark room
....

Auditorium

Exhibition

Media/Advertising
  Interactive display space
  Media production studios
  Industrial adv. dept
....

Financial bank
Director
Account
Hall/ cashiers
Foreign support
....

Prof/public exhibition(permanent)
  ...

Pavilion
......

Education
....
Library
....

Main Admin.
....

2- Sorting out spaces in terms of nature of activity would echo technological systems where components are classified in terms of the nature of actions performed in the system regardless of the label or name given to the component. This will form a SOFTWARE category on that level.

The choice of the terms forming the Software (controlling, communicating, performing, interacting, assisting) derive from the analysis of the major activities taking place in each space:

'Controlling' derives from the nature of activities where a certain influence is exercised and to which reference is present in a hierarchical manner.

'Interacting' would derive from analyzing activities where a high interaction among individuals -and even between individuals and some interactive systems- is present.

'Performing' is attributed to functions where a certain performance or production of an event/action in evident.

'Communicating' is attributed to functions with communication on line (networks) is dominant, and this is one of the most important aspects in the facility.

'Assisting' stands for activities mainly supporting other activities.

These five categories would describe the type of activity in each space of the Center, knowing that each space can relate to **one** or **more** categories for an accurate definition (eg Display space: communicating/interacting...)

The introduction of two definitions "static" and "dynamic" derive from the attribution of *static* for activities involving **low movement or sitting**, and *dynamic* for activities with a relatively **high level of motion**.

Consequently, the following space identification was carried out:
(SAMPLE)
-President: static / controlling-communicating
-secretary: static / assisting
-professionals in charge : static / controlling / communicating
-offices for companies: staff : static/dynamic interacting-communicating
                        small exhibition : dynamic / interacting-assisting
                        support : static / assisting

-demo labs : dynamic / performing-interacting
-conference : static / interacting-communicating
-lecture : static / interacting
-major exhibition: dynamic / performing-interacting-communicating
-A/V display space : dynamic / interacting-communicating
-media production : dynamic / performing-interacting
-technical control: static / assisting-controlling
-mediatech : static / communicating
-support mediatech: static / communicating-assisting
-financial bank: hall+counters: dynamic / interacting
                     accounting : static / controlling-assisting
-cafe : dynamic / interacting
-security : static / dynamic / controlling
… and so on …

Thus, 5 major categories of the **SOFTWARE** set were derived with variation between static/dynamic;
(controlling, communicating, interacting, assisting, performing),

in comparison to the different **HARDWARE** set categories
(technology incubators - information bank - exhibition - professional depts ,etc...)

---So, in simple words, the genesis of the facility would derive from a complex manipulation of Hardware and Software components on different scales (with the above defined Hardware & Software as the major 2), and conception of a multitude of 'bond systems' on different levels, and as applied to different conceptions of the hardware/software scales.

3-   Thus, the presence of these major Software and Hardware sets at this level   would start to create a network. The sophistication and development of this network, and consequently, of the process of design, will occur with the manipulation of these -Hardware/Software- sets and the definition of several levels of 'bonds', some of which would be created by a manipulation of the scale of Software/Hardware. (for example, the major Software defined above provides a level of bond and organization to the Hardware set mentioned, however this Software category will be considered as a Hardware when it comes to other types of bonds organizing its elements …)

Major 'bonds' that will contribute to the development of the network would be:

-the main software category set above, with its 5 components
  (these constitute a software bond when this category is seen as a
    hardware)
-the 'dynamic/static' aspects
-the 3 relationships stated earlier (physical-computer network- visual)
-network fusion v/s network plugging of hardware elements on a lower
  scale
-time
These will be referred to and explained.


Networks in technological systems:
Networks are formed by the combinations of hardware and organizational patterns/softwares in conceiving these systems. Here, networking of heterogeneous elements takes place with the ability of the network to redefine and transform what it is made of. So, technological systems do not link in any predictable fashion elements that are well defined and stable, for elements/entities could at any moment redefine their entity and mutual relationships in some way, and even bring new elements to the network.
This would well relate to the introduction of dynamics and energy of technology in the perception of static objects. In the Center for Technology and Industry, the idea of "spaces becoming" (dynamic-changing) would overcome the notion of "spaces being" (static), where the whole devised system or network of hardware and software components interacting, and at different scales, would allow the design process to dynamically conceive spaces and relationships. 'Spaces becoming' in the process itself; and hopefully during the lifetime of the building where changes in the scope of the center and some of its functions would be accommodated.

- The dynamic conception of space and relationships would start with the very manipulation of the 2 major Hardware and Software sets (previously defined), with a strong **decentralization** of spaces and functions [that would fit the decentralization aspects governed by the development of technology]. At a basic level, we would get:

a)

A SPACE IN
THE FACILITY

A SOFTWARE
CATEGORY

A HARDWARE
CATEGORY
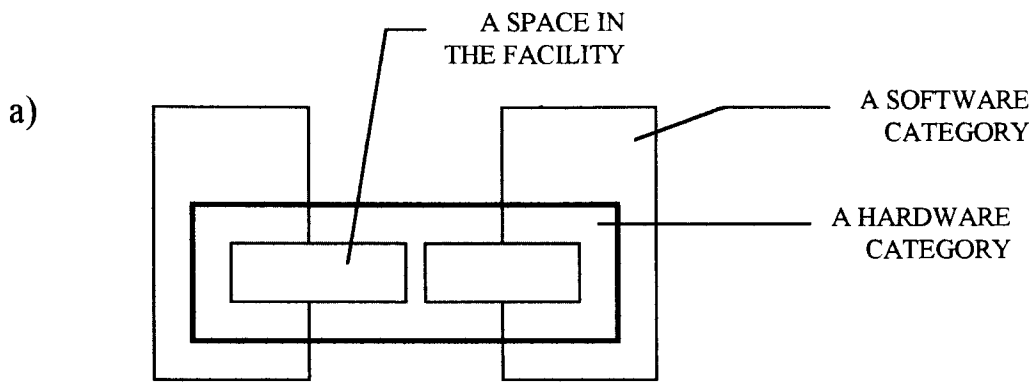
2 functions, each in a different category of the Software set(exp. performing - interacting), relate by being of the same category of Hardware set, with a set bond on the hardware level.

b)

A HARDWARE
CATEGORY
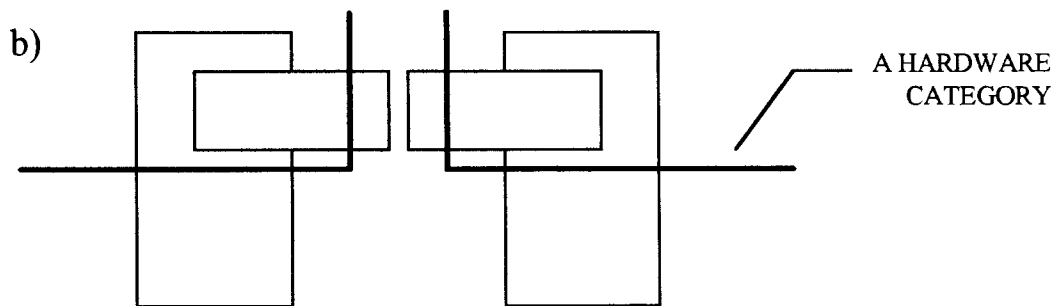
2 functions, each in a category of the Software set, relate by being of different categories of Hardware set, with a set bond on the hardware level

c)
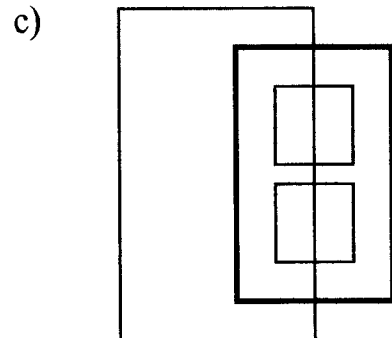
2 functions in the same Hardware category, happen to be in the same Software system, with a set bond on the hardware level.

d)
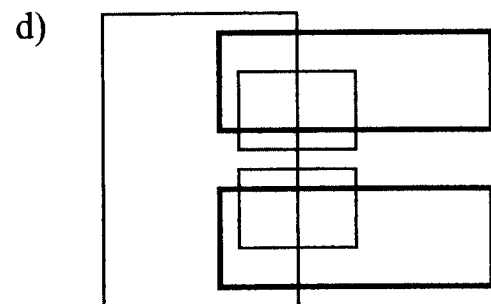
2 functions of different Hardware categories interact and relate in the same Software category, with a set bond on the Hardware level

→ this Software component is considered as a Hardware one with respect to the bonds relating the spaces/functions (and that are, *at this level*, the 3 relations of physical/computer/visual). This software, however, is an organizational pattern (and a bond system too) with respect to the major hardware, providing us with a **mesh.**

[Note that one space can be at the intersection of different Software categories (controlling, interacting,….)]

4-This mesh (a software) provides a layer for the insertion and grouping of the hardware components (the various spaces).
Here the notions of *'static'* and *'dynamic'* forming a layer of the major Software component would introduce a 'bond' system at a level superior to that of the 3 physical/computer/visual.

This bond is comprised mainly of "network plugging" and "network fusing" relations between spaces.
--"Network plugging" referring in principle to the "static" type of spaces (mainly) implies a certain manipulation of insertion of units/group of units in the mesh
--"Network fusing" referring to the "dynamic" type mainly, implies a certain increased spatial (& probably physical) interaction between spaces of the mesh.

5-At this level, the time element introduced by the process so far described, in the dynamic conception of spaces and networks, carries implications on these two types of 'plugged' / 'fused' elements; addressing also the flexibility and 'reverse salients' issues.

The 'plugged units' would probably be neutral spaces with interactive on line conferencing / link, where the space would not be anymore that of the unit alone, but also (and even more dominant) that of the 'other dimension'. Flexibility is in the possible replacement and occupation of those spaces by changing functions and needs, where the 'space beyond' is adaptable.
The 'fused units', spatially interacting, would provide a high flexibility in the mesh disposition of spaces, especially in the devised Software/Hardware manipulation that started to decentralize functions and conceive of space in a more dynamic way.

The whole process would form a complex and multidirectional approach to the formulation of the facility. It will still need to undergo a long developmental process that would hopefully take place during the design proper, applying it more concretely, with probably a multitude of "reverse salients" affecting the approach itself.

This process sets us off the traditional 'bubble diagram' approach, and as a *simplistic* diagrammatic representation of the network, we would get the following figure (that does not fully describe the process and its elements on various levels, but still gives an idea):

BONDS   △ Controlling
         □ Performing
----- visual   — Interacting
∿∿ comput.   O Communicating
----- physical   ○ Assisting

( ) DYNAMIC   ( ) STATIC
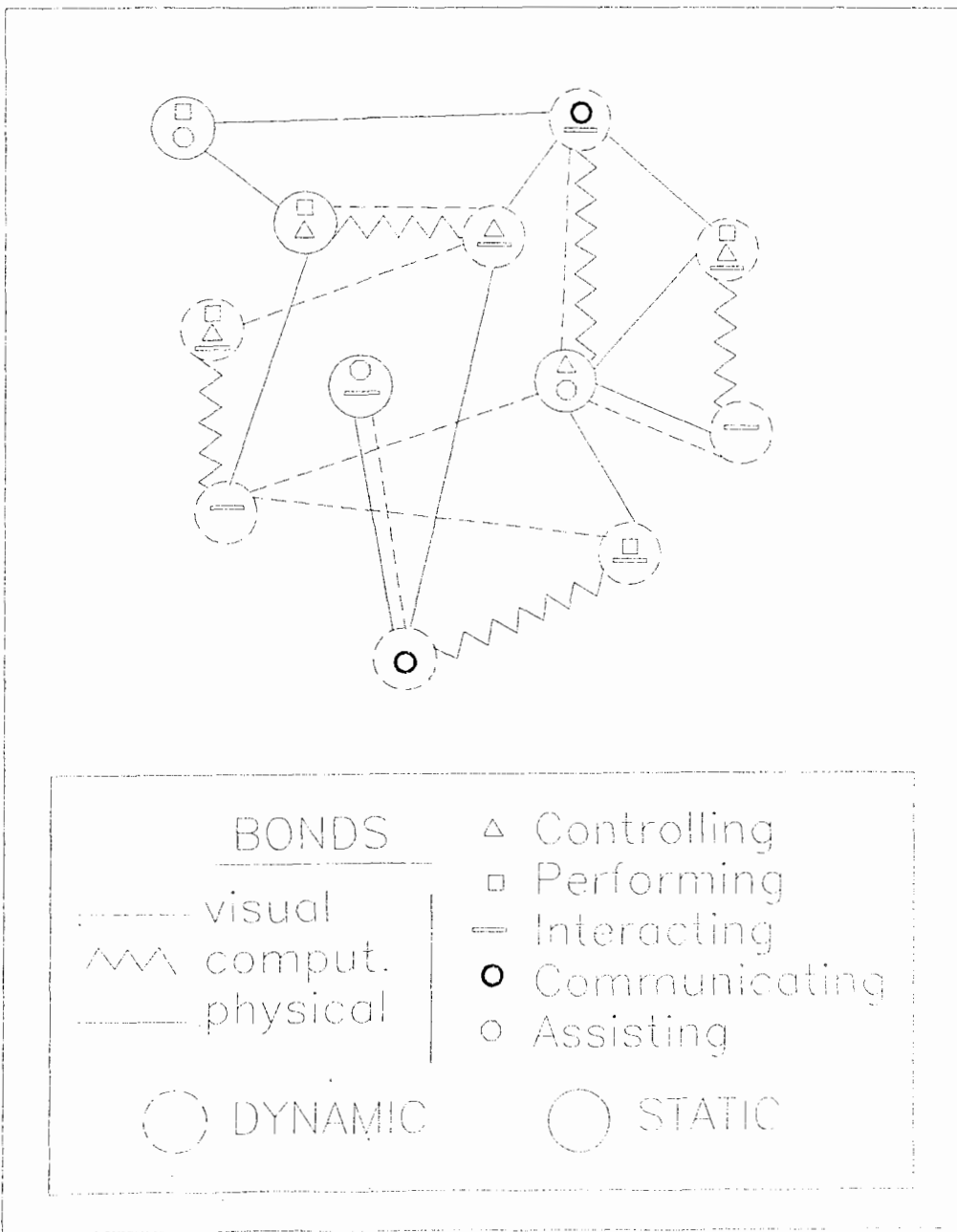
Relevant Examples.

Analysis of different relevant projects in the light of the process described would be of high importance as to the feedback obtained.

The analyzed projects are:

1-Aronoff Center for Design and Art;   Peter Eisenman
2-The Carnegie Technology Center;   Peter Eisenman
3-William Davis Computer Research Center;   The IKOY Partnership
4-The Cité des Sciences et de l'Industrie;   Adrien Fainsilber
5-Cologne Collage: Mediapark   Alsop & Lyall's

6-Advanced Technology Center
   (as a simple example of technology incubators - Of relevance to
      program formulation)

1-Aronoff Center for Design and Art, Cincinnati   Peter EISENMAN
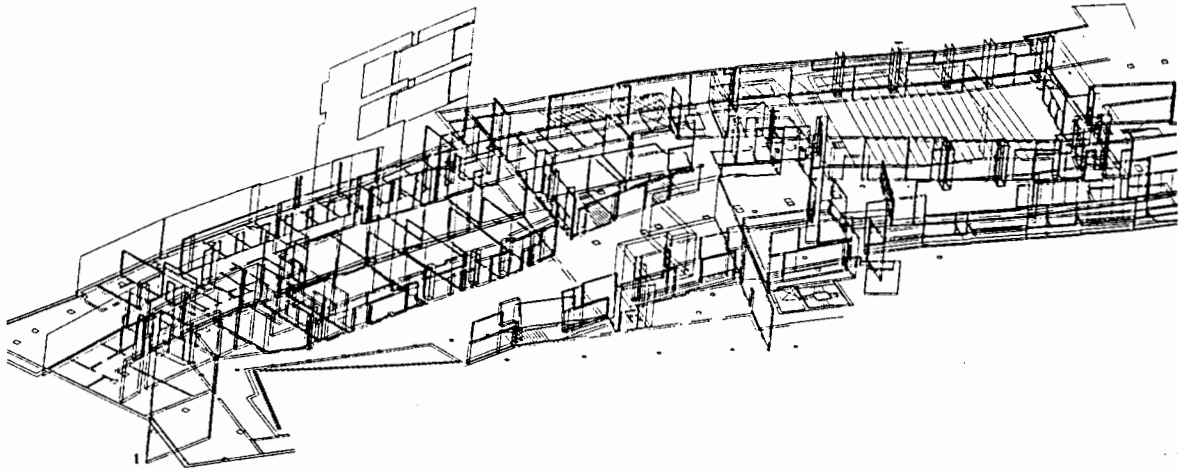
The Aronoff Center is indicative of a flexible complex prototopological space, yet it is conceptualized in a classical Cartesian coordinate space of x,y and z dimensions. Eisenman here manipulated the hardware and software components, but as terms borrowed from the *computer* industry. The distinction between hardware and software referred to the presence of both a topology and a hard box geometry. The interplay is mainly formalistic, but it also presents a different way of spatial description and perception.

In the building, the spline is a virtual curve. Hardware refer to some construction of hard lines; and the curve is in fact, at a lower level, a series of cubic volumes deposited along a curvilinear path. Thus, the difference between these two models of hardware and software would be a difference between a network of lines and a network of splines. However, the importance of the project was seen by critics to reside in the translation of the topological curvature of a spline into the Cartesian realm of cubic volumes.
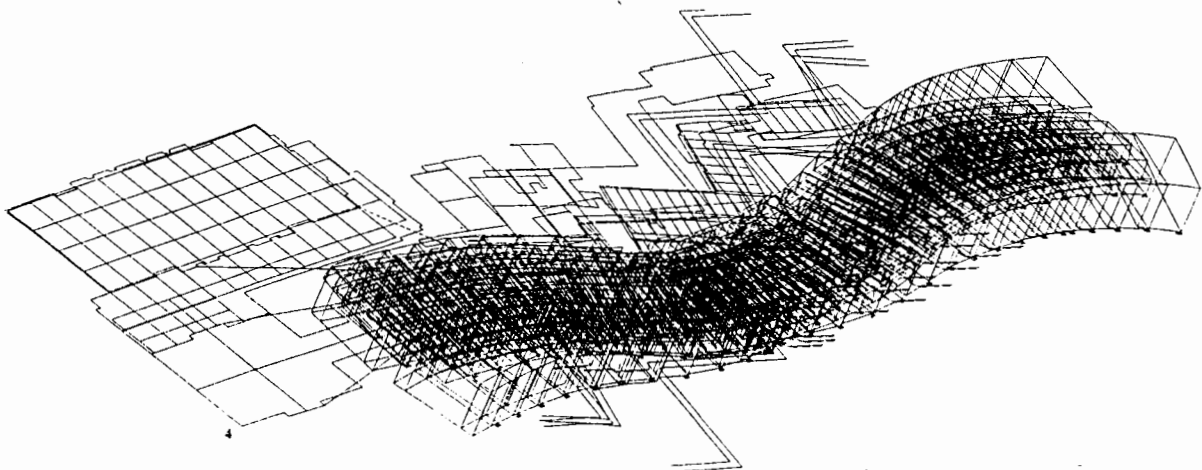
This building involves a radically new description of space, a new concept of time and motion and a new approach to design complexity, introducing new ways of spatial description in a dynamic aspect.
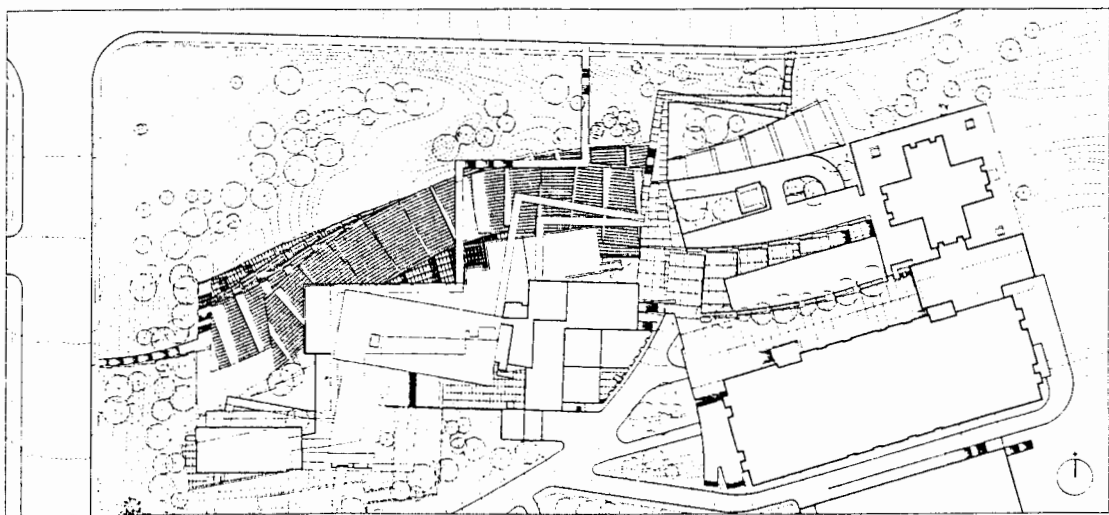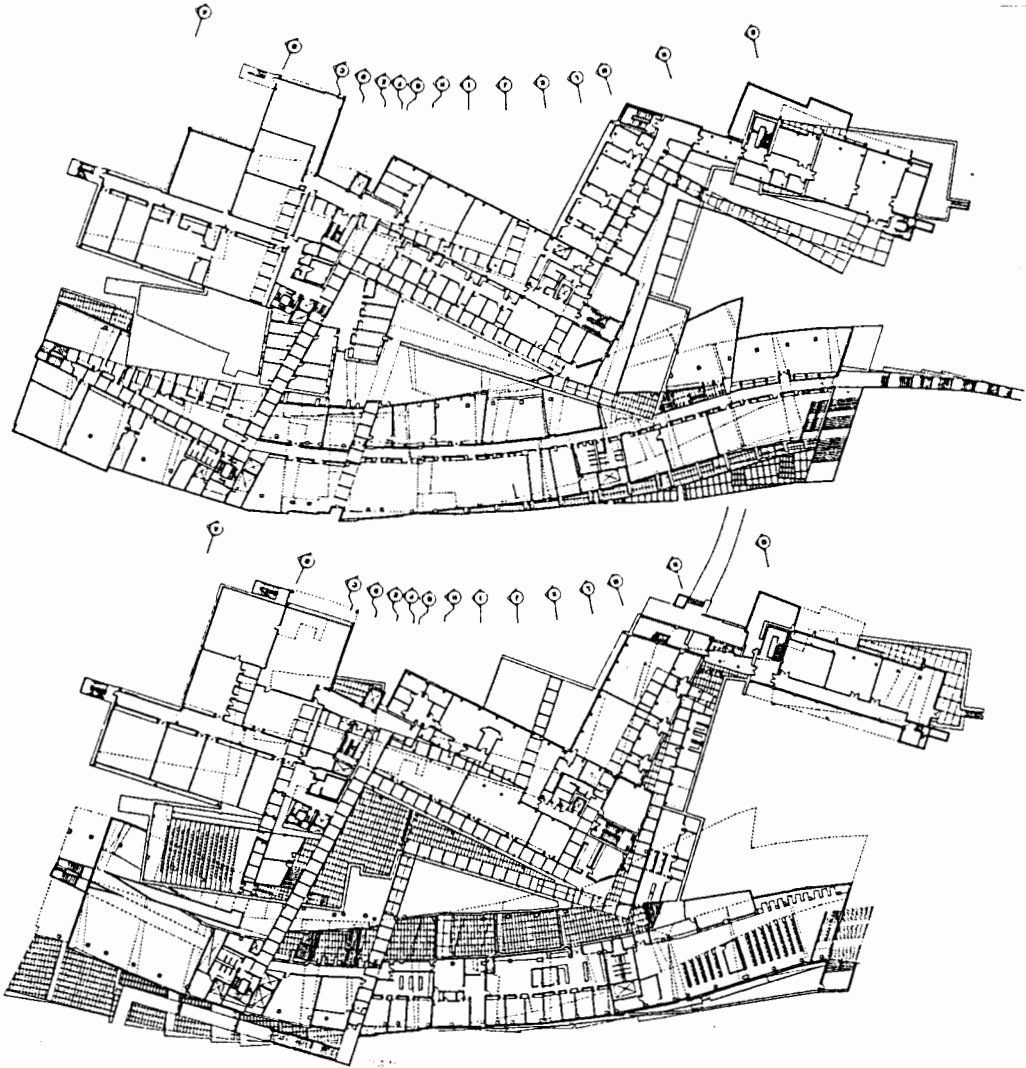
## 2-The Carnegie Technology Center, Pittsburgh, Pennsylvania
Peter EISENMAN

This building, forming part of the larger Carnergie Mellon Research Institute, is a building that is supposed to symbolize man's capacity to overcome the proliferation of knowledge.

Eisenman symbolized this in giving form to the Boolean cube, the mathematical concept that is considered a key to the development of Artificial Intelligence. This shows a direct jump from the software level of organizing principles of Boolean operations to a set of hardware concerned with form mainly, that is the cube. Even when a second software system is appropriated (the use of the exponential curve) its attribution is simplistic, as well as its interpretation on a hardware level, where the cubes in question are arranged linearly along the exponential curve, so that the spaces between them change from one pair to the next, showing a high concern for formalism.
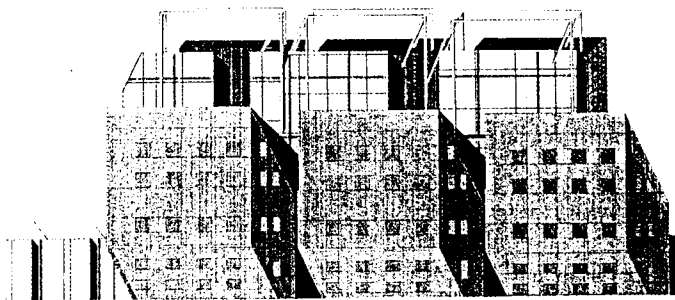
NORTH ELEVATION, PTC
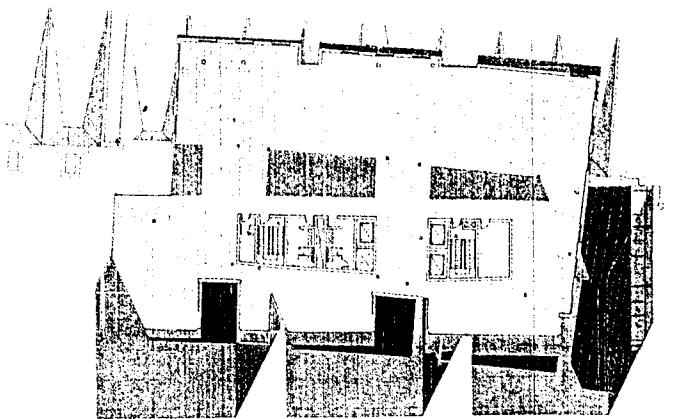
SIXTH FLOOR PLAN, PTC
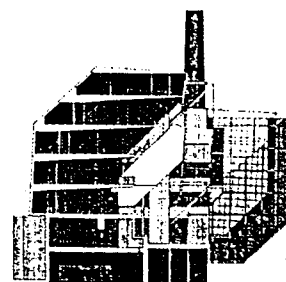
This concern for formalism in Eisenman's mind would stand in adding a meaning to the building, and using an interplay of hardware elements to create an organizational pattern in the building, adding this meaning: each pair of building cubes contains two solid cubes and two frame cubes of 40 and 45-foot dimensions, for office and laboratory modules respectively. The cubes overlap, and the frame cubes leave voids in the interior of the buildings, forming atrium spaces between the offices and the laboratory cubes. The atrium space and the bridges across it are designed to promote interchange between the different groups of researchers. Here, Eisenman saw that for scientists using the building, seeing a concept from their domain appropriated and transformed into another discipline, allows them to 'inhabit' the idea and perhaps come closer to 'controlling' it.
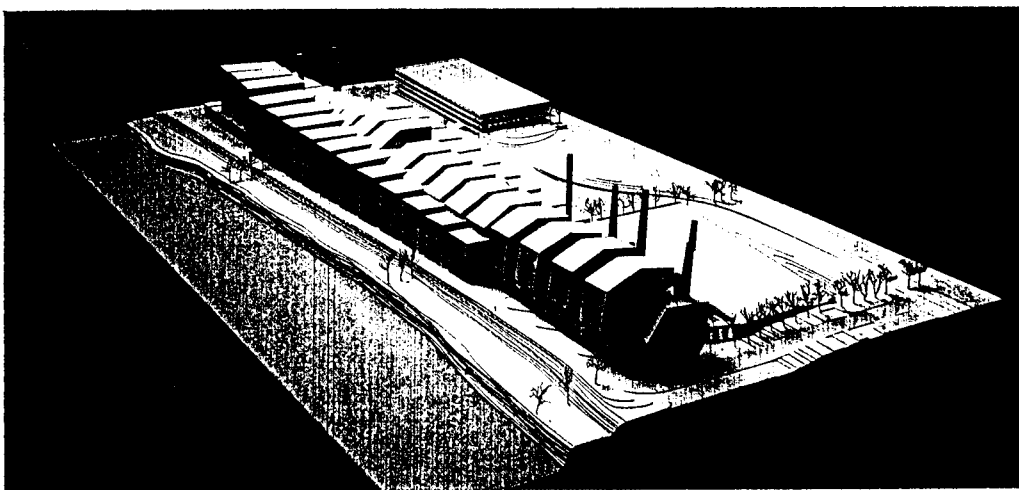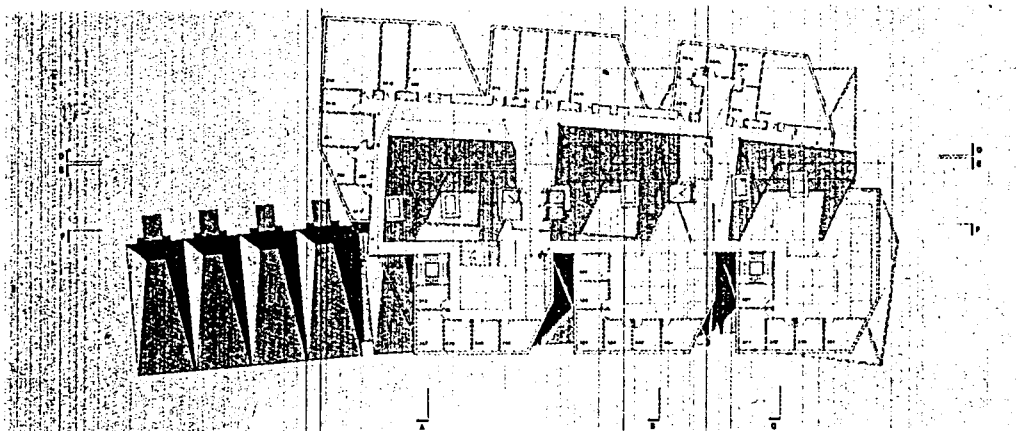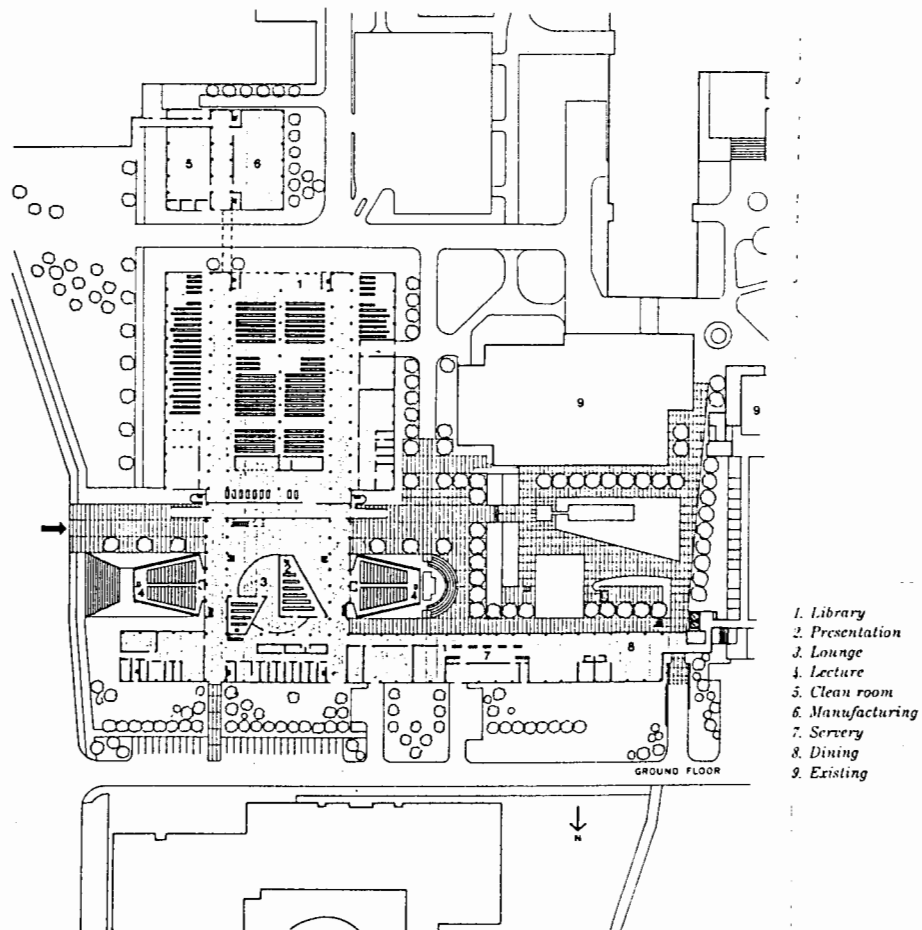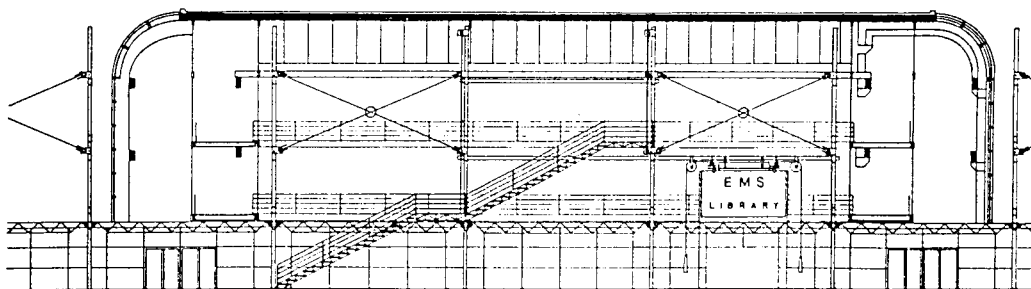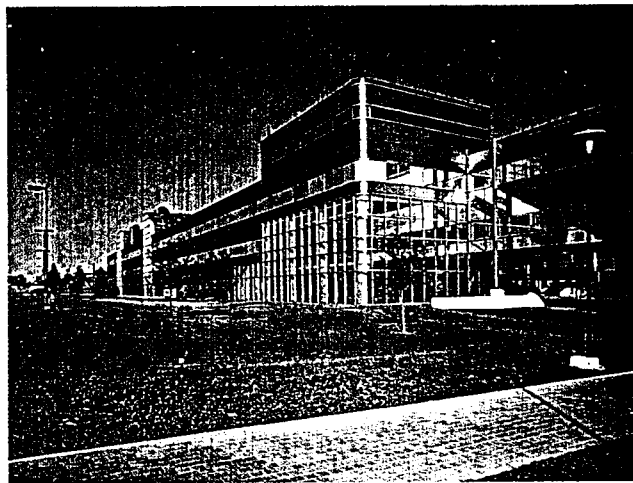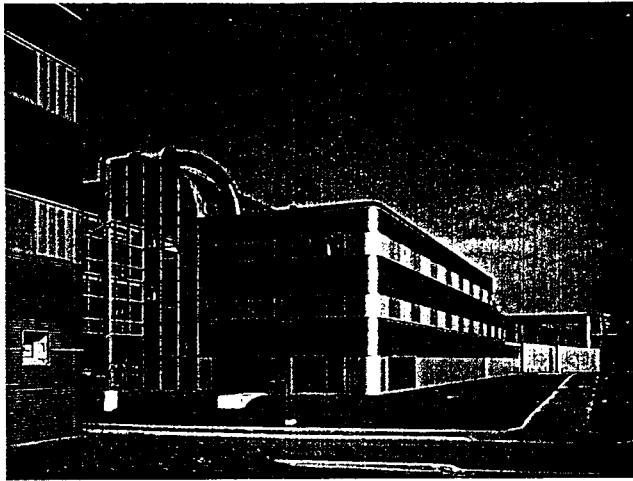
3-William Davis Computer Research Center, University of Waterloo, Ontario
The IKOY Partnership

This computer-research center is said to enlarge on the William Davis firm's pursuit of 'appropriate' technology as both an esthetic and pragmatic goal.
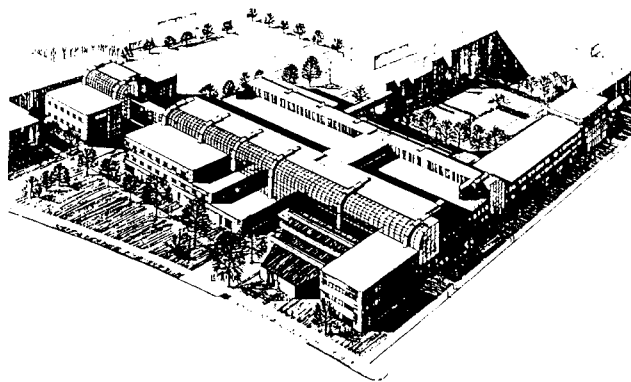
The issue here is that the reference of the building to technology, and more precisely computer technology is simplistic to the degree where the designers saw the architecture as an industrial artifact both on the 'hardware' of integrated assemblies using off-the-shelf components, and the 'software' of responsive planning and well made spaces.

This, in a sense, provides a direct and somehow naïve interpretation of these components to produce a "user-friendly" building (as mentioned by the designers) in creating first-class working environments and spaces capable of promoting collegiality among the occupants, with a high flexibility deriving from plug-in electrical fittings that allow do-it-yourself changes in space layout and equipment.


GROUND FLOOR

1. Library
2. Presentation
3. Lounge
4. Lecture
5. Clean room
6. Manufacturing
7. Servery
8. Dining
9. Existing

SECTION THROUGH GREAT HALL

4- The Cité des Sciences et de l'Industrie, Parc de la Villette, Paris
Adrien FAINSILBER

Opened in 1986, the Science Museum is the largest in the world to date with a total surface of 95,000 m2 . Of this 40,000 m2 is devoted to a permanent exhibition area with innovative interactive demonstrations using the latest techniques of communication. Other activities have their place as well, including an important convention center incorporated in the building, a 'mediatheque', temporary exhibit space for current scientific news, "discovery" area for children, scientific clubs, restaurants, etc...In front of the main facade, sits the Geode, an ultra modern cinema that totally submerges the spectator in sound and image.
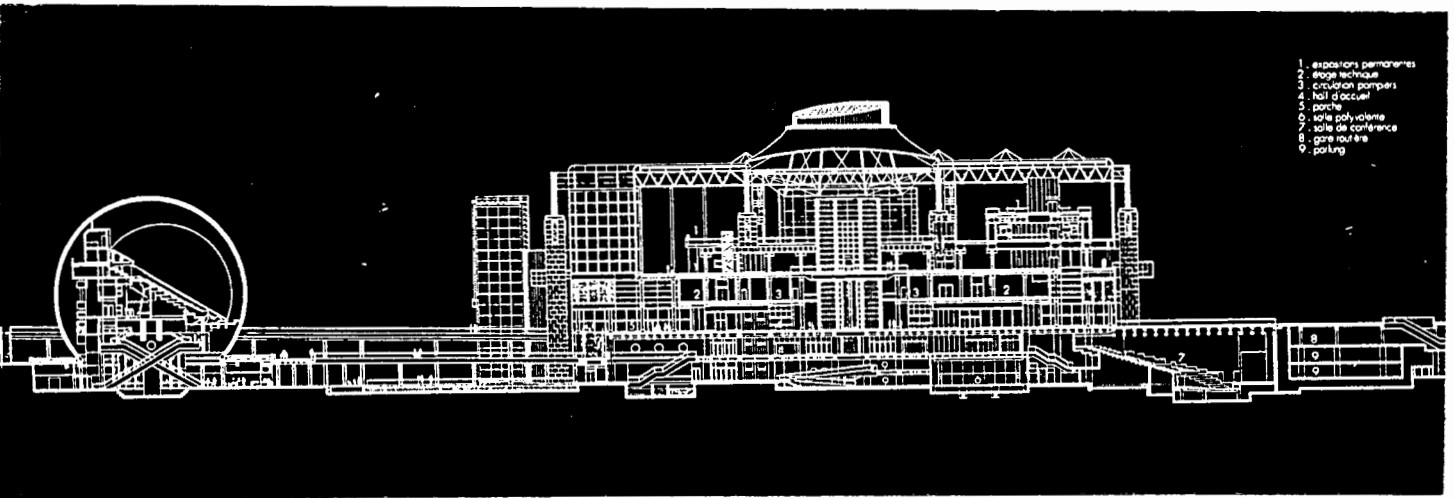
Many programmatic elements in this building echo functions in the project at hand, although in the Cité des Sciences all spaces are mainly public.

Highly restrained by the existing structure (the slaughterhouse of la Villette) of gigantic proportions covering 3 hectares, the design seems to decentralize and articulate space in a particularly interesting way.
The manipulation of spaces and sectional relationships (mainly) in a rigid present plan layout to reach a decentralized aspect and relationships was successful. But most of all, the play with energy as a major bond between spaces was the most interesting; Light.
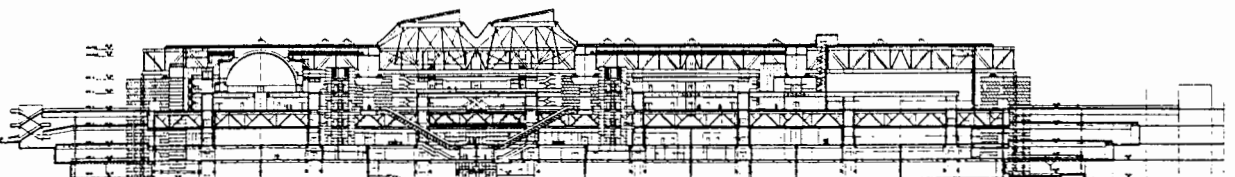

coupe longitudinale

Flexibility in the Center is a major feature, where spaces flow continuously along the huge area, and from level to another, with a 'dynamic' perception of spaces and relationships. Light was conceived to compose spaces and bring them together, and where a change in light would create a range of dynamic to more tranquil range of spaces. Three huge Bioclimatic boxes on the facade as well as two rotating cupolas admit different light qualities, especially in the main hall, where the rotating twin cupolas provide an added tool for "piping light efficiently" at different levels of quality, (in addition to the information piping in the facility, that was the initial factor for the decentralization). This element, with its non-linear dynamic wave properties was conceived to allow a more "intelligent" energy performance of the architectural envelop and spaces : energy performance seen on both levels of climatic control and energy shaping spaces.

The interesting issue in the analysis of this building resides in the fusion of this 'process-embodied' technology with the 'product-embodied' technology. The use of a dynamic element with its non-linear preperties and its implications on space manipulation was transferred in a sense to the up-to-date use of materials (product-embodied) with a process-embodied technology within.
This is striking in the use of elements and materials directly related to light control and admission: mainly the bioclimatic facades and the cupolas.
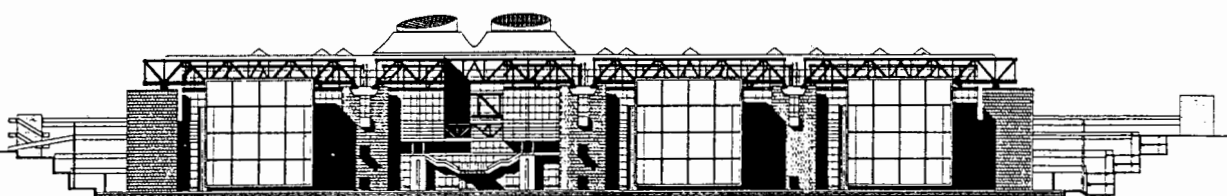

façade sud

Dealing primarily with two different material forms of glass, flat and transparent, and glass fiber fabric recognizes its 'dynamic chaotic' properties, especially when considered as structural fibers introduces the application of non-linear analysis to the up-to-date construction.

But this issue is most important and striking in the use and development of non-linear structural analysis that afforded a new appreciation of dynamic structural behaviour, in an attempt to simulate hydrodynamic flow by the application of modern mathematics to natural phenomena.

This allowed the development of
the structural 'flexibility' and finesse
of the structure by accepting greater
deflections than normal in the bracing
of the glass facades,
as well as in the application of
tensioned fabric in the rotating cupolas.
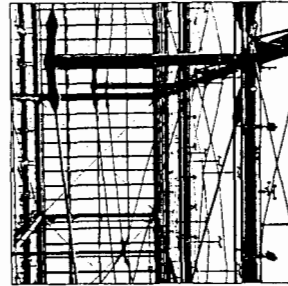
Non-linear analysis, a direct byproduct of the application of non-linear systems in technology, recognizes that the final geometry under load is different from the initial geometry by such an amount that its behaviour is different, and that 'restoration' is a characteristic of stability. This is a very good example of dynamic imbalance, that was, to a certain degree, introduces by the light/energy manipulation in the perception of space at la Villette.
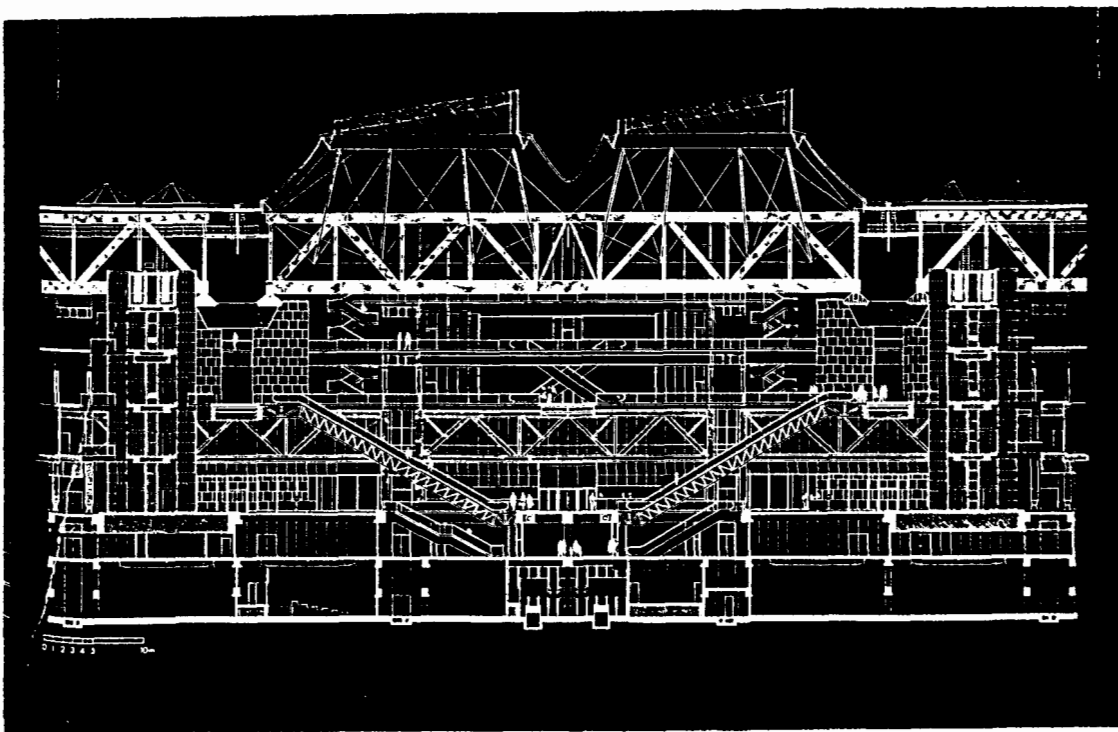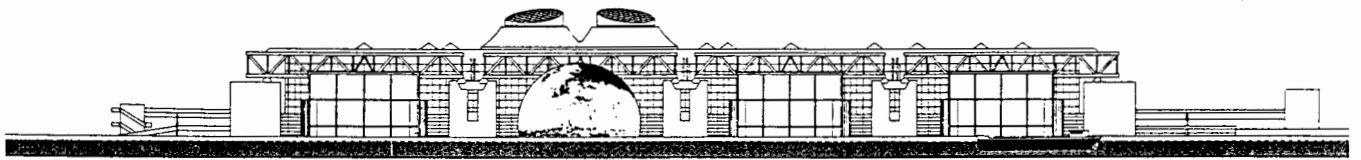
canal de l'ourcq

façade est

Level 1

Roof

Level 0

Level 3
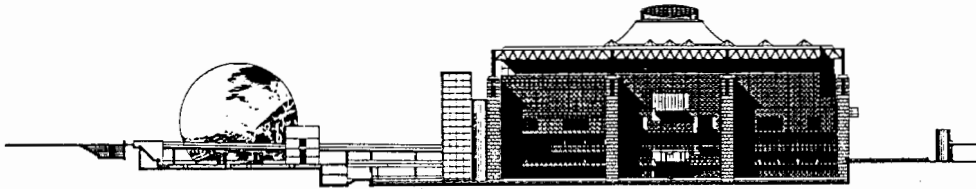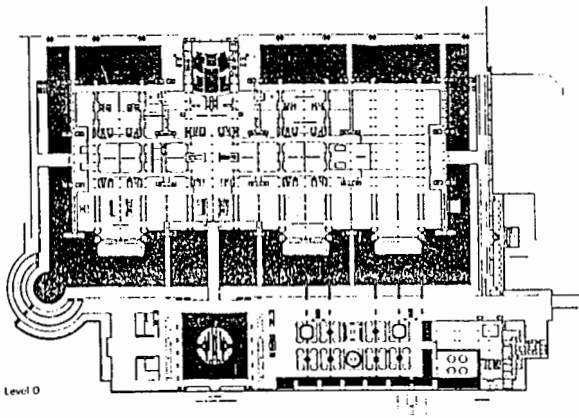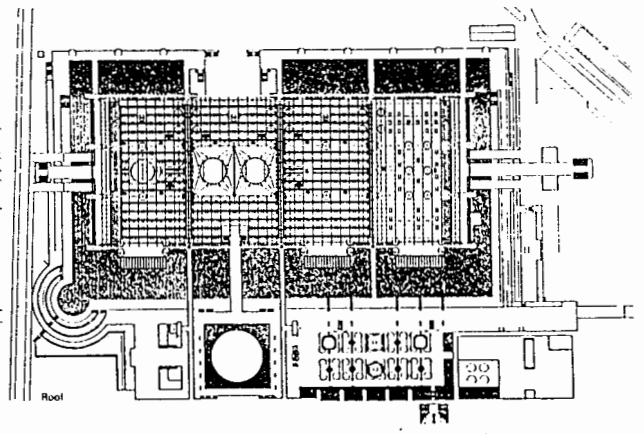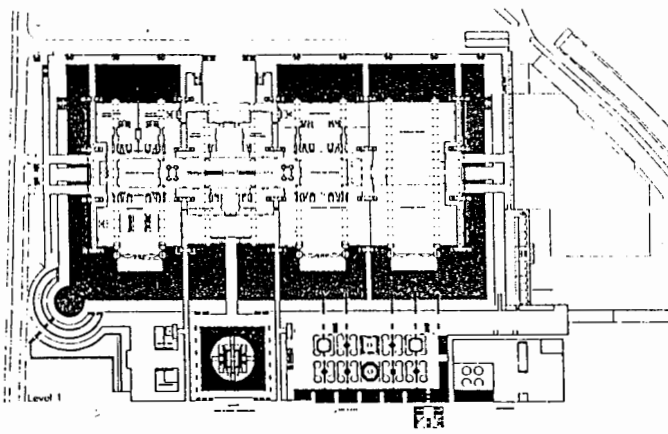
This facility is a *multiform* center, which is suggested by the definition attributed to it, Collage. Combining professional and public facilities, it even incorporates sports activities and residences across the park.

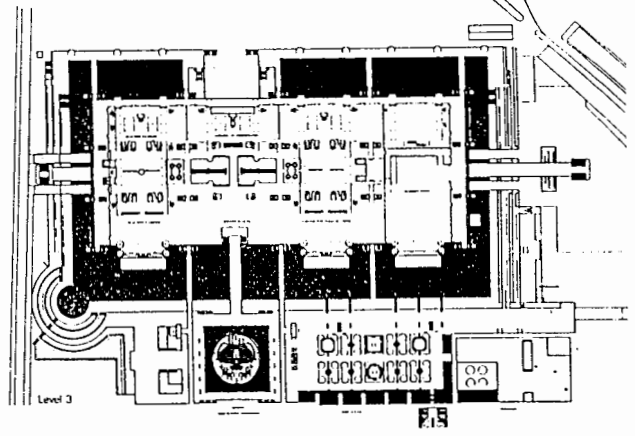The program includes a large volume of offices, factories, and studios for television and other electronic companies which will gradually cluster together, public facilities, electronic park, etc.
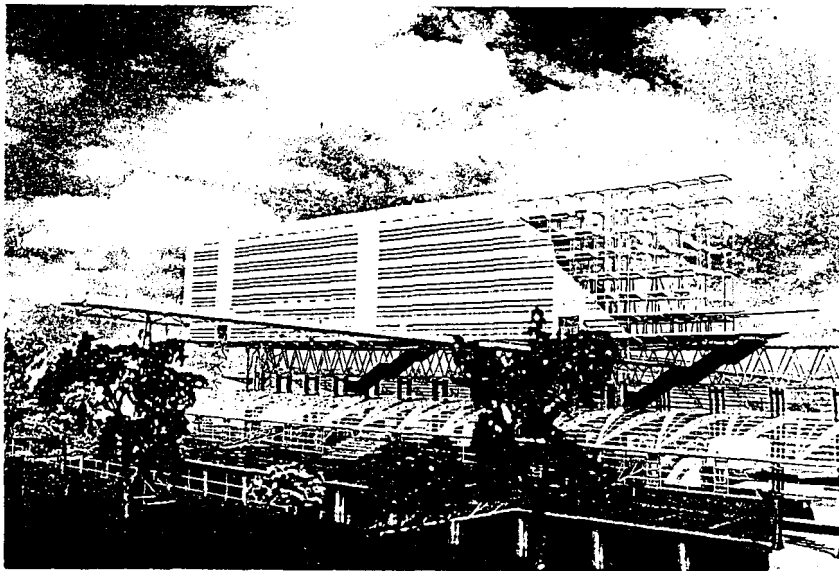
The building had to be implemented in phases, and a need for high flexibility was crucial.

The design developed a linear structure, where flexibility is primordial, especially in the longitudinal direction.

What is particularly important in the development of this building is the close relation between the level of 'object-embodied' technology through the high-tech complex construction and structure, and the distribution of spaces and functions.
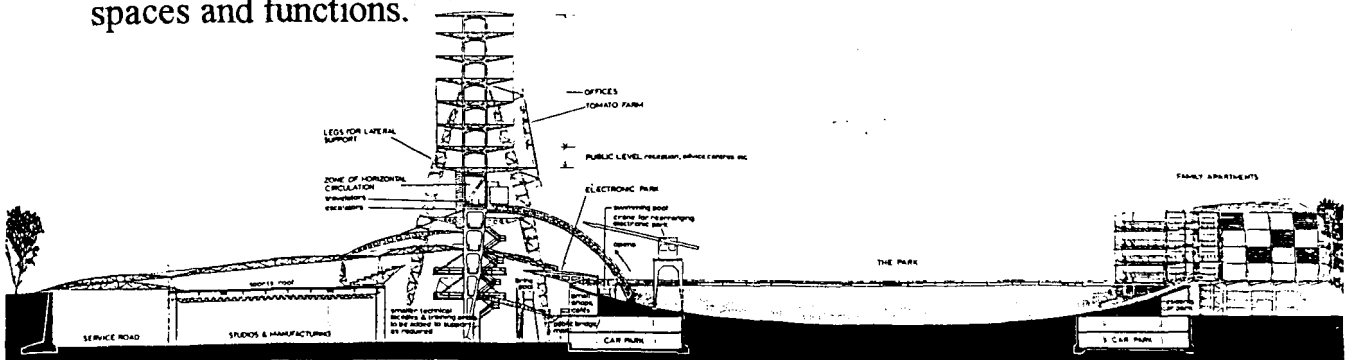
New relationships between spaces was devised by attributing spatial distribution to the structural manipulation, integrating these two in a clear way.

The building was divided into three main parts, each of a different structural role and nature, and housing different functions sorted out according to the three major zones. Hence, this linear structure consists of the *trench, the support, and the beam.*
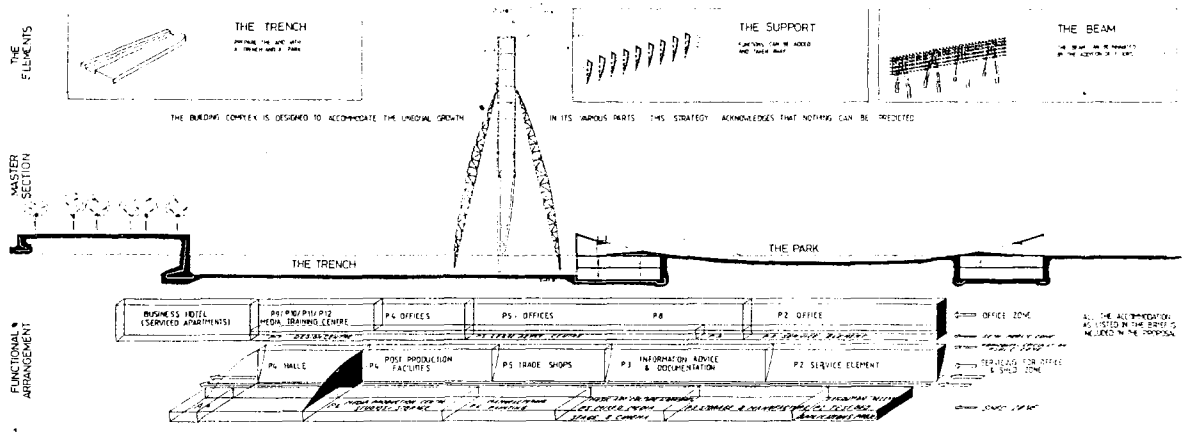
The trench contains the service roads, studios, workshops and factory facilities (these can be conceived of as production areas).

The support consists of mixed steel and concrete lattice structures within which is interlaced a 'medley' of functions ranging from small shops and cafes through an electronic park to the main horizontal circulation zone with its travelators and urban monorail aerobus.

The beam houses simply 7 stories of offices.

This approach taken by the architects was in response to the need for a building that will grow in unpredictable phases, and where the system developed allows the building to grow in chunks, with diverse functional elements to be slung in and out of the structure in a very flexible / efficient way.
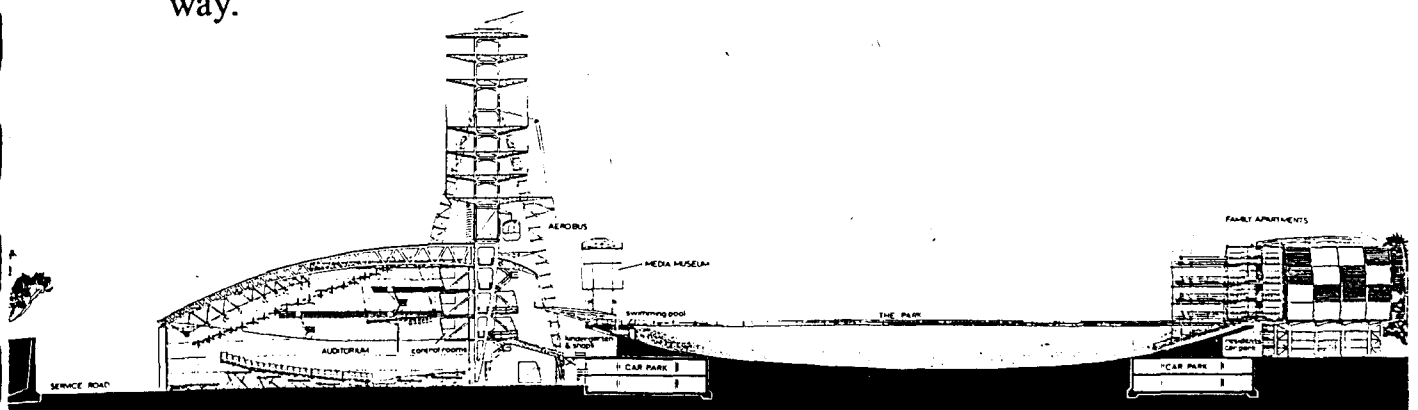
6-Advanced Technology Center, Edmonton, Alberta.

Incorporating this building as a relevant example resides simply in providing a simple example of small-scale "technology incubator" spaces for high-technology.

This is a low budget / low running cost facility that tries to adapt a notion of technology efficiency by being placed underground in a cold climate.

key to plans

a. entry	m. void
b. reception	n. skylights
c. lift	o. roof
d. atrium	p. food services
e. tenant	q. changing room
f. ERDPA offices	r. washroom
g. plant	s. boardroom
h. storage	t. support services
i. wet laboratory	u. street
j. duct shaft	v. bridge
k. terrace	w. caretaker
	x. exit
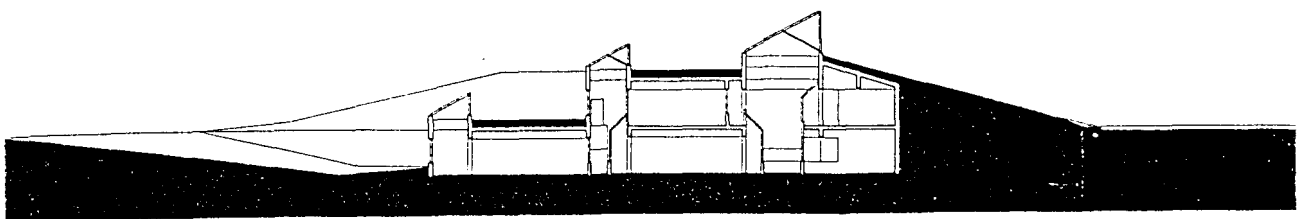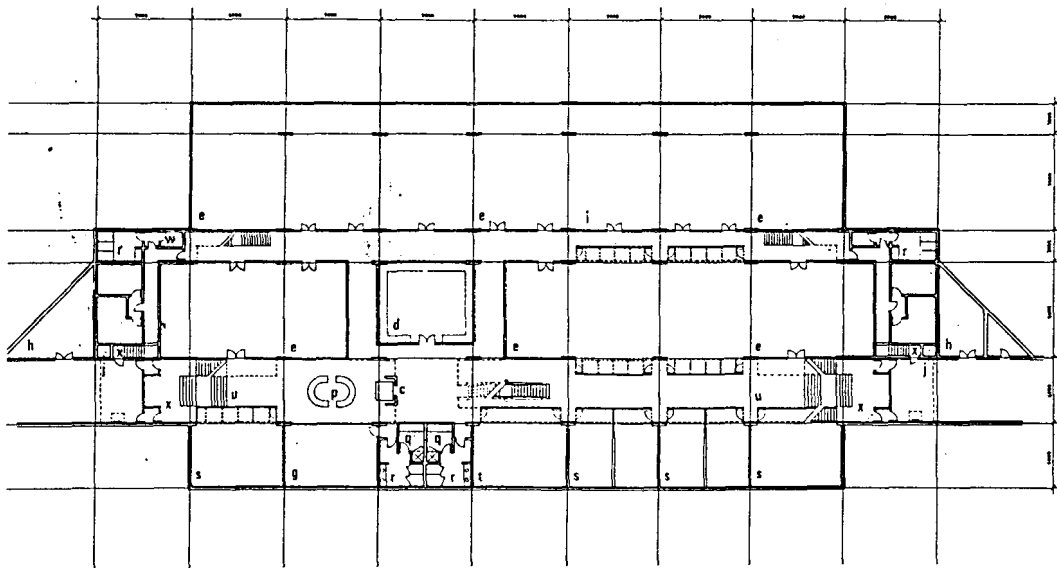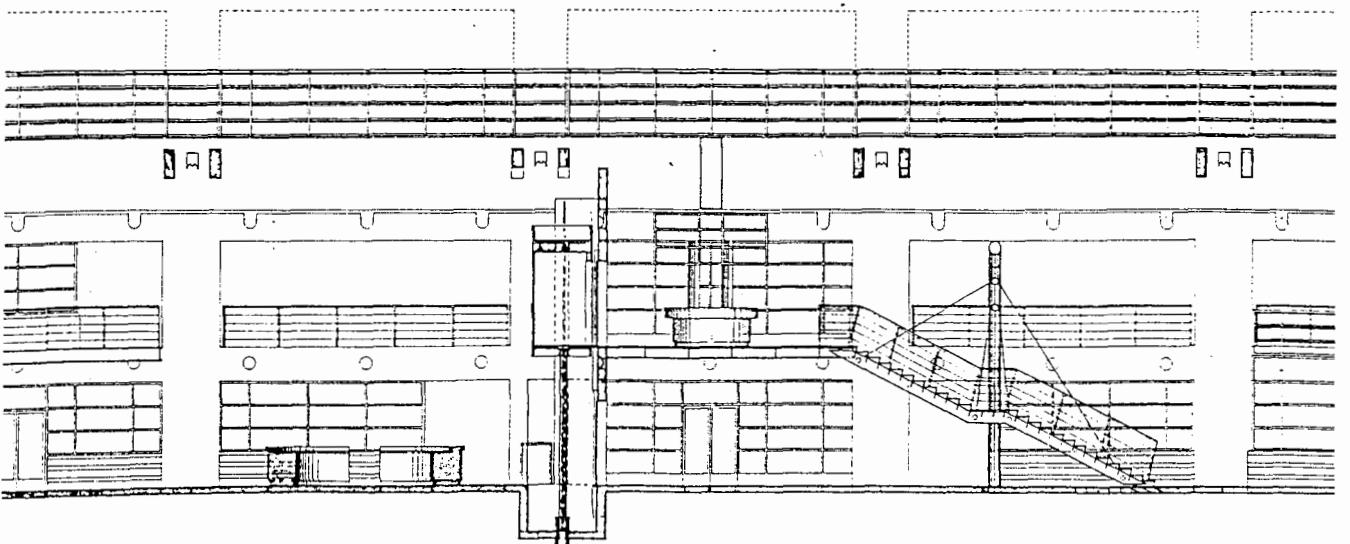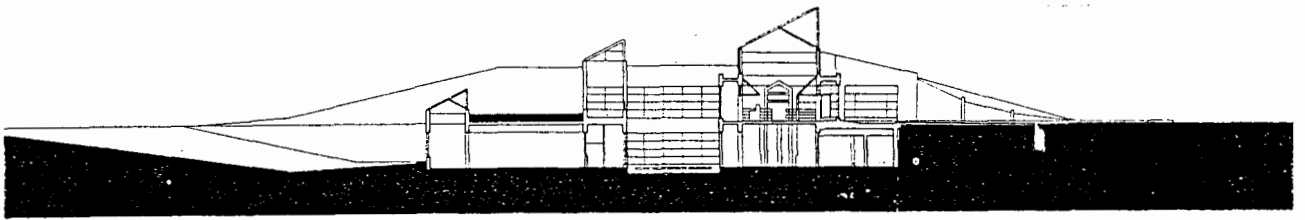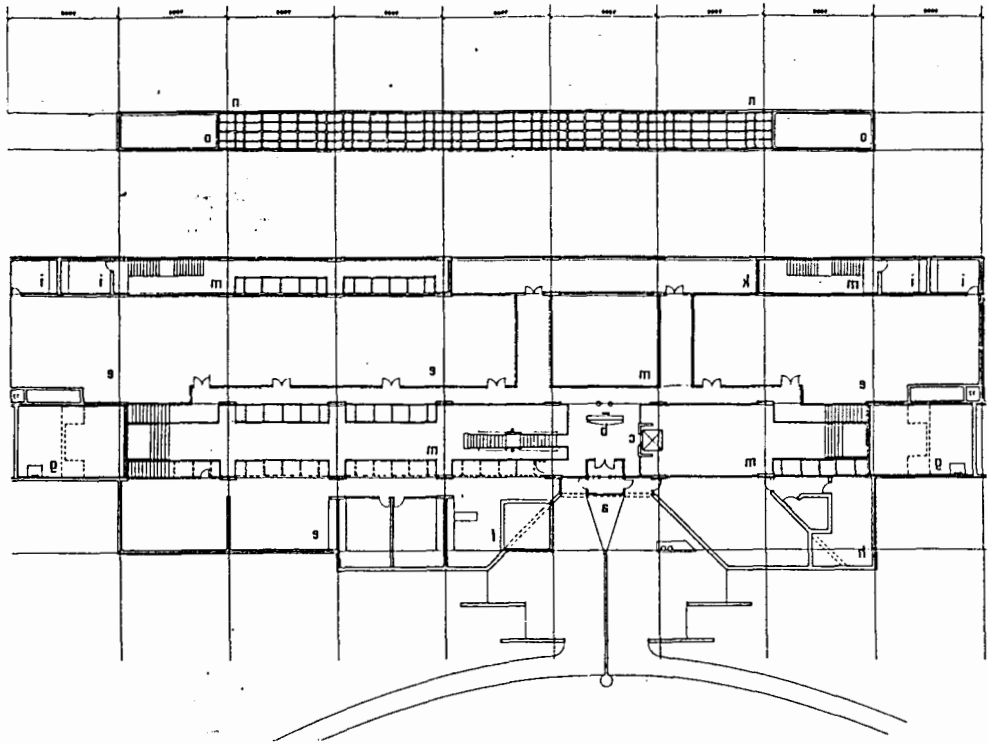
SCOPE OF
PROJECT

THE NATIONAL CENTER FOR TECHNOLOGY AND INDUSTRY

This Center for Technology and Industry is a new kind of facility in Lebanon. Its purpose is twofold:

1. Its main function is the promotion and support of the development of technology and industry. This section is mainly addressing professionals and industrialists with diverse services on many levels that are described in the program.
2. An informative section, smaller than the professional one, but of a high interest, addressing all age groups and people, in an effort to update the public interest in science and technology in an interactive multiform environment. Moreover, this is where the young generation gets exposed early to these issues in a humanistic way, preparing them for a better future.

Scope of the professional section of the center.

A Quick review of new perspectives on industry/technology in Lebanon

Effort is currently spent by the government to assist, protect and help develop industry and technology in Lebanon:

. Tax exemption when needed (on some raw materials) is being seriously discussed to allow more economic efficiency on products

. A general well organized industrial survey is about to be completed in an attempt to assess the condition of industry and possible future development

. Study and preparation of new industrial zones are being done, in order to update and create the infrastructure and a suitable environment for industrial development

. Opening new international trade markets between Lebanon and other countries

. Establishment of free zones to encourage investment in Lebanon and attract foreign investors to the country

. Reactivation of the "National Bank for Industrial and Touristic Development" and connections with other countries for foreign financial support

. Connection with the United Nations Industrial Development section (UNIDU) for possible high-technology manufacture in Lebanon and the establishment of **Technology Parks** as those in developed countries[1]

.Creation of the "Industrial Information Bank" gathering all information about technology and industry in Lebanon and worldwide (standards, technology developments, world trade markets etc.....)

. Support of the industrial advertising and promotion/media

. ...as well as many other issues that would be referenced in the study below.

B The **SCOPE** of the professional section of the center

As to the industrial and technological scope of the center, the facility would be serving in general all sectors of technology/industry through the service program of the "Industrial Information Bank" and the financial support branch.

But most of all, the center will be dealing with High-technology/computer/communication industry -mainly the assembly industry in these fields, *especially in a time where the government is even investigating the possibility of a complete production of high-tech industry in Technology Parks or a "Small Silicon Valley" in Lebanon* (as named by Eco News newspaper in October 1996). Moreover, the development in these fields will definitively boost the development of industry in **all its fields**, with a higher competitive power in the international market.

The decisions above were based on many factors/data:

. Interview with IDAL (Investment Development Authority of Lebanon) clarified many issues:

. the great potential in high-tech assembly with very good quality/efficiency and competition in the international markets

. the supremacy of Lebanon in the software industry and technology in the region

. the supremacy of Lebanon in media/ advertising in the Middle East

. Interview with Mr. Maher El-Jamal (who is about to build technology lab spaces in Bchamoun) showed the importance of Lebanon in the region as a link in the Middle East, and a very important assembly area especially in

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[1] Reference: "Al Mourakeb Al Inma'I " magazine. January-February 1996 - p.100

high-tech matters, and as a powerful exportation point of finished high-tech products and software technology if a good development strategy is followed.

. Interview with Mr. Antoine Semaan in LIBNOR (the Lebanese Standards Institute of the Ministry of Industry and Oil) showed that the assembly industry is of a high importance to Lebanon that could compete in these fields, especially in the development in the field of high-tech assembly.

. The decision of the Association of the Lebanese Industrialists to invest in the development of high-technology and developed computerized industrial equipment, even if at the expense of cheap hand labor[1].
Added to that the necessity of up-to-date technology with its periodic upgrading on all levels to improve efficiency, quality and competitiveness[2].

. The necessity of new high-tech development in the country and the advance in communication & media/advertising for the SME (small and medium-sized enterprises) to compete worldwide with big companies.

. The decision of the government to support and develop high-technology industry, and the possible complete production in this sector (still under study).

So, in summary, the following diagram shows the effect of the focus of the center on High-technology/Computer/Communications fields:

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[1] Magazine "The Industrial Newsletter" published by the Association of the Lebanese Industrialists; Nov-Dec. 1995- pp.11&13

[2] Magazine "Search Lebanon"; Mar-Apr. 1996 - p.12

competitive power in the Middle East
in this field proper

competitive power in the M E
& even worldwide
(especially in software industry)

↑

↑

**Main focus
of center**

1) focus on high-tech ----------→
computer/communic.

2) develop. of media/advertising
Aspect

↓

↓

positive effect/development in ALL
fields of industry

positive effect on ALL
fields of industry/tech.

⇕

⇕

developed computerized and
robotized systems of industrial sequence
up-to-date tech. → competitive aspect

professional assistance in the
development of trade publicity/adv.
and media communic. for industry

PROGRAM
FORMULATION

Programmatic description.

The main function of the National Center for Technology and Industry is the promotion and support of the development of technology in Lebanon. This is ensured through the *professional section* in the facility.

Services are offered to all professionals and industrialists according to their needs and type of support required, that would vary tremendously from case to another and among companies.

The main focus of the Center (as described earlier) will be the high-technology sector with the related communication/media technology, but it also serves all sectors of industry and technology in the country on the level of industrial information services (Industrial Information Bank), and the financial program level (Financial Bank). However, the focus of the center might vary in the future with varying needs and development of the different sectors and/or emergence of new challenges.

The professional section is mainly composed of :

-technology incubators
-audio-visual/media section
-information bank
-financial bank
-exhibition
-auditorium/conference services
-the 3 related departments : .the high-tech dept
          .the communication/media dept.
          .the general sectors dept.

The services provided by this section would be controlled by the 3 departments mentioned above, with coordination of the main administration's board of control (president + board of professionals) as well as the supervision of the Chamber of Commerce and Industry.

The technology incubators

These provide a structure to service fledging high technology companies, where meetings between companies (Lebanese-Lebanese but mostly

Lebanese-foreign) have the purpose of exchanging information and 'technology transfer' matters per se.

Moreover, Lebanese developing companies can meet and discuss common problems and issues in a suitable environment. This is a kind of organisation that have become usual and necessary throughout the Western world in the last 20 years, servicing high-tech companies that have brilliant ideas, little capital and the knowledge that they have to undergo a long learning and development period before returns come in.

Media/advertising section

This section groups mainly an interactive audio-visual network that links the center to major industrial zones / research centers in Lebanon and abroad, and to the foreign visiting companies home technological base. It directly serves the technology incubators section, as well as the rest of the facility. It acts as well like a media museum-like space, using the latest techniques of communication.

This section also groups an industrial Advertising section that is urgently needed for increased and proper media promotion of industrial high-tech / communication issues, as well as coordination on a national level, with specialised agencies, for proper industrial advertising/competitive packaging systems/etc.

The Information bank

This is a bank for industry and technology information that connects to and collects international information/updates/standards etc… as well as National data by connecting to : -the Industry Institute
-NCSR (the National Council for Scientific Research)
-LIBNOR (Lebanese Standards Instit,. for Industry)
-The Chamber Of Industry and Commerce
-Export houses
-Market trade associations

A mediatech serves any company or interested professional, and provides an additional but necessary service to the technology incubators.

The Financial bank

Linked to the National Bank for Touristic and Industrial development, it provides financial support and assistance to developing companies with low budgets or for companies planning major innovations / expansions. This bank

accommodates also a foreign support section, that serves the government's plan of getting funds from foreign countries for the development of industry. The bank is mainly controlled by the three professional departments in the facility, each serving its sectors in financial matters.

The exhibition center
It provides a big exhibition space and support areas for major exhibition events in the fields of high-technology and communications, with interactive facilities to provide the proper environment for such activities.

The Auditorium
Conference events, updates, special reports/films, demonstration projections, presentations, etc., will be served in this section. A direct relation to the audio-visual section, especially the A/V interactive display system will be possible in the conception of a new generation of auditoria.

The three professional departments
With the present main focus of the Center -that might change with time and development in the country- these departments could be described as:

1-High-technology department: dealing mainly with services concerning high-tech / computer field / robotics etc.

2-Communication/Media dept.: closely related to the first,dealing mainly with communication technology, media & software industry which is highly competitive in the region.

3-General sectors department : dealing with the various sectors of industry and technology. This department mainly assists the services provided by the facility on the level of the Information and Financial banks.

These departments supervise, control and coordinate the work and services provided by various sections [technology incubators, info bank ...] in the professional sector, and act as a mediator between these and the main administration and board of professionals, as well the Chamber of Industry and Commerce.

Common Professional/Public exhibition

This is a space for both professionals and the visiting public.
It consists of a small exhibition space where discoveries in different fields of science and technology are permanently exhibited; however, the focus on high-tech products and communication systems is more obvious.

The main information & control hall

A common professional/public space too, it distributes to the various professional and public spaces in the facility.

._ In addition to the professional sector, and which is the most important, a public sector is included too, smaller in size, but of a big importance.
This is an information sector, addressing all age groups, and people with different backgrounds. It would provide an interactive, and most important, a 'humanistic' approach to science and technology, through its various sections.

The Technology Pavilion

This groups many spaces and functions:

1-The Museum-like space is an area of a '3rd generation museum' on a small scale. It traces back the science and technology history up to new discoveries through interactive computer and audio-visual systems mainly, with object displays as a minor part.

2-The Electronic Park

-Computer space for all people, where on line computer terminals are accessible to the public under assistance.

-Simulators and interactive systems/games include high-technology simulators, virtual reality environments and games.

-Children's area; a special area for the youngest generation, to get it exposed early on to matters of science and technology, through educative games mainly.

The 3-D Image Auditorium

An up-to-date cinema space, using the latest techniques of Audio-Visual systems, where three dimensional image projection and the most developed sound systems would constitute a manifestation of a high level of technology at reach.

The Educational section
Under professional assistance, a plan for general educational information and advice **concerning** technology would be available to the public. Small labs/workshops will be available for testing and demonstrating systems in question.

The Electronic Library
Acting as a small public mediatech and information access facility concerning any desired topic, especially topics regarding science.
Access is allowed to the public under professional control.

The main administration
The main administration would group the President of the facility along with the 'boards of professionals' (board of directors) that would control and manage major services in the different sections, in a direct contact with the three professional departments. Moreover, these are linked to the Chamber of Industry and Commerce.
Accounting, security, public relation, maintenance departments all form part of the main administration.

Shown are administrative links between the 3 Professional departments, the different sections in the center, and the main administration's committee.
The Chamber of Industry and Commerce is reported to about on-going procedures and services by the main administration and the professional departments when needed.

The 3 professional departments are in direct control with the main administration that plays a major role in assisting them and taking important decisions as well.

The relations of various sections in the center with the professional departments is shown in following diagrams.

Administrative procedures for acquiring professional services by companies and individual researchers/professionals imply assistance and direct relation of the 3 prof. departments with these 'clients', for their access to the different sections (Technology Incubators, Info. Bank...etc.)

Each Professional Dept. serves a certain scope of the Industry / Technology, and deals with it and with visitors on that basis.

These departments report to the main administration for proper coordination.
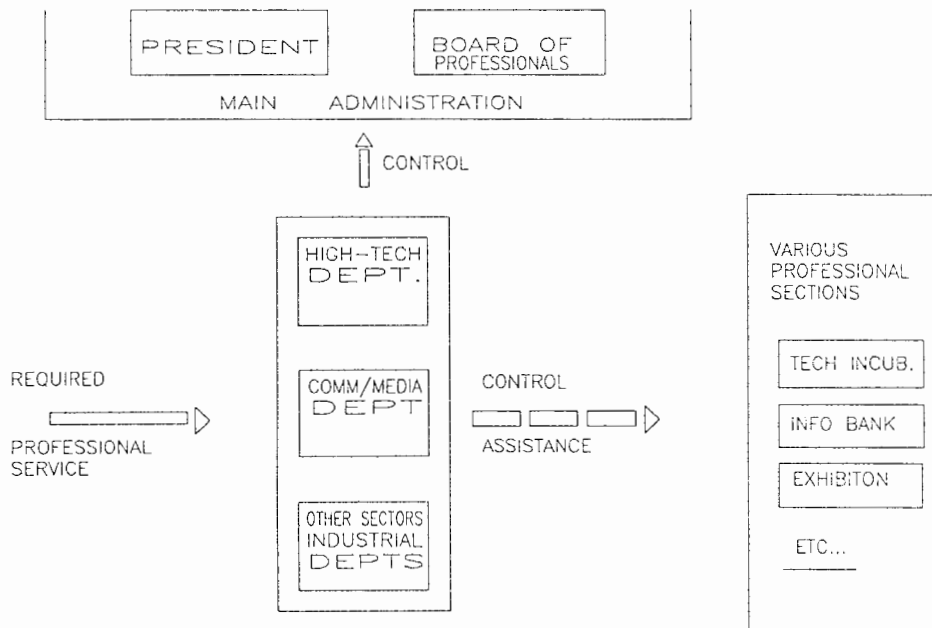
PROCEDURE OF AQUIRING PROFESSIONAL SERVICES

Administrative relations of major sections with the 3 professional departments

Because of the actual main scope of the Center, major services would be provided through the High-Technology and Media/Communication Professional departments.

However, highly important services are provided by the General Sectors Dept., without which the role of this facility is incomplete.

Eventually, the scope of the Center might change with time and development in the country in various sectors, and with the rise of new needs and circumstances. So, the present scope gives an idea of the present requirements and level of services needed at this time in Lebanon.
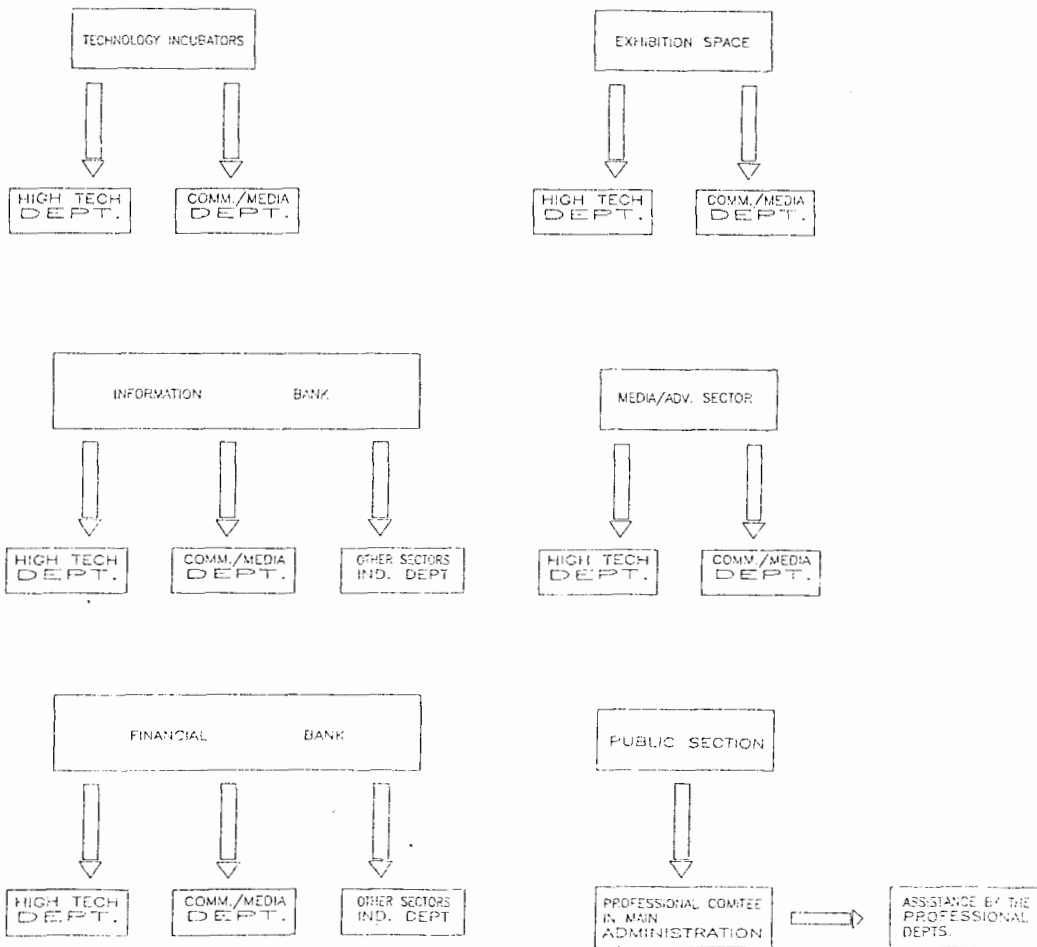
LEVEL OF RELATION BETWEEN MAJOR PROFESSIONAL SECTIONS

Provide A/V
demonstrations
to incubators

| TECHNOLOGY INCUBATORS |

& grl. A/V
connection

| MEDIA/ADV. SECTOR |

Provides
necessary
information
for development
and technology
transfer issues

| INFORMATION BANK |

Provide latest info./
standards/market data
in field

| MEDIA/ADV. SECTOR |

| INFORMATION BANK |

Provide A/V documentation
of information when available
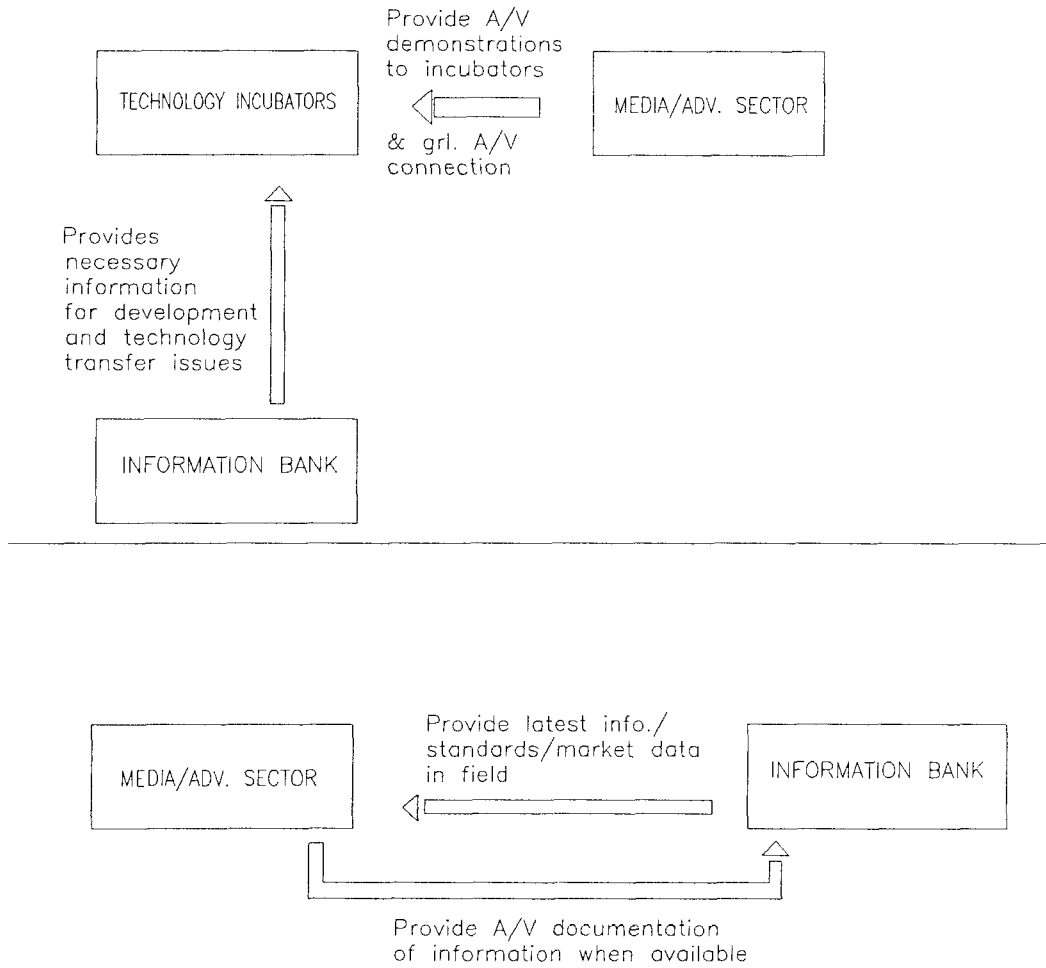
COORDINATION

Coordination between two different Professional Departments is crucial in assisting certain sections, based on the type of services at a certain time.

Hence, flexibility and overlapping in services is a must for the proper functioning of the system.
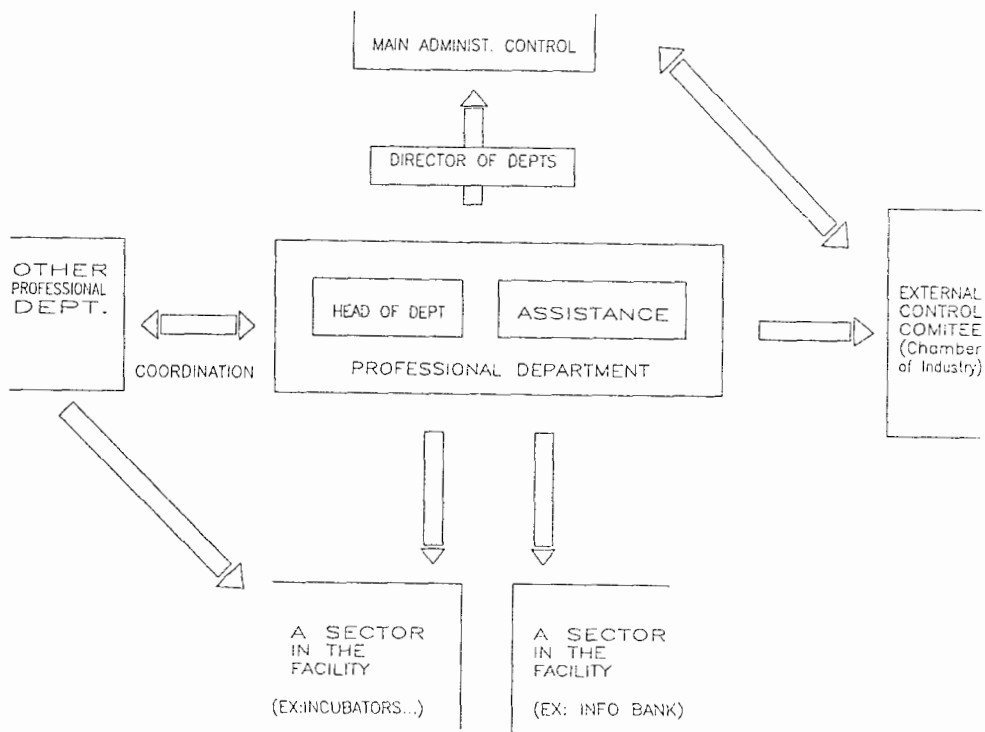
Program formulation

As mentioned before, the Center is composed of a professional sector, a public sector, and a main administration, with a small area common to professionals & public.

In describing the program, it will be presented and discussed along what was set to be the major HARDWARE component, in the 1st part of this document. (At this level, the analysis of some spaces might include the effect of Software categorisation or other effects of the set approach).

The **professional** sector includes several sections:
-Technology incubators
-Media/advertising section
-Industrial information bank
-Financial support bank
-Temporary exhibition hall
-Auditorium
-3 professional departments

The common **professional/public** area includes:
-Permanent exhibition hall
-Main control and information hall
-Restaurant/cafeteria

The **public** sector includes:
-Technology pavilion (& its sub-sections)
-3-D auditorium
-Educational section
-Computer library

The main administration includes many departments explained later.

Following is an explanation of the set-up devised for the program.
Different sections will be detailed and broken down in terms of their spaces, functions, and spatial units.
Moreover, definition of areas will be carried out.

→However, trying to define spatial requirements according to standards would imply, in this situation, a particular **selection of information** that would be compatible with the approach stated earlier for this project, in relation with the analogy of Technological Systems.
Hence, very strict typologies of spaces (eg some set office types etc...) will basically be **disregarded** in favour of more general information that would help define areas, and that contributes to the formulation of the 'inner body of knowledge' of the architecture; leaving the flexibility and freedom of interpretation of spatial conception and relationships.

TECHNOLOGY INCUBATORS

OFFICE SPACES	Small exhibition spaces
Demonstration LABS	

Conference Facilities	Lecture/ Projection area	LOUNGE
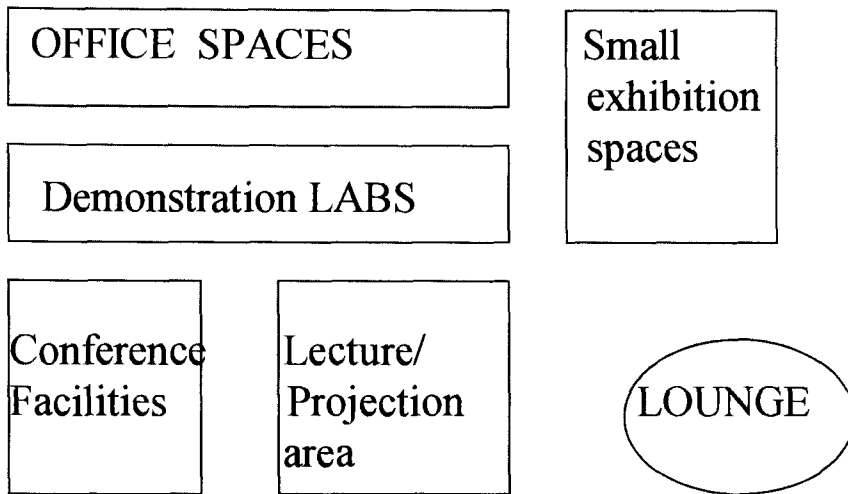
Functions that form the Technology Incubato

-The office spaces for companies accommodates Lebanese and foreign companies visiting the Center on short basis (1 day) or longer periods of several days/weeks in terms of technology transfer purposes.
Thus two set-ups would be provided, for very short visits(set-up 1), or longer occupations (set-up 2).
The office spaces is a big flexible area that would be arranged to house a maximum of 10 companies at a time, assuming 5 occupying one type of set-up simultaneously.
Hence, this 'interacting' space would be connected to small exhibition area/storage included in the set-up 2 conditions, with an increased amount of space for supposedly larger number of staff visiting.

Assumption is made that in the set-up 1 case, a visiting company should include: the manager, and 1-2 professionals (possibly 1 secretary too)
while in visits on long term, especially in the case of foreign companies,
a crew of manager, several professionals (3-4), and support staff (2) would be present.

Then, the average number of users in this area would sum up to reach 35-40 persons, with variations, of course, following the type of visits occurring.

Based on that, and taking into consideration the high 'interaction' between individuals of different companies in this area, a definition of 500m2 is carried out.
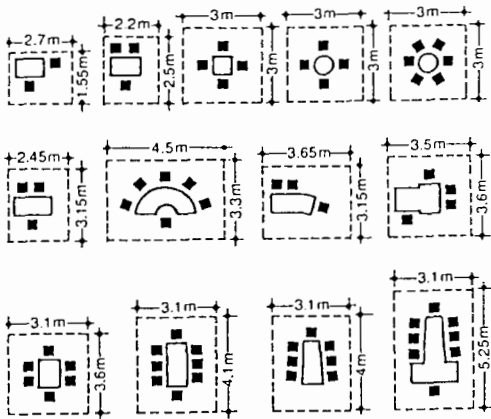
type of space	number of P	typical space required per P
provision at workplace meeting at desk	2–3	m² 2.0–2.75
meeting ar	4	1.5–2.5
provision for group of workplaces meeting or	6–8	1.5–2.5

Grade	Type assignment	Allowance, sq ft per person
GS 1-16		60
GS 7-11	Supervisory	100
GS 7-11	Nonsupervisory	75
GS 12-13	Supervisory	150
GS 12-13	Nonsupervisory	100
GS 14-15	Supervisory	225
GS 14-15	Nonsupervisory	150
GS 16-17-18 . . .		300

	Square feet
Top executive.	400-600
Junior executives.	100-200
Supervisors	80-100
Operator at 60 in. desk.	55
Operator at 55 in. desk.	50
Operator at 50 in. desk.	45

-Related are the spaces for small exhibition/storage serving mainly long-stay companies, or those needing such area.
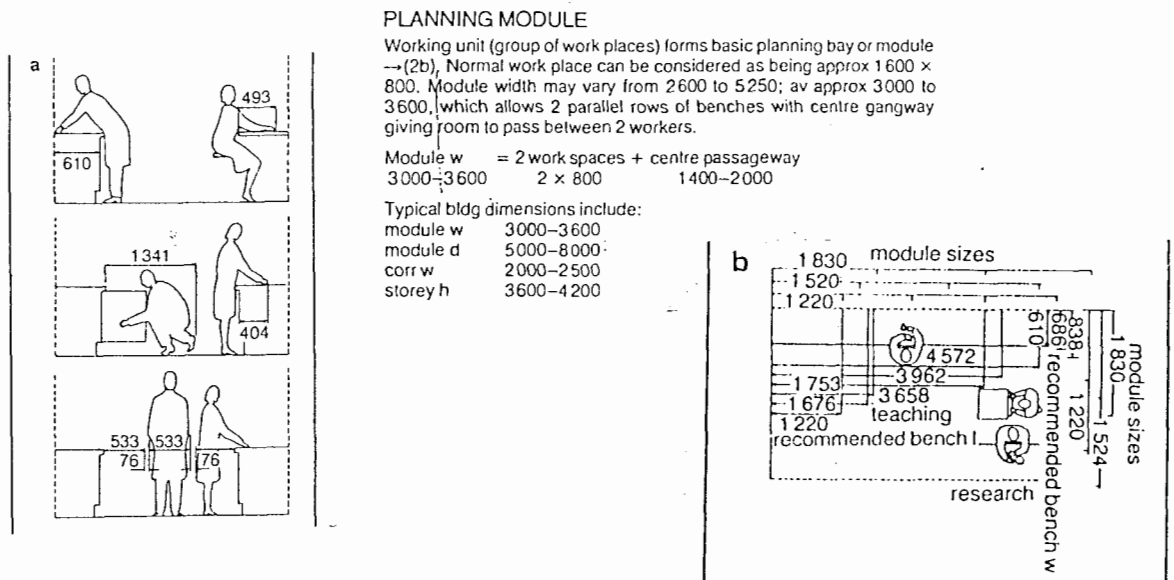An area of 50m2 would be allocated for a company. The total area would sum up to 150m2 assuming 5 similar set-ups.

-Demonstration laboratories (multi-use too) would add a necessary function to the incubators. These are used to perform high-technology/computer-related demonstrations mainly (technology transfer issues - testing/experimenting). These are not research and development labs, nor do they carry any wet experiment.
The labs directly serve all companies present, and are common to all.

A set-up of these mainly 'performing' (& interacting') spaces would comprise high flexibility for the arrangement of labs and their areas.

An area of 150m2 will be allocated, connected to the offices.

PLANNING MODULE

Working unit (group of work places) forms basic planning bay or module →(2b), Normal work place can be considered as being approx 1 600 × 800. Module width may vary from 2 600 to 5 250; av approx 3 000 to 3 600, which allows 2 parallel rows of benches with centre gangway giving room to pass between 2 workers.

Module w   = 2 work spaces + centre passageway
3 000–3 600   2 × 800   1 400–2 000

Typical bldg dimensions include:
module w   3 000–3 600
module d   5 000–8 000
corr w   2 000–2 500
storey h   3 600–4 200

[Services such as kitchenettes/WCs for these areas would occupy some 60m2 on the average]

-Conference spaces are of high importance besides the office spaces.
It is used for efficient group discussions with on-line connection through
computer conferencing with relevant technology centers, etc.
2 conference spaces are included, serving each for an average of 15persons.
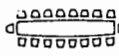These would occupy 100m2

type of space	number of P	typical space required per P
	8–12	1.5–2.0
assembly ar	100–150	
board rm	16–24	1.5–2.0
conference rm	15–20	1.5–2.0
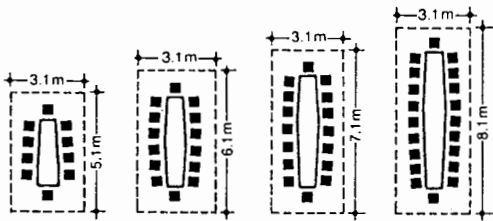
	Square feet
Reception room	400
Waiting or interviewing room.	200
Conference room . . ·	500

Add approximately 10 sq ft for each additional person to be provided for.

-A lecture hall with an up-to-date projection A/V system will be directly
serving the other spaces of the incubators, as well as professionals using other
sections of the facility and attending important presentations.
An average of 100 persons will be accommodated.

The area would be 80m2, considering 0.8m2/person on the average.

lecture rm	50–100	large conferences, presentations, lectures & training sessions
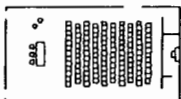
max horizontal viewing angle	30°
max vertical viewing angle	35°
critical angle of projector	12°
max viewing distance	6 × w of screen
min viewing distance	2 × w of screen
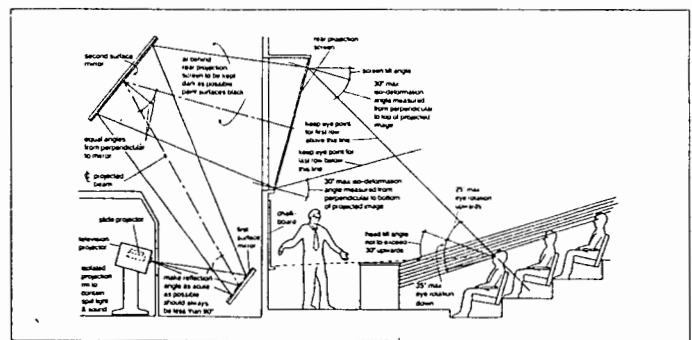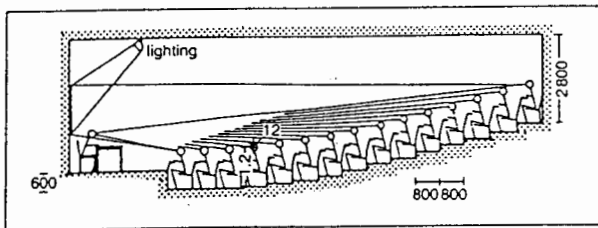
-A lounge / resting area is present for the technology incubators users.
Accommodating 20-25 people at a time, it occupies 50m2

MEDIA / ADVERTISING SECTION

INTERACTIVE DISPLAY A/V

INDUSTRIAL ADVERTISING dept

MEDIA PRODUCTION STUDIO

Technical Support Section

Functions constituting the Media/Advertising section

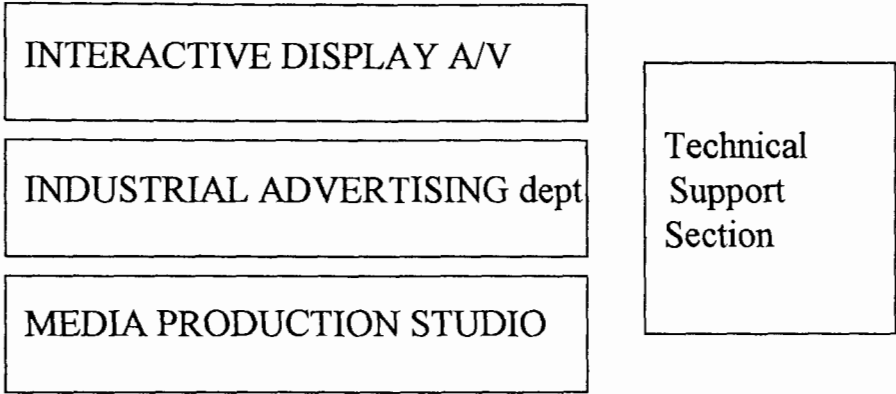-The interactive display space is an 'on line' interactive audio-visual display system / screen that connects the Center to technology, industrial and research centers in Lebanon and abroad, using innovative techniques of communication.
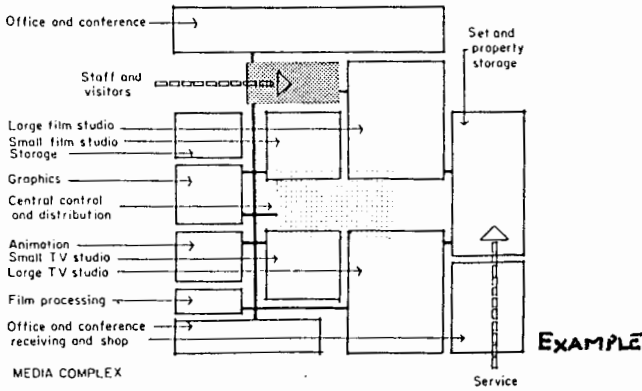
It occupies an average area of 100m2, just to accommodate the system and screen. However, the actual area served by this display is great and varies and flows from space to another, such as, for example, the major exhibition, but most importantly the technology incubators to which it is a complement.

-The industrial advertising department deals with a plan for developing the industrial advertising standard in the country for competitive purposes in the national/international market; through advanced audio-visual and graphics systems.

It plans advertisement production (for clients needing this kind of services) taking place in the related studio. It also connects with major advertising agencies throughout the country for coordination of strategies.

	Number of existing	Stations projected	Net sq ft per station	Total net sq ft
Audio visual center:				
Coordinator	1	1	140	140
Faculty office	1	1	100	100
Supervisor	1	1	100	100
Secretary	3	3	60	180
Projectionist's study room	...	...	...	100
Reception	...	...	...	80
Student viewing cubicles	...	15	30	450
Student/faculty laboratory	...	6	40	240
Previewing studios:				
Group (15)	...	1	225	225
Individual	...	4	40	160
Audio visual class/laboratory	...	20	60	1200
Repair shop	...	1	400	400
Subtotal				3,375
Television:				
Coordinator of educational activities of TV	1	1	140	140
Faculty office	1	1	100	100
Technical coordinator	1	1	100	100
Higher education officers	2	2	80	160
Secretary	1	1	80	80
Student work stations	...	3	60	180
Control room	...	1	400	400
Shop	...	1	400	400
Subtotal				1,540

4-5 people constitute the creative team, other 2 persons are in charge of coordination, occupying 50m2. A reception area of 30m2 is provided

Office and conference
Set and property storage
Staff and visitors
Large film studio
Small film studio
Storage
Graphics
Central control and distribution
Animation
Small TV studio
Large TV studio
Film processing
Office and conference receiving and shop
EXAMPLE
MEDIA COMPLEX
Service

-The technical support section consists of office space with technical control equipment, where the crew of production and control are accommodated.
Assistance to the interactive A/V display system as well as to the studio is assured.
A production crew of 5 persons and 2 supervising personnel occupy this space. It occupies an area of 50m2

-The media production studio, for executing the designed A/V and graphic advertisements. It accommodates special equipment (ranging from cameras to processing units)
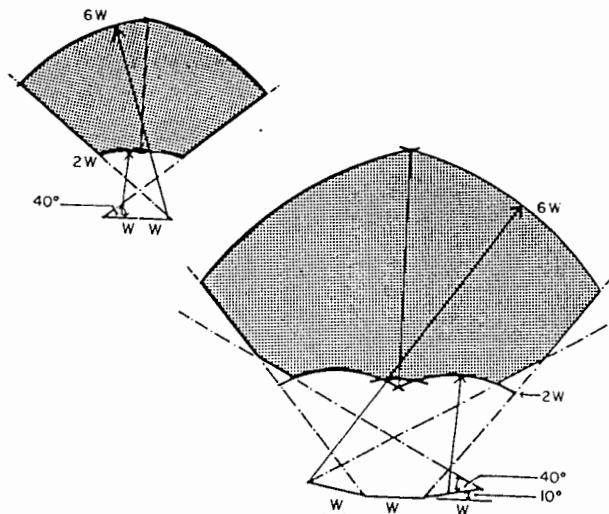The studio would occupy 75m2

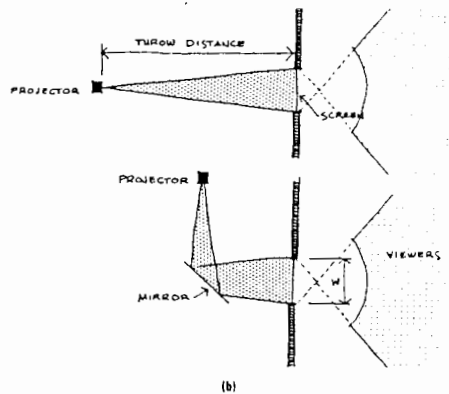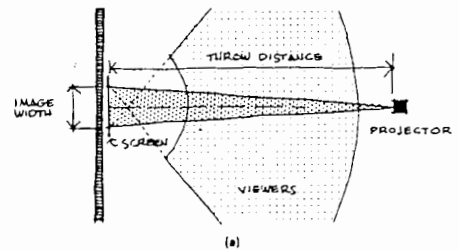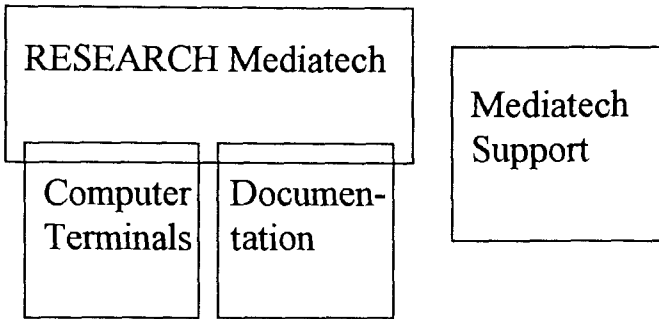Fig. 11 Viewing areas for two- and three-screen projection.

Fig. 7 (a) Front projection; (b) rear projection.

INDUSTRIAL INFORMATION BANK

```
+----------------------------------+        +------------------+
| RESEARCH Mediatech               |        | Mediatech        |
|   +----------+----------+        |        | Support          |
|   | Computer | Documen- |        |        |                  |
|   | Terminals| tation   |        |        +------------------+
|   |          |          |        |
|   +----------+----------+        |
+----------------------------------+
```

<u>Spaces forming the Information Bank</u>

-The research mediatech, is composed of:

.the computer terminals: providing information through related CD titles, processed information through the support offices, as well as on-line information.
It serves simultaneously 50 persons, occupying an area of 200m2
    .the documentation section comprising
        /microfilm area (mainly of old periodicals and related issues)
        with 5 stations, occupying an area of 50m2
        /slide library with 5 viewing stations and a projection room
        it occupies 50m2
       /current periodicals with a reading area comprising
        individual carrel spaces as well as common reading area
        the area of which would be 150m2 (25m2 periodical display)
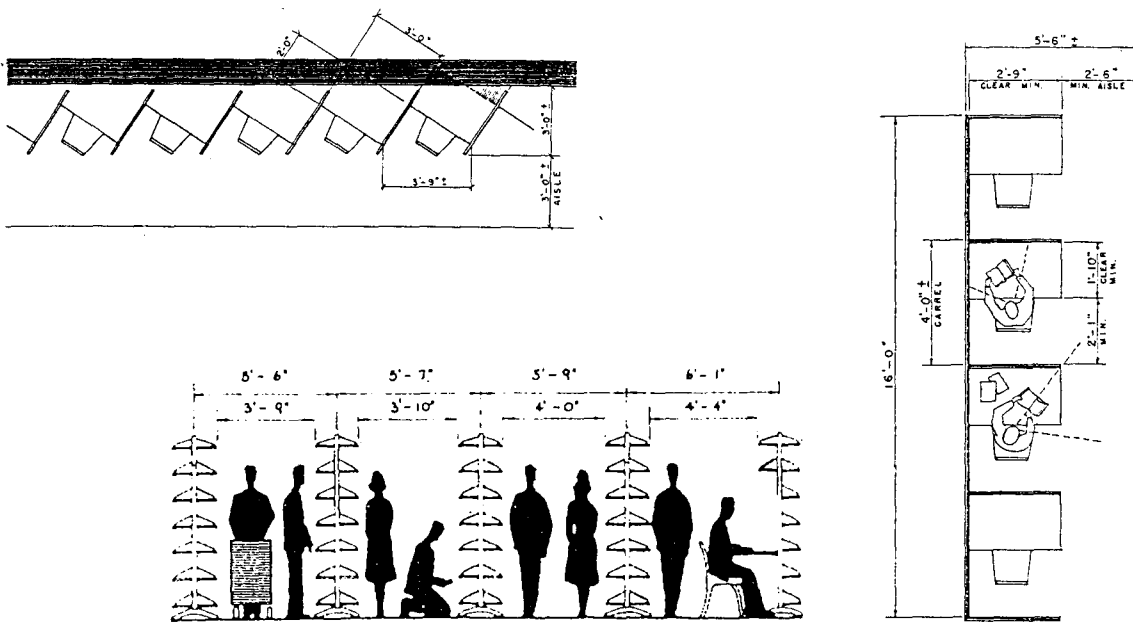
-Mediatech support, consisting of

. support computer terminals where 3 specialised personnel assist information channelling and processing from various sources in the country (such as LIBNOR-NCSR-Industry Institute-Research centers-Export houses-Industrial bases- etc...) and abroad takes place.
The area of this support section is 30m2

.support area to documentation with 1 record person in charge of receving CD software, as well as current periodical and any related item. 2 other persons assist the slide library and the microfilm services.
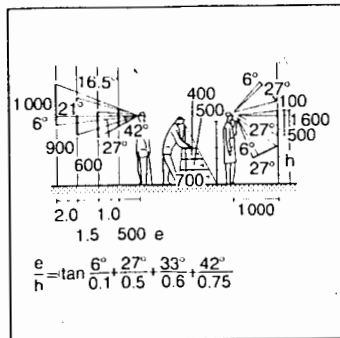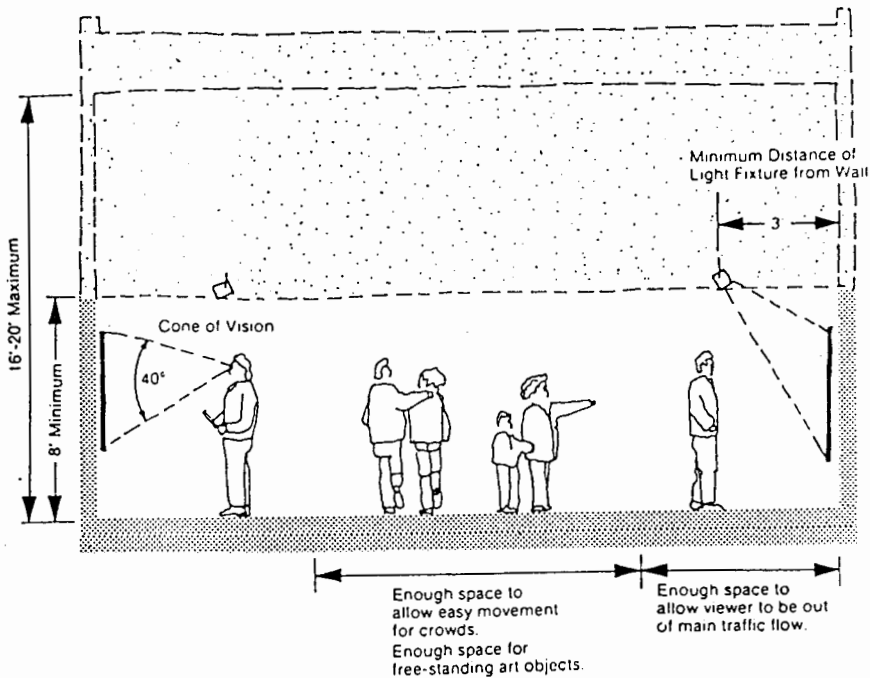A dark room of 15m2 would be included.
The area adds up to 50m2, plus 15m2 storage

This exhibition hall provides services for temporary events concerned with updates related to technology and industry.

A highly flexible space, it makes use too of the latest communication technology, especially in relating to the interactive Audio-Visual display area. Area could vary, as to the relation of this flexible space to other events in the Center; an average area of 2000m2 plus a preparation workshop of 150-200m2 serve the purpose.

Minimum Distance of Light Fixture from Wall

16'-20' Maximum

8' Minimum

Cone of Vision

40°

Enough space to allow easy movement for crowds.
Enough space for free-standing art objects.

Enough space to allow viewer to be out of main traffic flow.

$$\frac{e}{h} = \tan\frac{6°}{0.1} + \frac{27°}{0.5} + \frac{33°}{0.6} + \frac{42°}{0.75}$$

THE MAIN AUDITORIUM

This auditorium serves the professional sector, with major events accommodated, as explained earlier.

It would serve a minimum of 500 people, using, as other spaces in the center, an advanced audio-visual system.

An area of 500m2 is adequate.
500persons x 0.80m2 + 100m2 projection-storage and related services.

Basic requirements for auditorium levels; rake not necessarily limited to 10% & 5% in USA

THE FINANCIAL SUPPORT BANK

DIRECTOR	TRANSACTION

ACCOUNTING	FOREIGN SUPPORT

HALL - TELLERS - CASHIERS
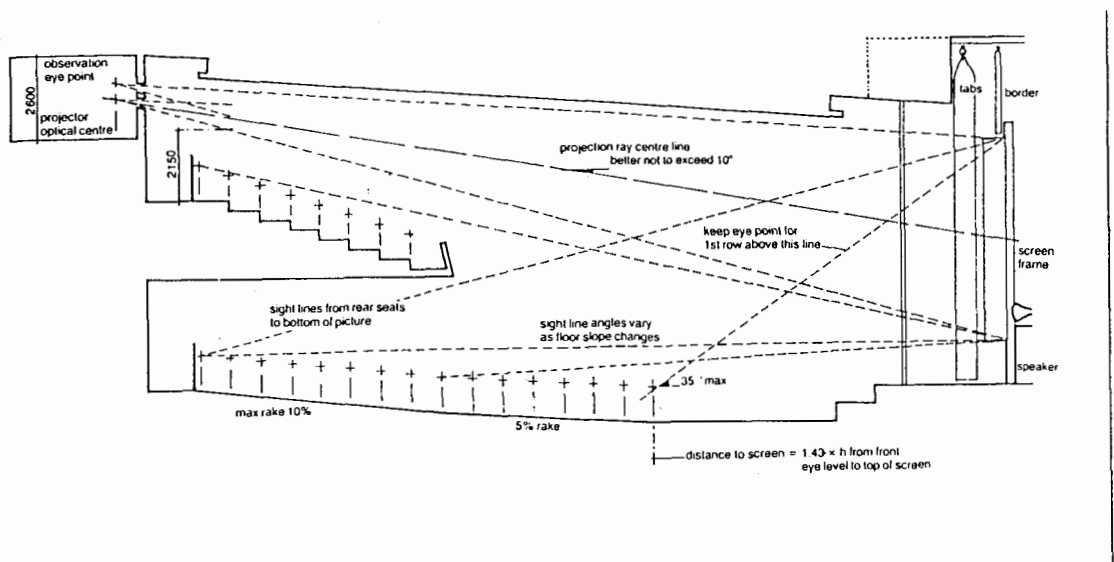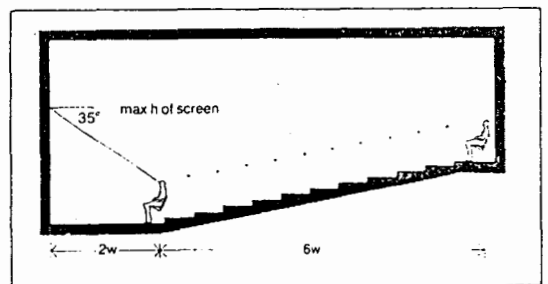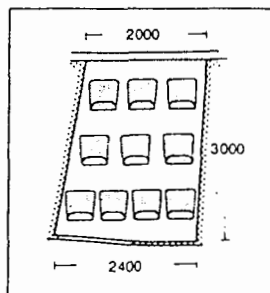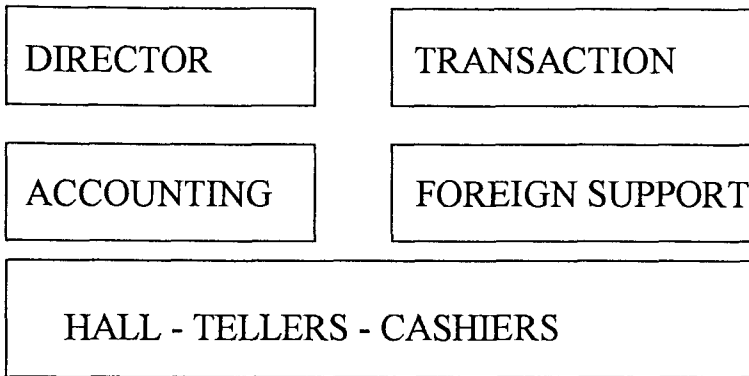
Functions forming the Financial Support Section

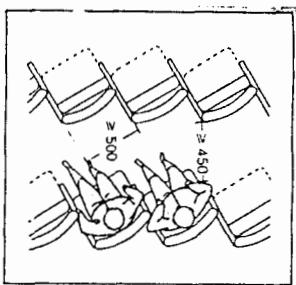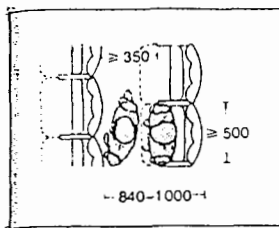-The director: a 'controlling' space with computer connection to different sections of the bank occupying 25m2.

-The accounting section, controlling financial flow, by a computer connection to the bank network. 3-4 personnel with an area of 30m2

-The transactions section, assuring proper procedures with 4 personnel occupying an area of 30m2

-The foreign support section, with a public relation team and assistance personnel, forming 4-5 persons, occupying an area of 40m2

-Cashiers & Hall: the direct interaction with the clients. This hall would be exposed to major activities such as exhibitions, interactive display areas, etc. A flexible set up that would eventually detach it from strict relations to the bank control areas.
This hall, with flexible area, would occupy 150-200m2

THE 3 PROFESSIONAL DEPARTMENTS

```
┌─────────────────────┐  ┌─────────────┐
│  DIRECTOR           │  │             │
└─────────────────────┘  │  Secre-     │
┌─────────────────────┐  │  tary       │
│  PROFFESIONALS      │  │             │
│  in charge          │  └─────────────┘
└─────────────────────┘

┌───────────────────────────┐
│                           │
│   VISITOR'S lounge        │
│                           │
└───────────────────────────┘
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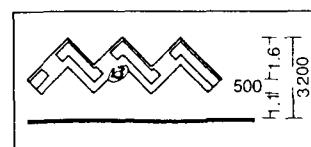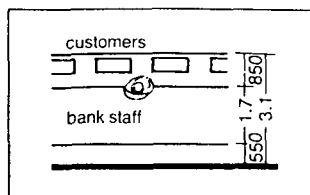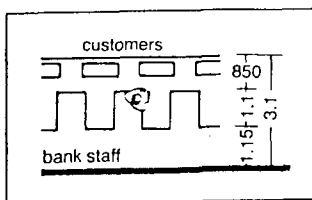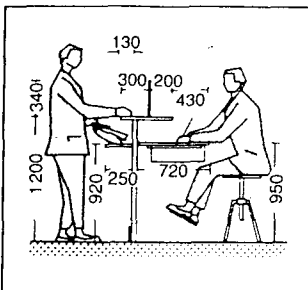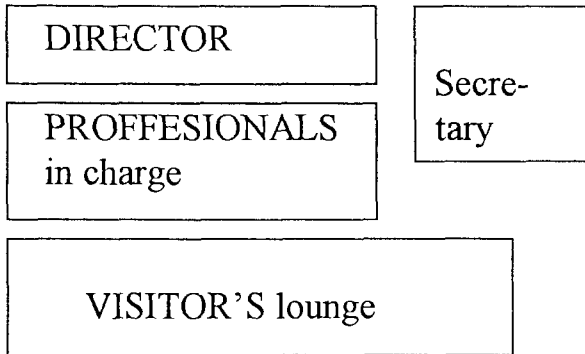
<u>A typical professional department</u>

These departments are:
　　　the High-Technology dept.
　　　the Communication/Media dept.
　　　the General Sectors dept.

The structure of the three departments is similar.

-The director: a space with on-line computer conferencing, controlling major services provided by the department, occupying 25m2
-Secretary: assisting the director and the department as a whole, 10m2
-Professionals in charge, 3-4 persons in charge of managing the services of the dept.
They are in direct contact with 'clients' (professionals/indusrialists requiring services).
The required area is 50m2 with visitors accessibility provided
-A visitors reception area , 30m2

THE PERMANENT EXHIBITION

Acting as a common Professional and Public space, it provides a permanent exposure to scientific and technological issues and innovations.

It would provide a flexible space relating to major other spaces such as the restaurant, the main hall, major spaces in both the professional and public sectors, acting as a buffer between some of them.

An adequate average area for this space is 750m2 including a preparation zone.
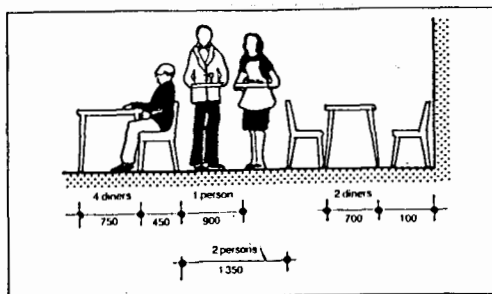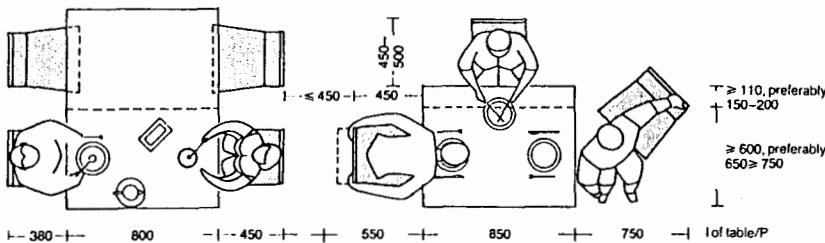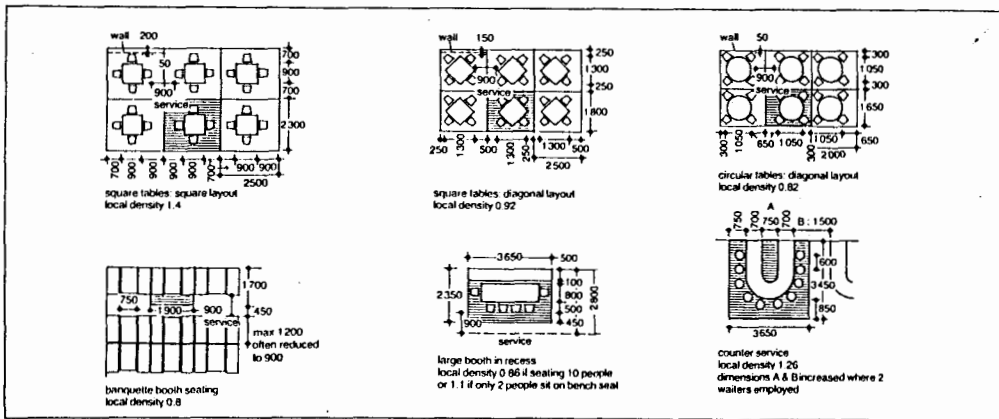
THE MAIN HALL

The main entrance hall, providing control and information.
It acts as a main distributor, especially between public and professional sectors.

An area of 150m2 is assigned to the hall, with a spatial continuity with major spaces increasing its apparent size.

One of the common public and professional areas, providing a relaxation area, with possible visual link to the major spaces, such as main exhibitions and interactive leisure environment,

It will provide mainly for self-service, counter and table accommodations.
Servicing 100-120 persons between public and professionals (+visitors)
it occupies an area of 200m2 with kitchen.
[175m2 seating + 30m2 preparation]

square tables: square layout
local density 1.4

square tables: diagonal layout
local density 0.92

circular tables: diagonal layout
local density 0.82

banquette booth seating
local density 0.8

large booth in recess
local density 0.86 if seating 10 people
or 1.1 if only 2 people sit on bench seat

counter service
local density 1.26
dimensions A & B increased where 2
waiters employed

$\top \geq 110$, preferably
$150-200$

≥ 600, preferably
$650 \geq 750$

l of table/P

Snack bar service
Usually restricted to light meals, served at counter or taken by customer to table. Food normally cooked within counter area but back-up preparation, wash-up and sto required. 1.50–2.20 m²/P including counter and cooking.

Cafe service
0.83 m²/P: limited menu, usually family type of business, designed on traditional lines with kitchen separate from dining rm. Food may be collected by waitress from small service counter or hatch to kitchen.

Self-service cafeteria
1.4–1.7 m²/P, long self-service counter, provide good circulation space. Space for clearing trolleys (carts) required. Self-service counters →p206(2).

Coffee shop service →(3)
1.2–1.4 m²/P, usually waitress service, often from forward cooking area with counter which may be decoratively screened. Main preparation and wash-up at rear. Counter service sometimes included.

4 diners   1 person   2 diners

2 persons

TECHNOLOGY PAVILION

```
┌─────────────────────────┐
│  MUSEUM-LIKE space      │
│                         │
└─────────────────────────┘
┌──────────────────────────────────┐
│        ELECTRONIC PARK           │
│  ┌────────┐ ┌────────┐ ┌────────┐│
│  │Computer│ │Simulators││Children's││
│  │Space   │ │Interactive││Area    ││
│  │        │ │Areas     ││        ││
│  └────────┘ └────────┘ └────────┘│
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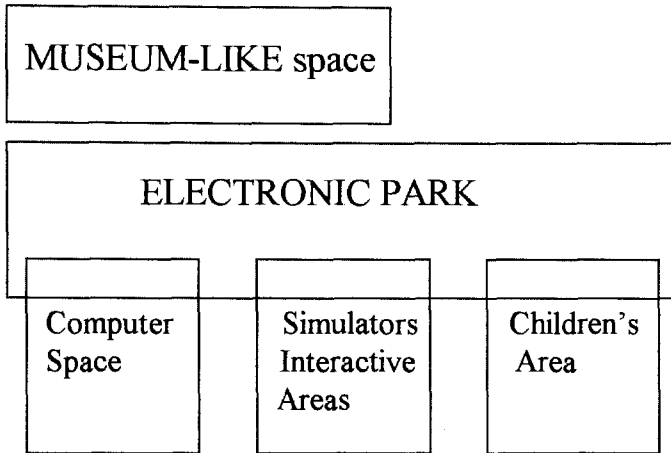
Spaces forming the Technology Pavilion

-The museum-like space is a king of science museums of the '3rd generation', comprising interactive systems for the display of the history of technology up to the latest innovations.
An area of 150m2 will be allocated for this space, with flexibility of relation with other areas, such as the permanent exhibition, and of course, the electronic park of the pavilion.

-The electronic park comprises
. computer terminals space accessible to the public, with professional assistance, with special programs & on-line connections...
This area serves simultaneously 25 persons, with an area of 100m2, being in a relatively crowded public place.
.simulators and interactive areas are highly leisure-directed, in an effort to update the public interest (from different backgrounds) in technology and development, where people can play with a variety of experimental and educational delights ranging from games to virtual reality simulators...
This would occupy an average area of 200m2

→ in fact, the terminals space & the simulators area would be flexible enough to form one space of interactive media, with an area ranging between 300-350m2

.the children's area has for objectives exposing the youngest generation to science through joyful educational games suiting their age.
Special assistance is permanently present to supervise and assist.
A number of 30 children will be accommodated each at a particular station, with an average area of 3m2 per child.
An area of 100m2 will be provided. Special services for children (wc, eating...) will be allocated (20m2)

3-D IMAGE AUDITORIUM

An up-to-date auditorium using the most advanced techniques of image and sound systems.

It will accommodate up to 300 persons. Thus the area would be 300m2, plus 50m2 for special projection and control rooms for such techniques.[350m2]

This types of cinemas use sophisticated increased picture size (Cinemascope, Cinerama, Todd AO, Circarama, IMAX...) as compared to the traditional ones. These will the shape and interior design and layout of the space as to the dimensions of cinema, with mainly very large curved or semi-circular screen [reaching 370']

The following illustrations show different techniques of projection and implication on the form of the auditorium. The most successful, however, is still the Geode at la Villette Cité des Sciences, with one main central projector below the seating space, with a throw covering the entire semi-circular screen.
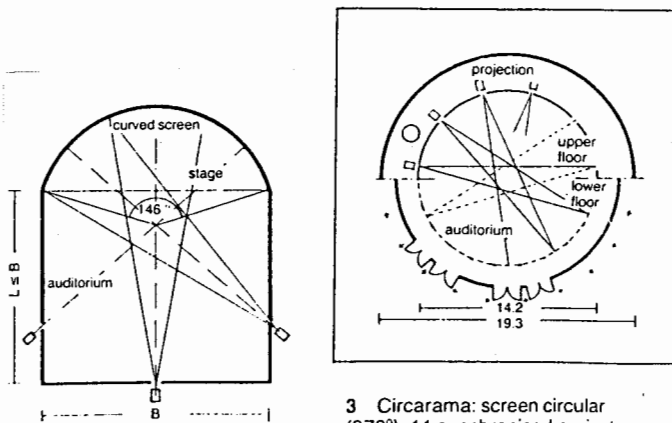
3 Circarama: screen circular (370°); 11 synchronised projectors produce coherent picture; example; Expo Brussels

EDUCATIONAL SECTION

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┌─────────────────────────────┐
│                             │  ┌──────────┐
│  FEEDBACK/LECTURE space     │  │          │
│                             │  │ ADVICE   │
├─────────────────────────────┤  │ Section  │
│                             │  │          │
│  MULTI-USE LAB spaces       │  │          │
│                             │  │          │
└─────────────────────────────┘  └──────────┘
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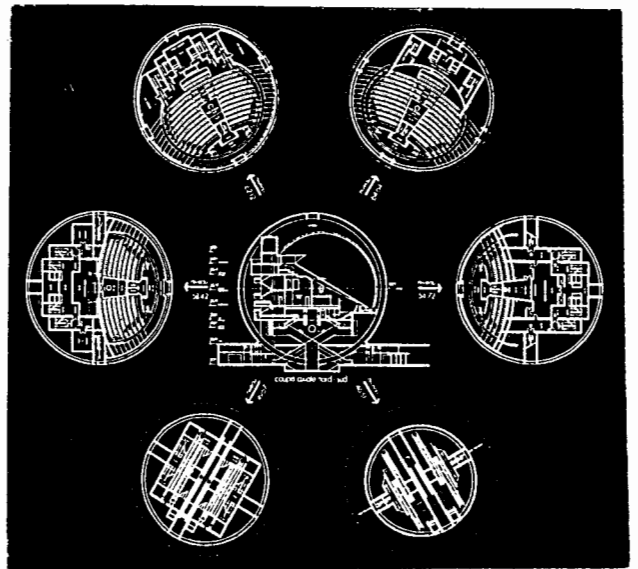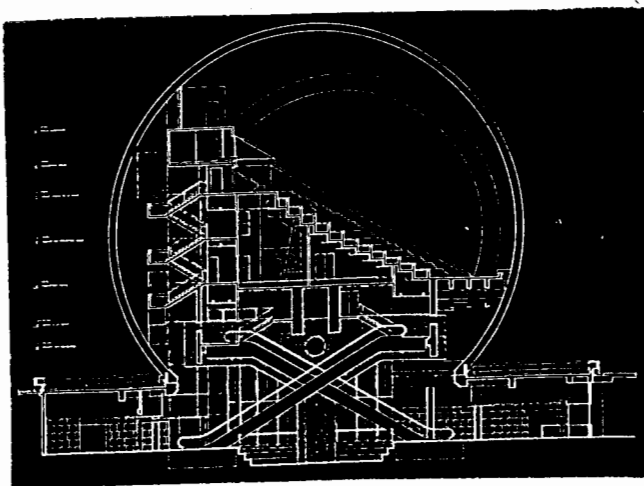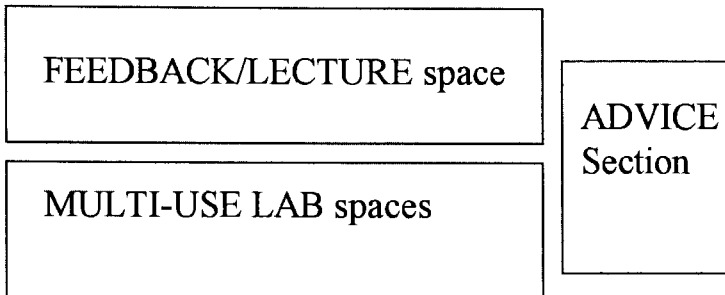
Spaces constituting the educational section

-The feedback/lecture space would accommodate 30 persons on digital stations with special instruction and assistance from professionals in various fields that will be determined by the administration.
-Connected is a multi-use lab space serving these people for special performance, testing , experimenting ...

The areas above are flexible to merge into each other as desired.
On the average, the area of each would be 50m2, both adding up to 100m2

-An advice section for the professionals in charge (2) occupies 30m2

PUBLIC COMPUTER LIBRARY

PUBLIC MEDIATECH	Assistance & Control
SUPPORT SECTION	
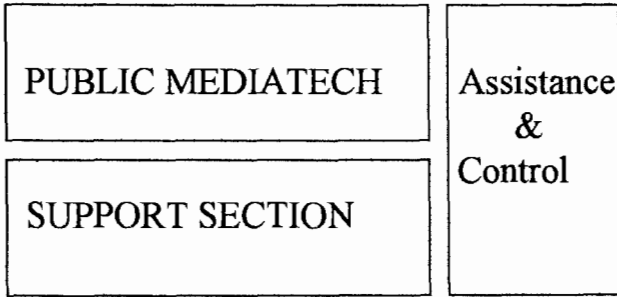
-The computer access terminals space provided for the public acts as a small mediatech provides general and specific science-related information., through CD titles, processed information, and Internet access.
It serves 25 persons simultaneously, with an average area of 100m2

-A support section controls the flow of information and its processing, through computer terminals linked to the public units.
2 persons at working stations, 25m2

-Assistance and control is provided through 2 personnel, 25m2
(in direct relation with the public + supervision)

THE MAIN ADMINISTRATION

PRESIDENT	Conference Space	Lounge
Board of Professionals		

Public Relations Dept.	Security Dept.
Accounting Dept.	Maintenance Dept.

Functions forming the Main administration

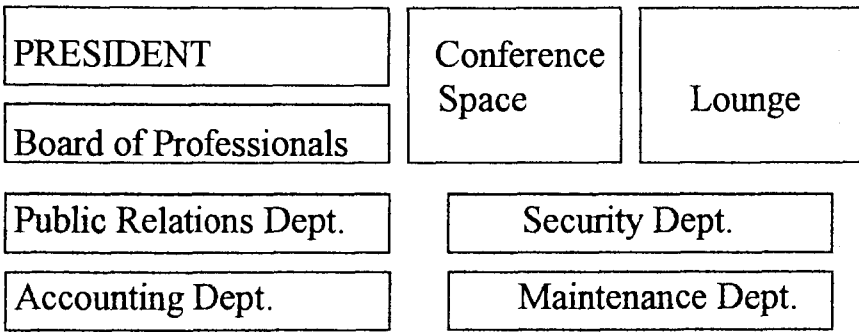-The president, controlling all activities in the center, public and professional. On-line computer conferencing crucial for internal links in the center, but most of all external links, especially the Chamber of Industry and Commerce. Decisions are taken by the president in coordination with the board of professionals.
-The professionals (directors of prof. sections) that form the board of professionals. They decide on major issues concerning the relative departments and sections in the professional and public sectors, in direct relation with the President. They connect also to the Chamber of Industry and Commerce.

The spaces occupied by the president and these directors would eventually form a possible example of (single) plugged units or group of units plugged in the network, equipped with on-line computer conferencing. The development on this topic will occur during design. Proposed unit area: 30m2
[Individual secretaries might be optional in such cases]
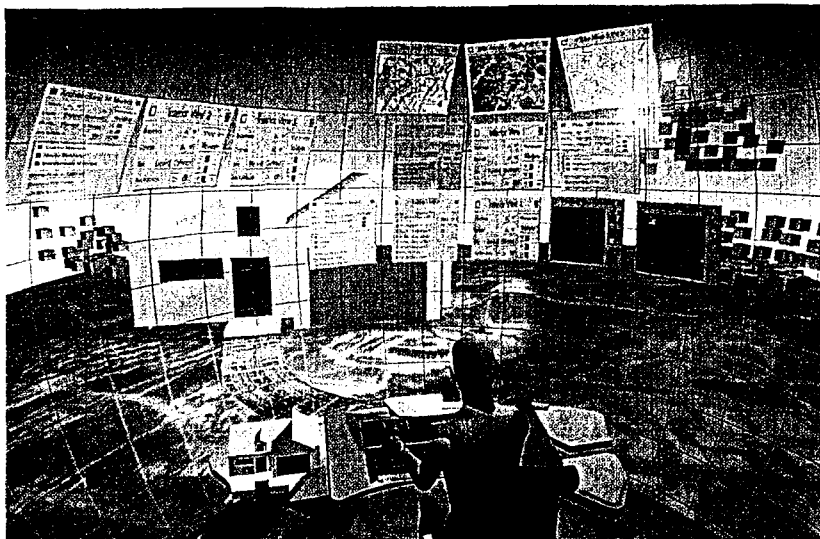
-On-line conference space is provided for general use in the main administration. Computer conferencing will reduce from the need for such a space, but it will still be crucial for important meetings, especially that it is equally equipped.

Accommodating 12-15 persons on the average, and the network screens required. It will occupy an area of 50m2.

-The accounting department takes care and controls financial matters of the facility down to the smallest purchase.

It consists of a chief accountant, 2 accountants/financial assistants and 2 persons in charge of purchasing. Area:50m2

-The public relations department assists the 3 professional departments in their external connections in Lebanon and abroad.

It consists of a chief assistant, communication section of 2 persons, mailing office 2 persons, 1 secretary, and a visitor reception area

An area of 50m2 + 25m2 lounge is needed.

-The security and maintenance departments provide office space for needed number of personnel. On the average 50m2 is provided for each.

-A resting area/lounge is accessible to major administrative functions.50m2

THE NATIONAL CENTER FOR TECHNOLOGY & INDUSTRY
PROGRAM

PROFESSIONAL SECTOR	USERS	AREA-m2
TECHNOLOGY INCUBATORS		
OFFICE SPACES FOR COMPANIES (2 possible set-ups)	40	500
SMALL EXHIBITION/STORAGE spaces (for larger set-up)		150
DEMONSTRATION LABS / MULTIUSE		150
CONFERENCE AREAS (2)	2x 15	100
LECTURE HALL	100	80
LOUNGE		50
SUPPORT		100
NET TOTAL (incubators)		**1125**
MEDIA/ADVERTISING SECTION		
INTERACTIVE DISPLAY SPACE		100
INDUSTRIAL ADVERTISING DEPT.		50
Creative team	7	
Coordination	2	
Reception		30
TECHNICAL SUPPORT	7	50
MEDIA PRODUCTION STUDIO		75
NET TOTAL (media)		**300**

INDUSTRIAL INFORMATION BANK	USERS	AREA
RESEARCH MEDIATECH		
-Computer Terminals	50	200
-Documentation		
Microfilm	6	50
Slide Library	6	50
Periodicals + Reading area	50	150
SUPPORT		
-Terminals	3	30
-Documentation	3	30
+Dark Room		15
Storage		15
NET TOTAL		**550**

FINANCIAL SUPPORT BANK		
DIRECTOR	1	25
ACCOUNTING	3-4	30
TRANSACTIONS	3-4	30
FOREIGN SUPPORT Section	4	40
HALL & TELLERS		200
NET TOTAL		**325**

TEMPORARY EXHIBITION HALL		
HALL		2000
WORKSHOP/Storage		150
NET TOTAL		**2150**

AUDITORIUM		
SEATING	500	400
Projection/Storage & related services		100
NET TOTAL		**500**

3 PROFESSIONAL DEPARTMENTS	USERS	AREAS
HIGH-TECHNOLOGY DEPT.		
DIRECTOR	1	25
SECRETARY	1	10
PROFESSIONALS in Charge	3-4	50
VISITORS' RECEPTION		30
COMMUNICATION/MEDIA DEPT.		
DIRECTOR	1	25
SECRETARY	1	10
PROFESSIONALS in Charge	3-4	50
VISITORS' RECEPTION		30
GENERAL SECTORS DEPT.		
DIRECTOR	1	25
SECRETARY	1	10
PROFESSIONALS in Charge	3-4	50
VISITORS' RECEPTION		30
NET TOTAL (DEPT.)		**340**
TOTAL AREA: PROFESSIONAL SECTOR		
NET		**4300**
GROSS		**5150**

COMMON Professional / Public		
PERMANENT EXHIBITION		
EXHIBITION SPACE		600
SUPPORT/PREPARATION		150
THE MAIN HALL		**150**
RESTAURANT/CAFETERIA		
SEATING	120	175
KITCHEN		30
TOTAL AREA: COMMON AREA **NET**		**1100**
GROSS		**1350**

PUBLIC SECTOR	USERS	AREA
TECHNOLOGY PAVILION		
MUSEUM-LIKE SPACE		150
ELECTRONIC PARK		
-COMPUTER SPACE		100
-SIMULATORS/INTERACTIVE AREA		200
-CHILDREN'S AREA + special services		100+20
NET TOTAL		**570**
AUDITORIUM 3-D IMAGE		
SEATING	300	300
TECHNICAL SUPPORT		50
NET TOTAL		**350**
EDUCATIONAL SECTION		
FEEDBACK/LECTURE	30	50
MULTI-USE LAB SPACE		50
ADVICE SECTION for public		30
NET TOTAL		**130**
PUBLIC COMPUTER LIBRARY		
MEDIATECH-TERMINALS	25	100
SUPPORT	2	25
ASSISTANCE/CONTROL	2	25
NET TOTAL		**150**
TOTAL AREA : PUBLIC SECTOR		
NET		**1200**
GROSS		**1450**

MAIN ADMINISTRATION	USERS	AREA
PRESIDENT	1	30
(+Secretary)	1	10
BOARD OF PROFESSIONALS		
-General Director of 3 PROF.	1	30
Departments	1	30
-General Director of PROF. SECTOR	1	30
-Director of Public Sector		
(related are the directors of the 3 Prof. Depts.)		
CONFERENCE SPACE	15	50
ACCOUNTING DEPT.		50
-Accountants	2	
-Purchasing	2	
PUBLIC RELATIONS DEPT.		50
-Chief Assistant	1	
-Communication section	2	
-Mailing	1	
-Secretary	1	
-Visitors' Reception		25
SECURITY DEPT.		50
MAINTENANCE DEPT.		50
TOTAL AREA: MAIN ADMINISTRATION		
NET		**365**
GROSS		**400**

SUPPORT SPACES	
STAFF (changing-sleeping…)	150
MECHANICAL	250
SERVICE Spaces as required	

TOTAL AREA OF CENTER		
NET		**7350m2**
GROSS		**8750m2**
+ PARKING	100 cars	3000m2

SITE
DOCUMENTATION

SITE

The site falls in Corniche An Nahr area, Beirut, close to the Justice Palace zone, and adjacent to the transportation terminal.It is situated on the Corniche Pierre Gemayel road.

The choice of site was guided by many criteria:

-The nature of services housed in the facility especially in the professional section would favor its location in a proximity to business centers and multiple services (institutional & others) in the capital

-The location of the site on major routes, with high accessibility from different parts of the capital and outside Beirut, for professionals and the public.

-Direct proximity of the Nahr stretch, opening to industrial quarters on the east and along the stretch itself, culminating in the new industrial region on the sea frontage (proposed by LINORD).

-The location, in the capital, of the Center in a relieved area, with this corner site benefiting specifically of the permanent openness to its sides, specifically the eastern one with the transportation center on its edge

-An area close to state-based activities/institutions would be convenient to this facility of a 'National' character

-A prominent site in the region due to the openness around it and its unique topography in a mainly flat area

-A site in an area of new developing/planned infrastructures and services, well services by mass transit systems, especially the intermodal transportation center on its edge, and major route networks in the direct proximity

ZONES and EXPLOITATION

The site falls in fact in 2 zones, 5 and 7, with the larger part being in zone 5.

The site results in a combination of 12 parcels of different sizes, the areas of which add up to 15000 m2

Coverage area and F.A.R. differ considerably between these two zones:
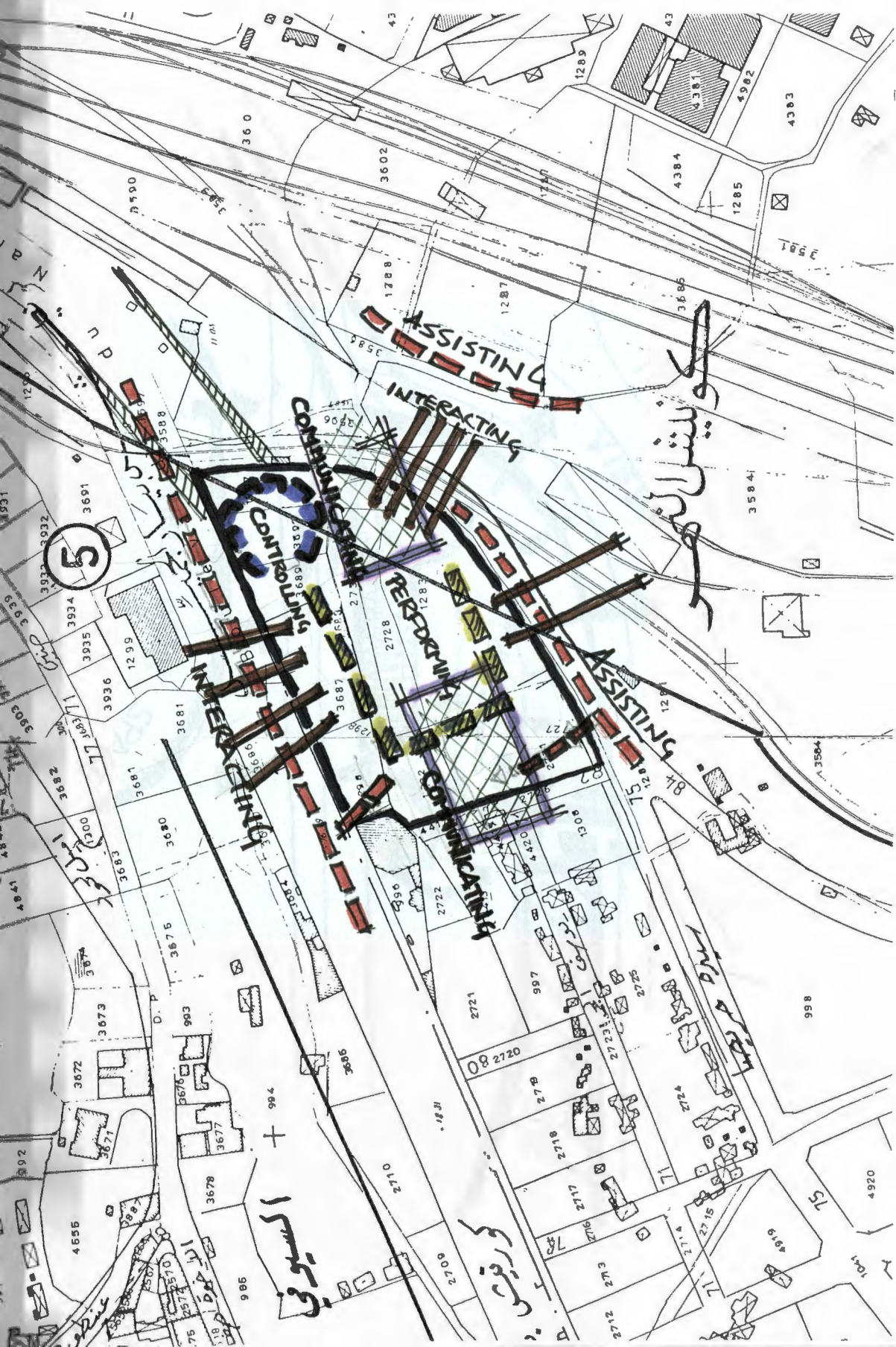

ZONE   :   5 (& 7)

AREA   :   15000 M2

PARCELS   : 1298,1302,2727,2728,2730
                        3687,3688,3689,3692,1283,1296,1297

EXPLOITATION: 40%(zone 5)   70%(zone 7)

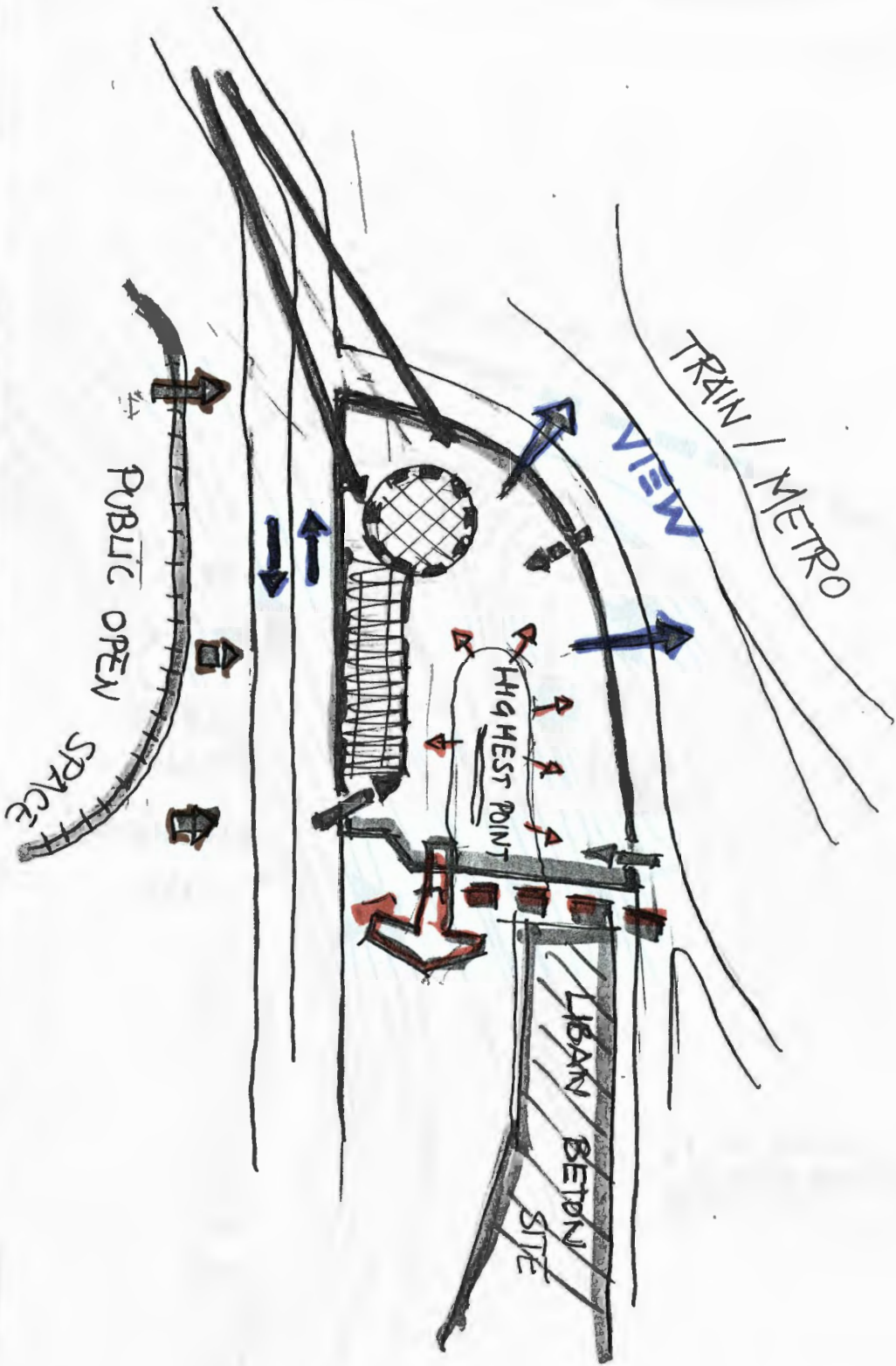FAR   :   2.5 (zone 5)   3 (zone 7)
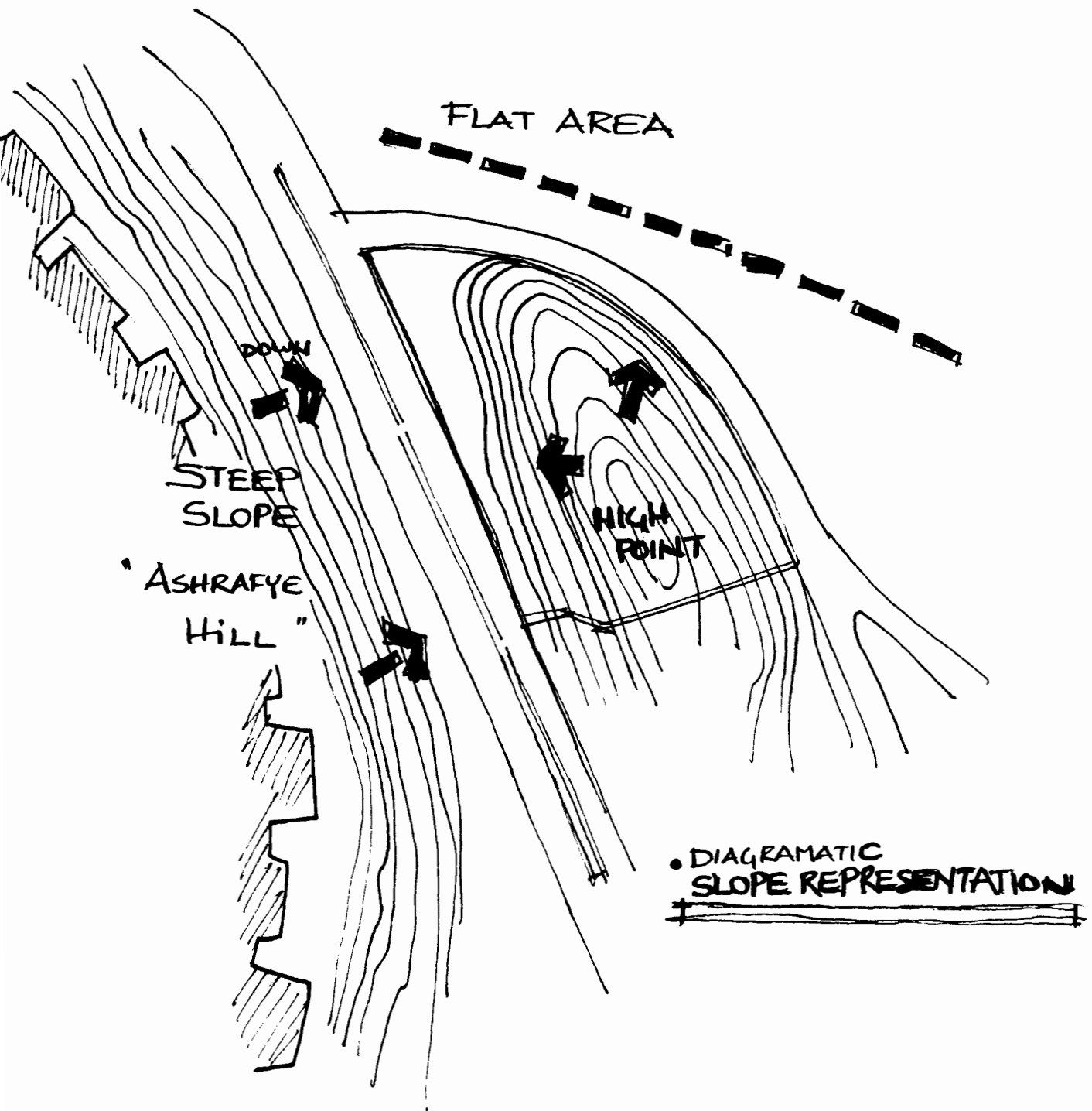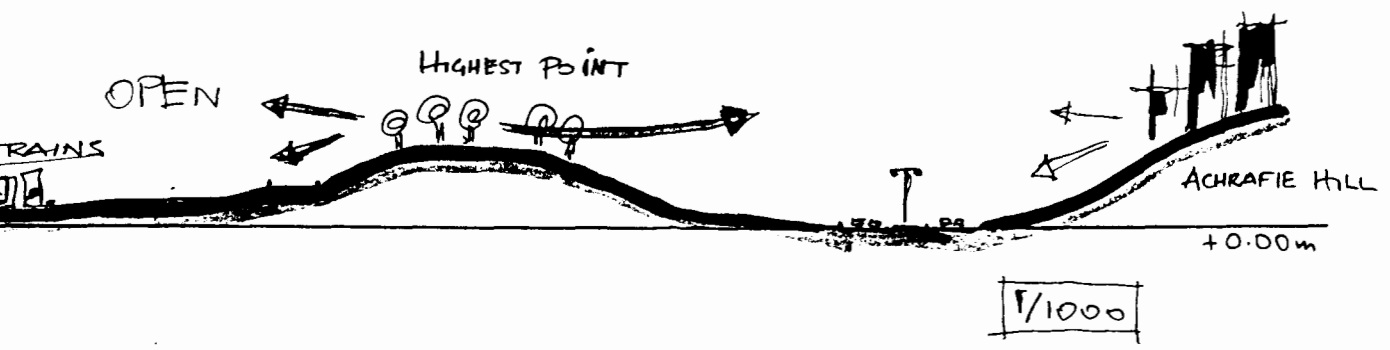
Accessibility

The site is easily accessible from major parts of the Capital, and outside it. On a major route (Corniche Pierre Gemayel) connecting to the Dora highway, to the National Museum area and Corniche al-Mazraa stretch, the site is adjacent to the Corniche du Fleuve, a spine with a plan for expansion to become a vital connection in Beirut.
Moreover, the road network is being developed in the area, for efficient connections and less traffic problems.

The site will be served by the new train and metro station situated across the road, with a bus station adjacent to it.

TRAIN / METRO

VIEW

PUBLIC OPEN SPACE

HIGHEST POINT

LIBAN BETON SITE

OPEN

HIGHEST POINT

TRAINS

ACHRAFIE HILL

+0.00m

1/1000

FLAT AREA

DOWN

STEEP
SLOPE

"ASHRAFYE
HILL"

HIGH
POINT

• DIAGRAMATIC
SLOPE REPRESENTATION

RESIDENTIAL (COMMERCIAL GF)

COMMERCIAL

INSTITUTIONS (MAINLY GOVERNMENT)

INDUSTRIAL

PALAIS DE JUSTICE

STE

MAR MIKHAEL

HÔPITAL DE L'HÔTEL DIEU

GET AWAY

Jeitaoui Hospital

Port

CORNICHE AL NAHR

CORNICHE PIERRE MAMEL

Beirut River

SINN EL FIL

Es Saleme

NEW INDUSTRIAL ZONE (LINORD)

N

APROACH FROM BRIDGE

-SITE-

VIEW FROM TRAIN STATION
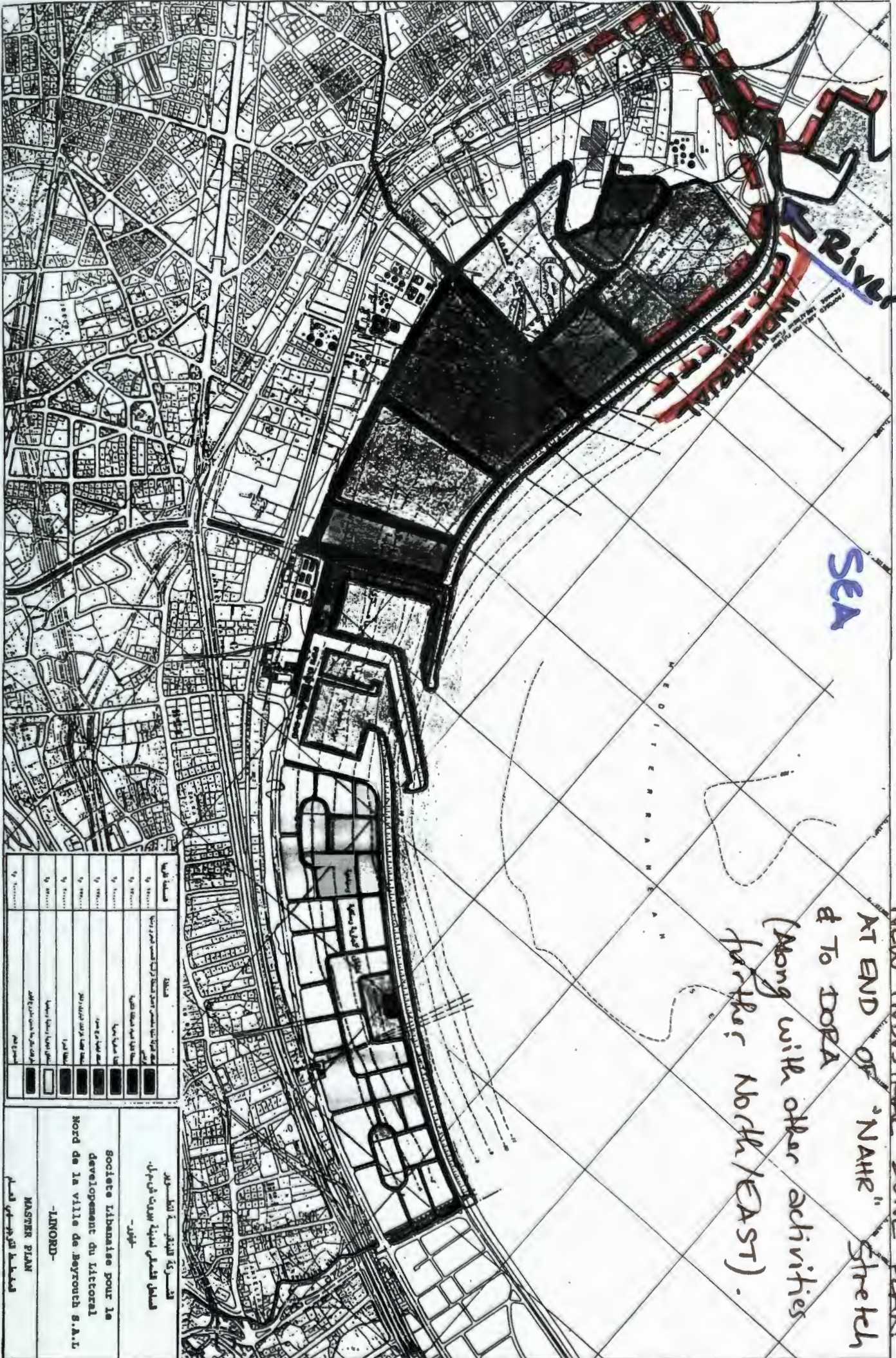
SITE

VIEW OF SITE
FROM EAST

ASHRAFYE
HILL

LIBAN BETON

VIEW TO TRAIN STATION
(ACTUALLY BUSES)
MAINTENANCE)

NEW INDUSTRIAL ZONE PLAN
AT END OF "NAHR" Stretch
& TO DORA
(Along with other activities
further North/EAST).

River

SEA

MEDITERRANEAN

Societe Libanaise pour le
developpement du littoral
Nord de la ville de Beyrouth S.A.L.

-LINORD-

MASTER PLAN

HOTEL DIEU
DE FRANCE

④

⑤

⑦

السيوفي

كورنيش بيار الجميل

كورنيش النهر

سيده مريضا

كورنيش النهر

اوتيل ديو

PALAIS DE JUSTICE

du Nahr

Boulevard بيار الجميل