Museum of Robotic Invention

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Preface

Museum of Robotic invention

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This book represents about the intersection between practical and theory, desert mechanism and interior design. From the attitude of human ambition of making a "Reasonable Machine" to the "machine to living in", the Museum introduces itself at a significant of robot society in legion, an application of advance technology and a study of architecture.

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I would like to thank the “School of Architecture” and all faculty members both named and unnamed here who lit me the knowledge of architecture. Thanks for the A.JOM, A.CHAE, A.A and specially advisor A.PORAWAN, the committees and Sujaras who had helped me pretty much for the completion in designing of Museum of Robotic Invention.
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Chapter 1 Introduction

1.1 Project name
1.2 History and background
1.3 Reason for studying topic
1.4 Problem and solving
1.5 The objective of the study
1.6 Scope of research
1.7 Scope of project
1.8 Definition of terms

Thesis Statement
The science museum for citizen and tourist present the idea of local science and technology development of Thailand linking to the global advance.

1.1 Project name:
The interior renovation project for the Museum of Robot invention, Bangkok; the significant advance science museum for citizen and tourist

1.2 Historical and Background:
- Automation and reasonable machine is the goals of man which has been an ambition since the first development of Science. Civilizations need slaves and the science and technology has capacity to create that kind of machine recently thought it has hardly a revolution since century for the first idea to the past few decade for modeling the reality.
- 1921- Karlel Capek, a Czechoslovakian, wrote R.U.R., he first describe a machine act like human called Robota – mean slave labor- then be come Robot in English. Then a series of other author about robot was born immediately after (Metropolis-1927; The world in 2030-1930; Frankenstein-1931; ...).
- 1950s- Robot becomes reality with the large scale of computer inventions
- 1970s- Robot becomes popular due to the advance of microcomputer
- The museum is manifestation of public pride; it is a unique of exhibition, where people come for knowledge, story, culture, thrills and delight. Event though those display artifact are not something new, as a source of idea, those records of human’ inventions have helped learners not to retrain mistakes and to create the new invent. The museum
of is there to make human beings realize the importance of systematizes all achieves and ideas.

- The inspiration of the project derives from knowing that Thailand recently very fast development of Robotic. The science museum in Bangkok is getting old and not enough to support the local developing. Therefore event the robot exhibition is currently operated around Bangkok but there are no appropriate places to attract people. The study of Robot in Thailand is pretty new; Thai has just started for a few years 2000’ Thai has celebrated the 1st. Robo cub Thailand Championship, and right after the Robo cub 2003 Championship they first went to World cub in Japan.

- The location is suitable because the surroundings are commercial zone, center of developed urban and expensive residential. The museum would be there for relaxation, delight, improve Thai educational system and attract tourists.

1.3 Reason for studying topic:

- Bangkok is the center of Thailand, as the Science and technology grow everyday, and since them grown giant, they need some where to tell the story. The museum may become a significant due to there are no such facility in Thailand and Southeast Asia neither.
- there are many one with out a background of engineering or computer wants to know about robot.
- to create a new program of museum in Bangkok
- to create a place for certificate the new invention in Bangkok
- present impressively the intertwining of science and interior architecture.
- the museum would cause audiences to be Intrigue by the architecture as well as inventions
- to inspire the visitors, to enrich local context of science

1.4 Problem and solving:

- Robot is something unfamiliar and being misunderstanding about what it is and what is it for
- The museum of robot is something sound desert, and boring, people interest in the Robot invention but a few understand the value of its past
  → Using architectural design to intertwine human and knowledge, to give soul to robot
- The museums in Bangkok are all most about Thai antique and basic science which is now almost overload. There are museums are crowned with visitor at the weekend but the existing facility make visitors disappointed (Ekamai science center for education).
- Bangkok does not have a significant museum where exploring its development.

1.5 The objective of the study:

- to enhance citizen to be proud of their technology development
- to emphasize and respect on the development of Thailand and pay attention to the history and background of advance science get along with the acceptation of the social changing
-to enhance the spirit of local science development
-to support the local occupation
-to inspire the visitor, making them want to know and learn more about local Robotic development and benefit researchers.
-to understand interaction between museum and user, to make the design will be useful and efficiency.
-using interior design (emphasize on architectural element and language) to persuade man’s interest in robot

Design objective:
To motivate visitor’ experience of science.
To create a space expresses the relation between science and architecture.

1.6 Scope of research:

User Behavior
Design Principles: organization and operation of museum, management facilities, function analysis, spatial organization, circulation, temperature, lighting standard, HVAC system, artifacts maintenance and the general information, which relate and advantage for the design project
Site analysis: study the advantage and disadvantage of the building, the building’ context, historical background.
The Robot and Robotic invention history
Robot, its categories, functional and applications
Artificial Intelligent, robot sensor and application to use for interactive in Intelligent building

1.7 Scope of project:
The interior design project focus on the principle functions of the Museum include the following:
- Entrance / Foyer
- Temporary Exhibition area
- permanence museum’ collection
- multipurpose area
- up-to-date collections
- Workshop
- Souvenir Shop
- Office
- Conference
- Library
- Storage
- artifact storage
- artifact installation
- exhibition preparation

*the total area of the project* sq.m.
area of the groundfloor plan ~2000 sq.m
area of the 1st fl. plan ~2500 sq.m
area of the 2nd fl. Plan ~2000 sq.m
area of the 3rd fl. Plan ~2000 sq.m
area of the 4th fl. Plan ~600 sq.m
The whole area of the building: 9100 sq.m

1.8 Definition of terms:

*Robot*: a system that simulates human activities from computer instruction

*Robotic*: major of science study in every field about robot operation

*Sensor*: device use to detect change in temperature, light, pressure, sound and other function that make robot aware of various conditions

*Artificial Intelligent*: the human made ability for a object, ability to adapt effectively to the environment, either by making change in itself or by changing the environment of finding a new one.
Chapter 2 Research

2.1 LITERATURE REVIEW
2.1.1 Fundamental of museum design
2.1.2 The New Museum
2.1.3 Robot

2.2 CASE STUDY
2.2.1 National Science Museum
2.2.2 Science center for Education

2.1 LITERATURE REVIEW

1. Museum design principles:

The basic principle of functions, organization, and planning of museum:

Catchments areas: ~15%
lobby: the introduction of museum story, it has to access easily to another space which is assembly of circulation, information boot, ticket boot, has to be clear guideline to museum space flow. The lobby should be able to load many guest as they go in group. The size of the lobby is about 3-4% of the building.

Reception: include registration area, ticket counter which must have direct approach in order to provide backup information and supporting services. The reception should be ~2%.

Design: counter height ~1.05m for guest used and 0.72m for seated work area. The overall depth should not exceed 0.65m

Restroom and Toilet: should be near the lobby lounge but obvious completely hidden. Should be carefully considered about cleanness of ventilation and humidity. ~2%

Café, Restaurant: These primitive service need to plan convenience and the design should go along with the overall concept and the food. ~7%

Souvenir shop: ~3%

Presentation areas ~65%

Layout planning typologies of display area:
-Linear progression (Sequence arrange schematic area in a route)
-Open plan (Random circulation)  
-Satellite galleries  
-Labyrinth (free circulation between schematic area)  
-Combination (Combination of above schemes)  
Exhibition area

Permanence collection
Multipurpose area ~ was include in the lobby area and temporary exhibition

Administration ~2%
Including records, design studio, construction and maintenance control, security

Office ~4%
Include manager, accounting, telephone operator, computer operator

Storage ~5%
Should be easy access with big and heavy items. Should be considering about security and environment to maintenance artifacts.

Conservation ~6%
The functions serve modern museum by making audiences interacting with subjects and experience them.

Workshop : the facility serves audience to make robot and trying to program them ~3.5%

Technical department ~3%
Due to the specific object of exhibition, technician has to support the robots; they are electronic engineer, programmer and modeler.

2. New Museum:

- The users:
Modern society is in the frost of easy acknowledged subjects and/or meaningful approaches. They demand environment with highly creative, modern, new emotion and experience. Users are greedy about information “they seemed to find it almost impossible ‘to avoid the desire of continually going on to see what comes next’

- Laboratories for sensual perception and for critical thinking (1)
The museum is not simply a 3 dimensional library or entertainment center but it help to serve audience for critical thinking and architecture for sensual experience.

“Each museum type, then, is like a chapter within a longer story, pressing toward an end point at which is simultaneously the point at the next chapter commences. Like the
reader in a detective novel, it is toward to this end point that the visitor's activity is
directed."(3)

→ The museum as "sculptural architecture": This implies a redefinition of the
sequence of museum spaces in the sense of a series of organic or expressive spatial
forms that can no longer be defined in terms of traditional concepts. (2)

3. ROBOT' story

At the beginning of 1920', the first exploration age of machine and space exploration.
A Czech writer- Isaac Asimov- has concerned about a slave machine by the word
"Robota" which lately become "Robot" in English.
The most unique feature of Asimov's robots are the Three Laws of Robotics, which all
robots in his fiction must obey, and which ensure that robots don't turn against their
creators. One of those stories, "The Bicentennial Man", was later expanded by Asimov
and Robert Silverberg into a novel The Positronic Man.
Modern definition of a robot:
Robot is a mechanical device which performs automated tasks, either according to
direct human supervision, a pre-defined program or, a set of general guidelines, using
artificial intelligence AI; for alternate uses,
Robot categories:
- Industrial robot: manufacturing, welding, assembly...
- Explorer robot: medical robot, educational robot
- Hobbyist robot: BEAM, Cybot, Micro mouse..
- Entertainment robot: AIBO, Micro mouse

Robot brain: the robot which is intended to perform complicate action has to be
program on it processor. The programming is usually done through computer
languages. The robot' mind normally called Artificial intelligence.
Artificial intelligence is defined as intelligence that performs by machine through a
human made program. The "ability to adapt effectively to the environment, either by
making a change in oneself or by changing the environment or finding a new one"
(Should such things ever exist on Earth)

Human' dream:
Technology forecasting over periods of more than a decade is notoriously inaccurate.
In 1899, Charles Duell, Commissioner of the U.S. Patent Office, recommend that the
patent office be closed because everything that could be invented has already be
invented.
In 1932, Albert Einstein said "There is not the slightest indication that [nuclear] energy
will ever be attainable."
In 1943, Thomas J. Watson and John von Neumann estimated that the total world
market for computers might be 5.
In 1981, Bill Gates predicted that no one would ever need more than 640K of RAM.
So in the early day, Artificial Intelligence was predicted the most
difficult problem as they require of pretty high level of mathematical reasoning. Now a
day, we can see where AI has gone but man always question --
What if human let machines make more of their decisions for them simply because machine-made decisions produce better result? [Kaczynski95, Moravec98, Kurzweil99, Joy2000]. Just because some thing is possible does not mean that it would be wise or good - what if artificial mind turn evil? And the Fear of intelligence machines comes not from science fiction but from concern about job security. Fears of Automation- machines replace human employers.

Book
SCIENCE FICTION the illustrated encyclopedia
John Clute @1995

The book is a guild tour of stories about million tomorrows. It is overall history of SF since “proto SF” until 19th century and then began to take shape in the works of Mary Shelley, Jules Verne and H.G.Wells; but mostly in 20th century we see how SF spread over American and the world. We always see the future in a SF, but that not the goal of SF to predict future but to make thing excitement, by the time of “solutions seem more confused than the problems”.

“SCIENCE FICTION TAKE PLACE in the future and in the past, in familiar settings and in distant galaxies, in worlds that might be and worlds that might have been. More than any other genre, it is influenced by the age in which it is written: in time of trouble, its speculates on war, and in time of progress it looks to our destination.” SF in each period has its own child: mad scientists, mighty machines, robot, and alien, and after they explore the whole world they ten to spread to other planets, other galaxies. In each step, it shows off newest technologies, philosophy, state-of-mind, and imagination. Historical context:
19th century : Industrial age: Mighty machines.
1900 – 09: a glowing future
1910 - 19: the world at war; the are no world left to find
1930 – 39: the depression decade
1940 – 49: global conflict;time travel;alternate world
1950 – 59: a silver age;
1960 – 69: fiction is fact; thinking machine; space flight
1970 – 79: looking inwards;
1980 – 89: new beginning; cyborgs; aliens
1990 – 94: facing a new century;

Book
FUNDAMENTALS OF INDUSTRIAL ROBOTS AND ROBOTICS – Rex Miller @1988.

- Introduction to robot and all the relate fields: computer programs, electronic, applications, and the aspect between human and robot.
- Drive systems: mechanical systems of motion.
- Robot sensors: introduce various types of sensing devices.
- Control methods: various types of powers and controller: mechanical controllers, actuators, relay logic controller, Programmable controller, Microprocessor-Based controller, Microcomputer controller.
- The Robot and the Computer: Interface, Languages, Sol wares.
- Manufacturers’ equipment.

The book is a comprehensive introduction to the topic. It is a source of information for robot hobbyists. It provides subject without overwhelming readers with technical terms. At the end of each chapter there are questions which guild reader to clarify information. The book presents clearly what Robot can and can not do and then lead to other view in future possibility.

Book
INTELLIGENT BUILDINGS
Brian Atkin @1988

Overall idea and detail in which fields Intelligent Building is, the book brings together collection papers by architects, engineers, authorities in Telecom and information technology and those expert in fire protection, security and environment control. The first concept I get from the book is about infrastructure require by contemporary and data-processing systems and extended in the future. The second concept is a “Robot building” in which all services, security and environment management is fully automated. The discussions in the book is some how “old” as it time of publishing. It has yet considered about “Robot building” but there seem no possibility. Through the use of sensors, new evolution of Fuzzy logic and the other technique to command machine.
2.2  CASE STUDY

2.2.1 National Science Museum

Figure 2.2.1a. view from outside of National Science Museum

1) Purpose of studying
The purpose of selecting this case is to study in design concept about Science the designer transform the idea into design. It is focus on the objective of the thesis which tries to transform the idea of local into the modern way. The builder concept has a serious idea from the local area knowledge improvement which is the environment of Thailand science society transform into design.

2) Introduction
Nation Science Museum (NSM) was found in 1996, to explore the revolution of Thai science & technology. NSM is support by Thailand Ministry of Science & Technology.

3) Museum information
Site location: Technothanee ,Rungsit-Aungkarug road ,Amphur klonglaung PATOOMTHANEE
Architect: Chaleumchai Honak
Completed and opened in 1996
Approach: Can be approach by bus and car. It takes about 40 min from Bangkok. Better go by private car.
Open 9:30-17:00 from Tuesday to Sunday.
Exhibition content:
-First floor Basic science
-Second floor Technology in everyday
-Third floor Industrial
-Fourth floor Advance technology
-Fifth floor Tradition Technology
Figure 2.2.1b. Information and ticket check. Right: lobby area. Below: Meeting area
Organization chart of National Science Museum

Figure 2.2.1c. Permanence exhibition area

Figure 2.2.1d. Interactive element in exhibition
Left: Concrete structure

Right: Stainless steel portable fixture unit for hanging model or presentation board

Figure 2.2.1e. Outdoor playground and exhibition area
2.2 Science center for Education

Figure 2.2.2a. View from out side SCE

1) Purpose of studying
The purpose of selection this case is to study in facility design. It is focus on the objective of the thesis which try to transform the idea into the reasonable space. The Science center for Education has been a very first science museum in Thailand which was function well event the design is not in-trend thought.
2) Introduction

Science museum was established on 1972 and now under control by Thailand Ministry of Science & Technology. The total area is 120,000 square meter and building area approximate 18,000 square meters. Today science museum is the center of education in Sukumvit business district. There are many education facilities around the site such as Patoomkongka high school, Dara School, Southeast Asia minister of education organization, etc. All around the site are business quarter and there are the Eastern Bus Station that is the source of traffic jam, noise, and air pollution in this area.

3) Museum information
Approach: Can be easy approach by BTS, and there are some bus stop around.
Client : Ehime Prefecture
Design Completion 1972
Total exhibition area: 18,000 sm
For the architect of the 70s, the building was to be high-tech, funny, and save money. The design, however, was not as expected, and there are no such "innovative" ideas at that time also. So they try to use the classic-style buildings and mix it with the vivid color to make funny for the children and then try to use natural lighting as the main source of light for the buildings that currently become a big problem in lighting control.

Exhibition...
5) Concept and design analysis

The architect of the 70s designed the building to be high-tech, funny, and save because lack of budget, and there are no such “interactive” idea at that time also. So they try to use used the steel structure and paint it with the vivid color to make funny for the children and then try to used natural lighting as the main source of light for the building that recently become a big problem of lighting control.

Exhibitions are almost design for presentation only and very little object for interactive there for the visitors are not very interesting in the show. The space functions are not clear and there are neither guild-lines of exhibition nor visitor guild that makes the
space look un-organized. The exhibitions are not in sequence of presentation therefore the users get confused easily in the "open exhibition" except in some of the area that are just renovated such as Exhibition about Satellite or History of Time.

2.2.3 Ehime Museum of Science

1) Purpose of studying
The purpose of selection this museum is to study about the concept design of the museum. It is focused on the museum which uses the idea of local area transform into design. Kurokawa has the concept which bring the idea of the museum location which is the Ehime district and landscape to be the inspiration in design
2) Museum information

Site location
Ehime - Japan

Architect & Interior designer: Kisho Kurokawa

Client: Ehime Prefecture

Total floor space: 24,290 sm
6 storey + 1 basement

Completion: September 1994

3) Museum Planning

4) Concept and design analysis

A collection of geometric forms— a cube, cone, sphere, triangle, and two crescents-scattered at the base of Shikoku mountain express the scientific concept of assembly and inter-relationship, the layout of each fragment is designed to reflect the free arrangement of stepping stones in a formal Japanese garden.

Figure 2.2.3b. interior
2.2.4 National Museum of Emerging Science & Innovation

1) Purpose of studying
The purpose of selecting this museum is to study about the facility design of the museum, the organization and the exhibition about robot. It is focused on the museum area specified for robotic in which Miraican Museum is the very pioneer.

2) Introduction
The National Museum of Emerging Science and Innovation was born in the "Tokyo Academic Park" (The National Research Exchange University Village), as a center for deepening understanding of science and technology, and to fulfill Japan's aim of becoming a scientifically and technologically creative nation.

The sharing of scientific creativity and activity of people is our focus.
New and stimulating encounters with the world of science.
People experiencing science will create a resonance of excitement.
We will work with the community to construct a living dynamic medium.
We will support researchers by becoming an open and disclosed research hub.
Powered by volunteers' enthusiasm we will together, progress.
Science and Technology is incorporated with all aspects of life, including music, fine arts and sports.
We will create the place which is open to anyone.
Working on communication and networking is our job.
Offering you places to visit, we seek new ways to visit you.
3) Museum information

Site location
National Museum of Emerging Science and Innovation
2-41, Aomi, Koto-ku, Tokyo 135-0064 Japan
Client: The Japan Science and Technology Agency
8 storeys + 2 underground (parking area)
Height: 45 m
Floor area: approx 40,589 sm
Building area: approx 8,881 sm
Site area: 19,636 sm
Completion: July 2001
4) Museum Planning

1F
- Museum Shop
- Vending Machines
- Restrooms
- Elevators
- Telephone
- Reception
- Lockers
- Escalators/Stairs

B Study Area Exhibition Area
Research Area
Elevator

Geo-Cosmos
Cafeteria (Wendy's)

Exhibition Space EX1
Event Zone EVZ
OR2 OR1
Orientation Room 1
Orientation Room 2
400-inch Display Zone

3F
- Restrooms
- Elevators
- Escalators/Stairs

A Study Area Exhibition Area
Research Area

Geo-Cosmos

Exhibition Space 2 EX2
Exhibition Space 3 EX3
Science Workshop SWS
SCL

5F

A Study Area Exhibition Area
Research Area
5) Concept and design analysis

Japan is leading the world in robot development. In addition to industrial robots, significant achievements are being made in the field of humanoid robots which are shaped similarly to humans. Following the Great Hanshin-Awaji Earthquake in January 1995, much R&D has been conducted on rescue robots for lifesaving purposes.

Exhibition

Facilities available for presentations, seminars and the like: Innovation Hall and Conference Rooms. The outline of each facility is as follows. User may use their own A/V equipment or rent such things from Mirai Can. Each Conference Room has space for a pre or post party or gathering. In principle, these facilities will be restricted to symposiums, educational societies, etc. to promote technology.

Figure 2.2.4b. Miraican Hall

Floor space 404 sm
Capacity 300 seats
This conference hall is flexible with equip fully visual audio mechanism (Mobile rear projector, 3CCD video camcorder, sound table recording system, lighting operation table, horizontal curtain control)
Figure 2.2.4c. Innovation Hall
Floor space 196 sm
Capacity 63 adjustable seats
This multi-purpose hall is flexible with fully visual audio mechanism (300 inch screen, video camcorder, sound table recording system, lighting operation table, horizontal curtain control, seat control system)

5K planet Restaurant

Science Gallery cafe

Cafeteria
Chapter 3  Project Fact

3.1 Site Analysis
   3.1.1 Introduction
   3.1.2 Transportation and Approach
   3.1.3 Site and Surrounding
   3.1.4 Building Configuration
   3.1.4 Physical Character
   3.1.6 Functional Analysis
   3.1.7 Design Analysis

3.2 Facility Study
   3.2.1 Museum Organization
   3.3.2 User and Staff Behavior

3.1 Site Analysis

3.1.1 Introduction

Capital Club
Owner: President Park Co.Ltd
Number of stories: 3 floors + 1 basement
Designed by Axis Architects & C2
Start 1992 - Completion 1994
Site area: 5,000 sm
Building area: 2,500 sm
Target group: tourist
Facilities: restaurants, pub, shopping plaza, banquet, fitness and massage
Location: Soi 24 Sukhumvit, Bangkok, Thailand
3.1.2 Transportation and Approach

The blue arrow shows the entrance to the back of the building.

The Capital club is located on soi 24 Sukhumvit. It is just a few minutes walk from the Rama IV and about 5 minutes drive from Sukhumvit through soi 22, 24 and 26. The location is right at the center district of Bangkok which can easily approach by civilian and tourist.

3.1.3 Site and Surrounding

Figure 3.1.3a. exterior Capital club
The building is surrounded by the expensive service building, retails, small office building and car park facility. The advantage is that it is very easy to approach from main road and it locating at a road cross. The disadvantage is that there is no public transport to the site.

Adjacent area
North (front side of the hotel): car parking
South (back side of the hotel): Resident Park
East: service building, retail store
West: small office building, shop

3.1.4 Building Configuration

Characteristic
Reinforced concrete in Beam and column system. Flat slab. The column system is radiate form which it center is the road cross. Above the 4th floor there are covered by a translucent tensile Dome structure.

3.1.5 The Physical Character

a) Building orientation
The building is oriented in North-East direction which the sun raise from the lower right side of the building, and then sun set on the upper left side. The building start to receive sun light from about 10:00 to 14:00 because the tall buildings besides shadow over it for the rest of the day.

b) Natural light
The ground and the first floor are very dim because of a little light received in daytime due to it limited height. The second and third floor is fill with day light because of it glass wall cover around. The fourth floor is very bright because of the dome structure above is translucent white.
3.1.6 Functional Analysis

Zoning of the hotel can be separated in the following:

1) Cafeteria, super-market, stock located on ground floor.
2) Lobby and social club, waiting area, restaurant are located on the first floor.
3) Administrative office, member and executive, locker rooms, spa, massage and therapy rooms, club bar, karaoke bar, steam room, sauna, wet, lounges, is located on the second and third floor.
4) Climbing wall and fitness on fourth floor.

Target group:
Tourist and high income people who stays in the service apartment around.

4 entrances provide the access to the building

1) Main entrance is the back access from car parking which directly lead to the main lobby and front desk.
2) Entrance access to the Super-market area on the ground floor and restaurant on the first floor.
3) Staff entrance and loading located at the back of the building which is the access to staff and food loading area.
4) Access on the third floor from Residential Park.

3.1.7 Design Analysis

The Club itself has been designed to be apart of Presidential Park, all the construction lines radiated from the center which formed by the crossing of 2 road. Which all the material and design are some how luxury due to its main target is high income civilians.
3.2 Facility Study

3.2.1 Museum Organization

- Curator
- Head of Operation (17)
  - Head of Customer relation (20)
  - Head of Production (14)
  - Head of Development (4)
- Researcher 2
- Planner 1
- Editor 1

Roles and Employees:
- Accountant 2
- Financier 2
- Advertising 2
- Marketing 2
- Facility management 9
- International relation 2
- Ticket boot & Check 4
- Librarian 2
- Souvernir 2
- Visitor guide 10
- Engineer 3
- Programmer 3
- Interior designer 2
- Graphic designer 2
- Worker 4
- Facility managerment 9
- Security 2
- Maintenance 3
- House worker 4

3.3.2 User and Staff Behavior

- Visitor
- Lobby
- Ticket/Info
- Temporary exhibition
- Library
- Workshop
- Auditorium
- WC
- Souvenir
- Restaurant
- Permanence exhibition

- Staff entry
- Time keeper
- Office
- Locker
- Toilet
- Storage
- Exhibition preparation
- Exhibition
Chapter 4  Data analyzing & synthesis

4.1 Area Requirement
4.2 Relationship Diagram
4.3 Functional Diagram
4.4 Zoning

4.1 Area Requirement

SCE: Science Center for Education
NSM: National Science Museum
<table>
<thead>
<tr>
<th>Area</th>
<th>No. Occupant</th>
<th>Area/ Occupant (sq.m)</th>
<th>Reference approximate area from SCE (sq.m)</th>
<th>Reference approximate area from NSM (sq.m)</th>
<th>Appropriate area for Robot Museum (sq.m) Included Circulation 30%</th>
<th>Equipment</th>
<th>Furniture requirement</th>
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<td><strong>Office</strong></td>
<td></td>
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<tr>
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<td>24</td>
<td>24</td>
<td>5%~450</td>
<td>7%~820</td>
<td>4%~340</td>
<td>Computer telephone</td>
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<td>4 Supervisor</td>
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<td></td>
<td></td>
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<tr>
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<td></td>
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<tr>
<td>3 Programmer</td>
<td></td>
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</tr>
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<td><strong>Souvenir shop</strong></td>
<td>2 sale</td>
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<td></td>
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<td></td>
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<td>8%~720</td>
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<tr>
<td></td>
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Employee office: 1 desk + chair + 2 guest chair + pedestal + file holder

Office: 2 desk + working table + chair + pedestal + sketch table

Souvenir shop: 2 meter long Counter + chair

Restaurant: Counter shelf

Employee: 2 meter long Table set for 5070

Employee: Employee bathroom, break table
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<th>4%~360</th>
<th>4%~270</th>
<th>3%~354</th>
<th>4%~342</th>
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<td>4%~342</td>
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<td>3.5%~300</td>
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<td>-table set for conference</td>
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<td></td>
<td>1 m shelf</td>
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<td></td>
<td>40 user</td>
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<td>unit</td>
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<td></td>
<td>1000 visitors</td>
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<tr>
<td></td>
<td>2000 visitors</td>
<td></td>
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<td>Permanence Exhibition</td>
<td>10 visitor guilds</td>
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<td></td>
<td>1000</td>
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</tbody>
</table>

**Storage**

**Exhibition preparation**
- 4

**Auditorium**
- Available: 2000 audiences
- 0.8

**Library**
- Available: 1m shelf
- 4 librarians

**Workshop**
- Available: 2000 books
- 2 staff
- 40 user

**Permanence Exhibition**
- 10 visitor guilds
- Available: 1000

**Electronic Modeling equipment**
- Projector
- Light & Sound control unit
- Computer

**Shelf, cabinet**
- Cabinet
- 130 seats
- Table set for conference
- Counter + chair
- Book shelf

**Table sets**
- 10 Working table sets

**Tracks display adjustable shelf back fixtures wall display**
OPEN plan

Enlarge the space & exhibition
Orientation break

Core with SATELLITE galeries

core attracts with
schematic satellite

LINEAR progression

Fréquence arrangement
of display area

LABYRINTH

Free circulation between
thematic areas

COMBINATION

Difference by the type
of design & building

Typical styles of exhibition arrangement

Standard dimension

Figure 4.1a Standard for waiting area
Figure 4.1b Standard dimension of front desk

Cafeteria and restaurant area
Figure 4.1c Standard for coffee shop and cafeteria area
Figure 4.1d Standard dimension for bar area

Circulation and seating

Figure 4.1e Standard circulation

Figure 4.1f Standard exhibition humanoid
Circulation and seating

Figure 4.1d Standard dimension for bar area

Figure 4.1e Standard circulation

Figure 4.1f Standard exhibition humanoid
The exhibition objects is Robot which is various in dimensions can be divide into two main categories.
- Humanoid has dimension similar to human (1.7m, 0.6m, 0.2m) and should be provide circulation for itself operating.
- Inventory robot and hobbyist robot has similar size to pet.
- Industrial robot is the big object which need about 2-4 sm for operating.
4.2 Relationship Diagram

Figure 4.2 Relationship diagram

4.3 Functional Diagram

Figure 4.3 Functional diagram
4.4 Zoning
Innovation and the Future
Robot World Exhibition
In this exhibit, visitor will witness actual examples of humanoid robots and rescue robots and demonstrations of their use. There are also robots that visitor can touch and manipulate themselves. By watching the demonstrations and operating the robots, they can get a hands-on experience of ways robots move, the types of work they can perform, and the significance of their existence in our lives.

Assortment of Robots
In this exhibit, visitor can enjoy demonstrations of the different locomotive methods of the humanoids and the rescue methods performed by the rescue robots.

Robot Hall of Fame
History of Robots
The Museum will introduce the thirty-year history of humanoid robot development using a chronological table and video.

Humanoid Chronicles
Functions of Robots
Robots are greatly different from computers in that robots have arms and legs and other moving parts for interacting with the environment. Watch the video presentations and manipulate the models to discover how robot movements are achieved.

Robot's five senses, muscles and brain
Evaluation of Robots
In order to make robots practical, it is essential to conduct various tests. The Museum creates a large testing field in the open exhibition on Third floor which rescue robots have space to move freely. There visitor can also manipulate several rescue robots that have been provided. Other institutes also use the test field for testing the properties of their own rescue robots.

Rescue Robot Field
Interviews with Researchers
The advisors who supervise the robot exhibits, sends a video message to visitors. In addition, researchers from around the world who have participated in "RoboCup," an international competition for robot soccer, describe via video their techniques for developing robots.

Message from the Advisor
Interviews with researchers: "Let's ask a robot scientist!"
Chapter 5  Design Solution

5.1 Design concept
5.2 Planning
5.3 Design solution

5.1 Design concept

The Museum of Robotic Invention presents contemporary advance technology as well as modern architectural concept. It tells the story of automation machines in the past, present and in future. But overall, there is the impressive using architectural element, not by using mechanic form but felling.

"The robot vision"

According to the most present robot vision, there are the image processing from the camera to be memorizing and simply redraw on a two dimensional graph. I had developed the concept to be simply subtracting element of form which still remain the major part of the form, and overall become true polygon using computer generating.
Conceptual approach

Robotic image processing and memorizing

True basic form
Optimization: decreasing the number of vertices and polygonal algorithms

Real form
Geometry simplify
FIRST FLOOR LAYOUT PLAN
5.3 Design solution

The concept of robotic visioning has been applied by reboot the overall interior space into metal, which does not mean space making of metal but sharpness and coldness. Besides, each of exhibition area have appropriate atmosphere due to the object it is presenting.

Below is the illustration of main material and furniture designed for special function, on the right side is luminaries that used in the museum.
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