

INTERACTIVE INFORMATION SYSTEM FOR

BUS COMMUTERS OF MUMBAI

The process :

- To understand the existing BEST system.
 - User realm
 - Requirement of the user.
 - Addressing different scenarios.
 - Classification of Information.
 - Product brief.
 - Concepts.
-

Public transport in Mumbai

As observed over the project, Mumbai is one of the only places where railways have a very significance presence in commuters routine. Delhi has a opposite situation, there bus transport is more popular. (Now with new metro in Delhi, there might be change in traveling patterns of commuters.)

Everyday approx. 15, 000 visitors, migrants, businessman come to Bombay to seek desired job / money. Mumbai transport has a very significant role to play in terms of connecting all the novice people (new visitors) and regular people to their desired destination .

Public transport in Mumbai

Railway network is very linear and well defined because of the tracks, unlike the bus network. Bus network is quite diffused and distributed and has its own defined routes and stops

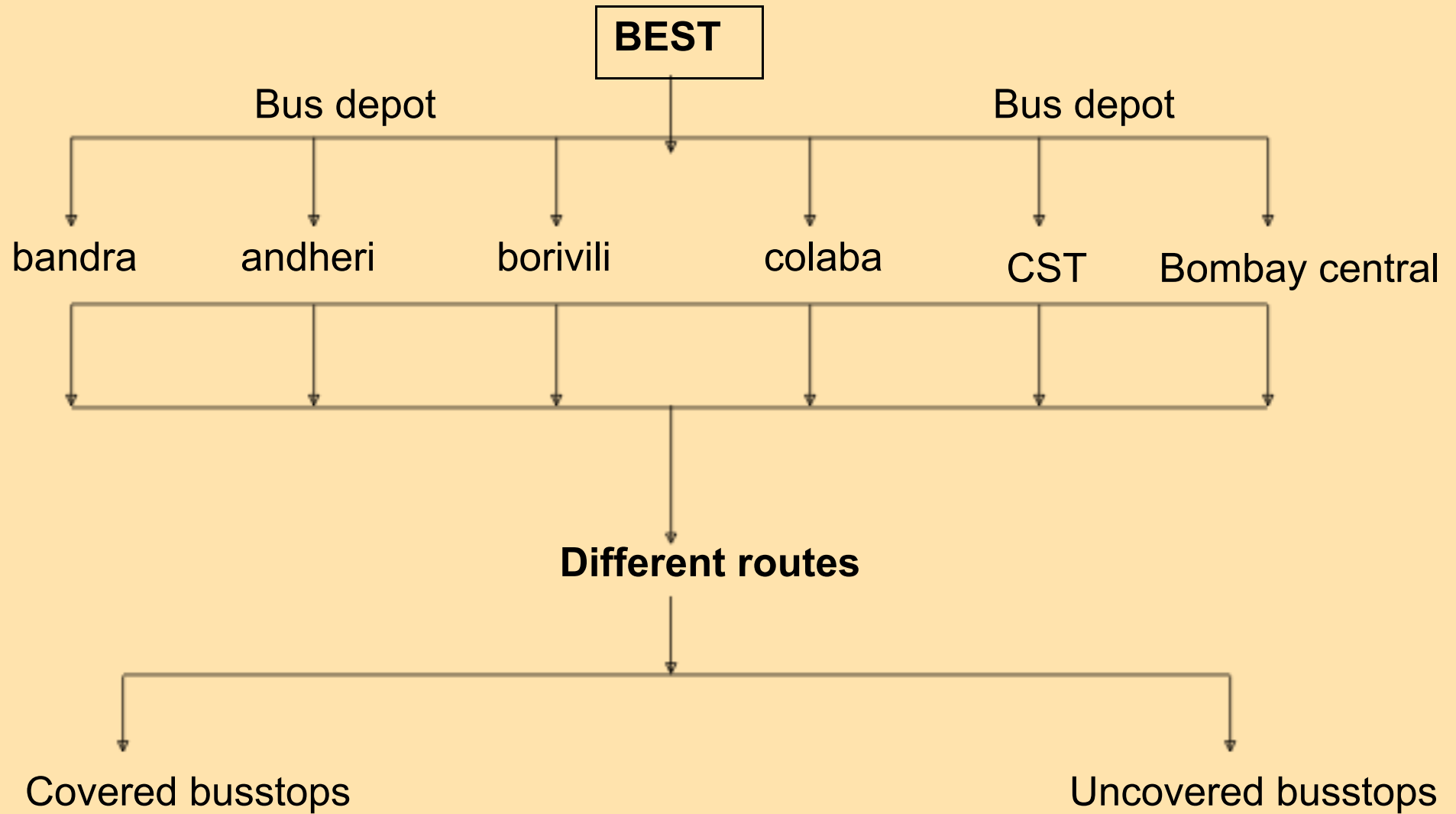
Bus is still popular among the users who stay at **locations where there is no railway line** or preferred by the commuter **who can reach half way by train, and later half by bus.**

Marriage of train and bus networking is very important, as commuter uses both the modes very effectively and efficiently for commuting short or long distances in Mumbai.

Public transport in Mumbai

BEST, with its distributed network, need a information system which can reach to all the class of commuters, giving relevant information like bus no / destination / time information.

- Existing BEST system.



Different context of bus stops in Mumbai:

A -covered bus stops (powai / andheri)

A1 -bus stops at bandra (placed in a row)

A2 -bus stop with dual outlet for the commuter to board the bus.(andheri)

A3 -bus terminal for out station buses.(Bombay central)

A4 -bus stop at (chatrapati shivaji terminal)

B -uncovered bus stops (with less traffic/ powai / sakinaka)

- Bus stops studied at **andheri are located outside the railways station.**
- The bus stops **cater to different zones / area of Mumbai.** Currently it has information board and is covered.
- **Type – A, A1 and A2. types are seen at andheri.**
- Andheri has more traffic ,as it's a pivotal area for distributing traffic to central

and western Bombay.

- Uncovered bus stop i.e. **B type are found as intermediate bus stops only.**
- This study shows the clear picture of physical context of the bus stops in Mumbai, as its very important to locate the place / space where product could

be installed.

Existing modes of information and problems observed:

- Painted boards at bus stands.
 - On bus
 - Tourist guide maps.
 - Computer website
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Existing modes of information and problems observed:

- Painted boards at bus stands.



- On bus



Existing modes of information and problems observed:

Board at bus stop:



Existing modes of information and problems observed:

Design ideas obtained from the above studies:

- To display bilingual information at the same time, providing commuter with option.
 - Height of the information displayed , font size to be taken carefully.
 - Information about the bus numbers with the frequency of bus should be given.
 - Time of the starting bus and last bus should be mentioned.
 - To provide direct navigation to commuters and try to reduce the actions. This can only happen, if the information is prioritize.
 - Contextual map or area based information will help commuter to locate the new address, in the new context.
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About user and their perception:

Interviews of Bus commuters were taken **under different context**. Every context differs and asks for different information from the commuters end.
Study conducted includes commuters from different backgrounds and professions.

User profile:

Commuters interviewed were, resident of Bombay, some were commuting from pune to Mumbai four times a week.

There were bus commuters, using bus since 9 years, 2 weeks, 3 weeks or a day visit for some interview. in Mumbai

About user and their perception:

Users background:

Professionals (doctors, architects)

Technical savvy (engineer's, mechanics)

Marketing field (salesman, marketing man)

Home makers (house wives, retd personals)

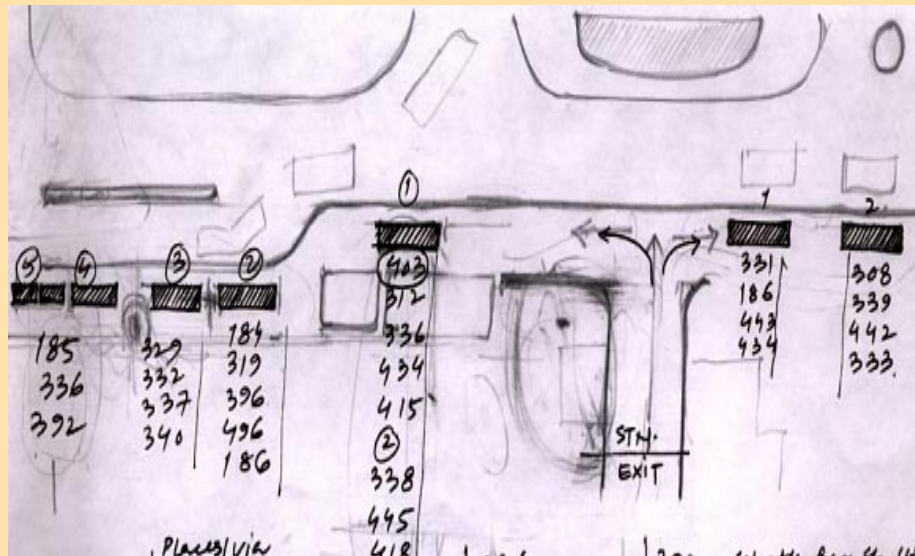
Students (school, college)

Business (small, large, medium) daily basis like hira panna

Worker class (sabjiwala, construction contractor, labour , carpenter)

Interviews were conducted at:

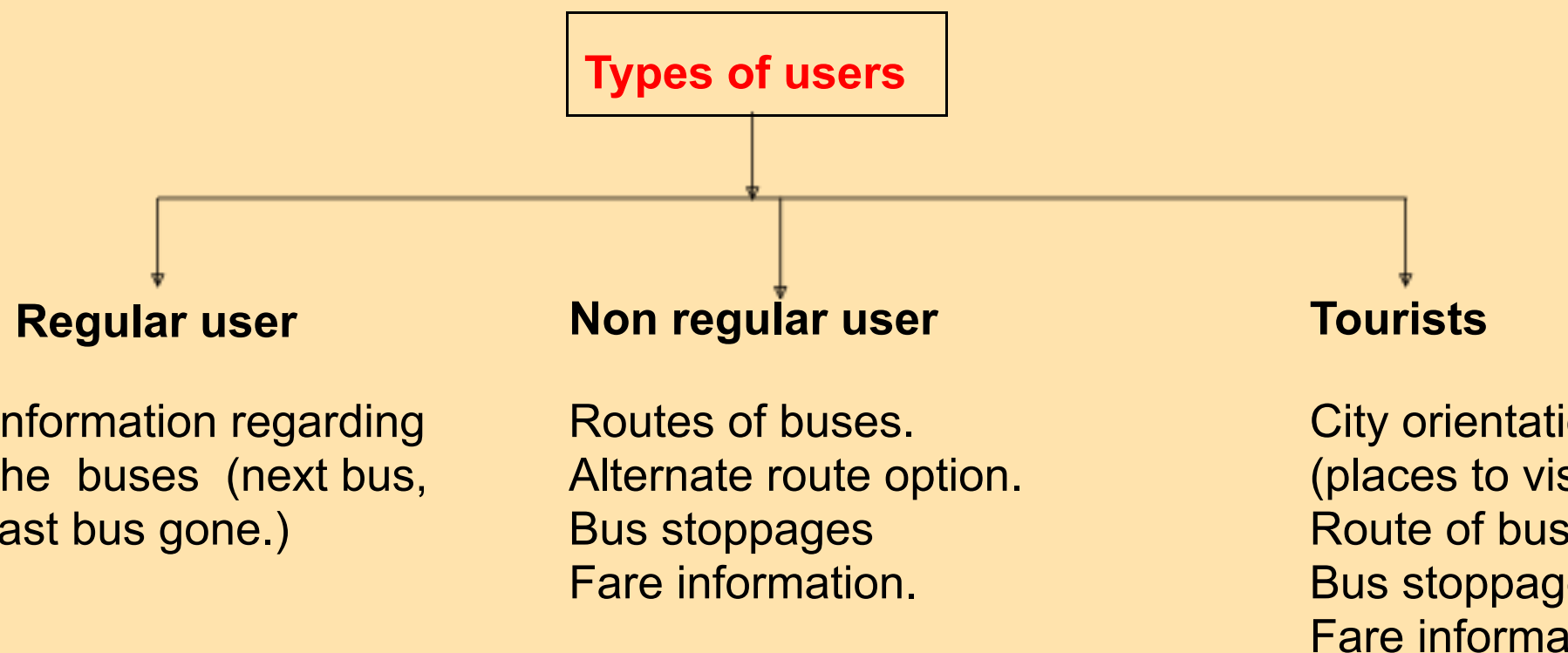
- **Andheri (east), bus stop, with bus number 185, 336, and 392.**
- **Bandra (west) bus stop, with bus number 422, 422 AC**
- **Hiranandani bus stop**
- **IIT powai , maket bus stop.**
- **At commuters house.(regular user)**
- **In trains, with commuters who uses bus to reach their offices, from the station.**



Interviews were conducted at:



Types of users



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graph TD; A[Types of users] --> B[Regular user]; A --> C[Non regular user]; A --> D[Tourists];
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Regular user

Information regarding the buses (next bus, last bus gone.)

Plan of the context, around 200 mtr for giving direction.

Some communication for emergency

Non regular user

Routes of buses.
Alternate route option.
Bus stoppages
Fare information.

Tourists

City orientation
(places to visit)
Route of buses.
Bus stoppages.
Fare information.

About user and their perception:

Activities involved during bus commuting : (By regular user)

- Regular commuter starts on the regular routes with the hope of getting the regular bus which commuter takes daily.
 - What next / alternate bus can be taken, in case regular bus doesn't come or is missed.
 - After reaching to bus stop, commuter tries to locate some other regular users, which takes the same bus.
 - Boards the bus and gets settle, knows exactly, when to start moving, to get down from the bus.
 - For avoiding change (money) problem with the conductor, tries to carry exact change everyday.
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About user and their perception:

Activities involved during bus commuting : (By non regular user)

- Start from the place.
 - Think about the destination and close landmarks.
 - Which route to take, as there are options of routes for reaching the same
 - place (goregoan – IIT , there are two routes)
 - Look for the bus number which goes through shorter route .
 - Board the bus.
 - Ask fellow passengers about the destination .
 - While taking ticket , ask conductor once again.
 - Getting down at the right bus stop.
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About user and their perception:

- **Why/when people choose bus for transport**
 - **what / which information commuter seek**
 - Where to stand for the bus/ which direction.
 - Which bus number will take me to desired destination.
 - What time will bus come.
 - When did the last bus left, as bus have certain frequency of coming (if its going to take long then, commuter can have option to go by train).
 - If the bus has left, then whats the alternate bus number that goes to same route.
 - What route does bus take , as bus have different route.
(goregoan – andheri – IIT= 1 hrs) (goregoan – RA colony – IIT = 30 minutes)
 - First and last bus on that stop.
 - type of bus – regular bus, AC, Ltd bus.
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About user and their perception:

Information needed inside the bus

Mumbai bus has different scenarios in a day like office hrs/ no office hrs.

Buses are extremely crowded during office hrs. If non regular / novice user is traveling during these hrs, it adds up to their anxiousness of knowing when their destination is going to come.

Currently bus conductor shouts for such commuters or fellow commuter helps these users.

Depending on others for information:

The situation of asking some one for the information is very normal , problem faced in this situation is, of not receiving the correct information from the fellow passenger.

Commuter mostly trust bus conductor for the information.

About user and their perception:

User matrix: 1 = Important information, 2= Less important, 3= Not needed.

Activities / Needs	Regular user			Non regular 1	Tourist / novice
Bus number	1				1
			1,2		
Destination	3				1
			1,2		
Stoppages	3				1
			1		
Scheduled time	1				1
			1,2		
Routes of buses	3				1
			1		
Alternate route option	1				1
			1,3		
Fare information	3				1
			2,3		
City orientation	3				1
			2		
Direction to locate bus stop.	3				1

About user and their perception:

Design ideas obtained from the studies:

- A commuter requires different type of information at every context.
- At bus stop regular user need to know the Bus number/ bus destination/ schedule time.
- Non regular commuter requires similar information, with some more details about which route bus, will go through, alternate buses going to same destinations .
- Commuter needs the information at railway stations or at the time of Commencing the journey or , to locate the bus stop of the bus, to be boarded.
- Display / signage integrated product can be placed at major junction s like

Andheri, bandra , giving direction / destination / bus numbers.

About user and their perception:

Design ideas obtained from the studies:

- System to be available at regular interval, so that user can retrieve the information whenever required.
 - There is no bus time displayed currently, if time is displayed in a system then commuter can make a choice of choosing some other mode of transport.
 - Provision of seeing detail map of any area (like eitchers map of delhi), can help commuters to locate the address of the new place.
 - Different context requires different product,(type B bus stop). This context doesn't require display system and signage as the location of the bus stop is different than like andheri / bandra. It can suffice with the interactive device, which can give information about the buses coming to that stop, and bus numbers. Can also deliver alternate information about the buses and other information like emergency, area based if needed.
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Case studies

- **Analogy of railways and BEST bus**
- **IVS (Insta visual solution)**

Insta Visual Solutions designs, manufactures, supplies and supports a range of customer-based passenger information and entertainment systems for trains, buses, metros, trams and travel centers.

The study gave the design and technological insight of the information system project which is been done in Finland



Synthesis of the study:

The **product is targeted at all the bus commuters**, in Mumbai

- **Commuter, who is a regular user.**
Currently finds out the information by asking fellow passengers.
- **Commuter, who is not a regular user.**
Finds out the information, before starting the journey, from neighbours or friends.
- **Commuter, who is a tourist.**
Has to ask everybody, on the way for the destination.

Goal of the project:

It would help BEST, to organise and help people, seek information.
This would ultimately lead to **transparency** in the system among the Commuters . This would make commuters self dependents.

Synthesis of the study:

- The study of commuters and different context evokes the need of various design solutions to the existing BEST system.
- Mumbai context is big and it varies.
- Information, commuter seek is different for different scenarios.

Objectives of projects:

Project is an attempt to give :

- 1) Organized fascia to the existing diffused and distributed bus transport.
 - 2) To make the bus routing and **traveling information transparent** to the novice / Regular Bus commuters.
 - 3) To connect a network system of information for the BEST.
 - 4) To draw similes between Railways and BEST, as they compliment each other in dire straits.
 - 5) To provide information about BEST bus service of Mumbai at macro(city) level.
 - 6) To **replace human dependency** for obtaining information, by providing product / System.
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Products definitions:

- a) **Display, at main junctions of the bus stops or railway stations, which could give the static information regarding the buses. (non interactive)**
 - b) **Second product could be placed at bus stops, which gives information about the bus no , bus destination, timing of the bus. (non interactive)**
 - c) **Display device to be installed inside the bus, so that commuters can relax and wait for their stops. Device will display the last bus stop and coming up bus stop. Device will try to negate the anxiety in commuter.**
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Products definitions:

d) Product can be an interactive product, placed at various sites in Mumbai, like:

- At main bus stops, where users are expected to commence their journey.(Andheri, dader, bombay central , bombay vt.)**
 - At Railway stations.**
 - Where the Bus stops location is not very isolated.
(passenger wise)**
 - At airport.**
 - Hotel lounges.**
 - At STD / PCO booth.**
 - Any temporary public exhibition for longer duration**
-

Design process :

After identifying various possible design project, that can be helpful to the network of information for BEST Mumbai, Because of time constraint only one of them is taken further to detail.

As non of the product identified, can be seen in isolation, all of them make the system, and can be detailed in phases.

Product D – has been considered further to see in detail at hardware and interface level. Product D can be further developed to retrieve the city information in detail, based on the need of commuters.

Design process :

Displaying the huge information at the same time to the commuter is the great challenge in the project. Big data bank of bus numbers, destinations, need to be displayed and communicated properly to commuters.

Study of different context and users indicates the information needed by the commuters.

It can be classified into two types of information, **Auto & manual**

Automated information = standard information

- Bus numbers

- Destinations

- Direct journey information (IIT – Andheri)

- Break journey information.

- (IIT – Ghatkopar/ Ghatkopar – Dader)

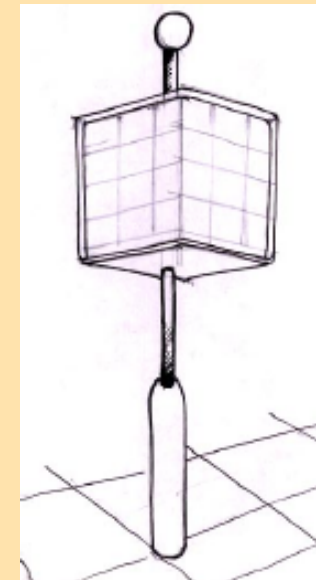
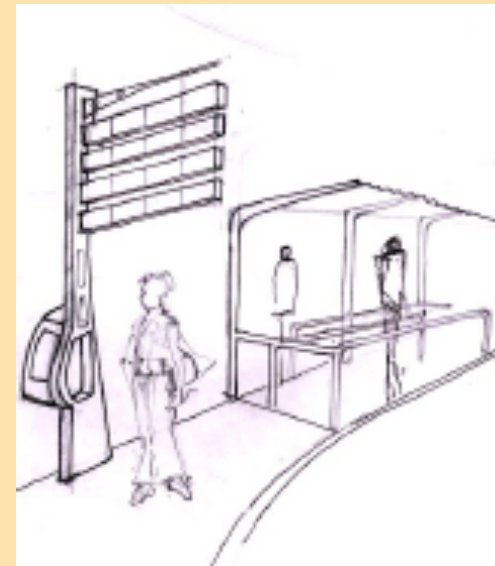
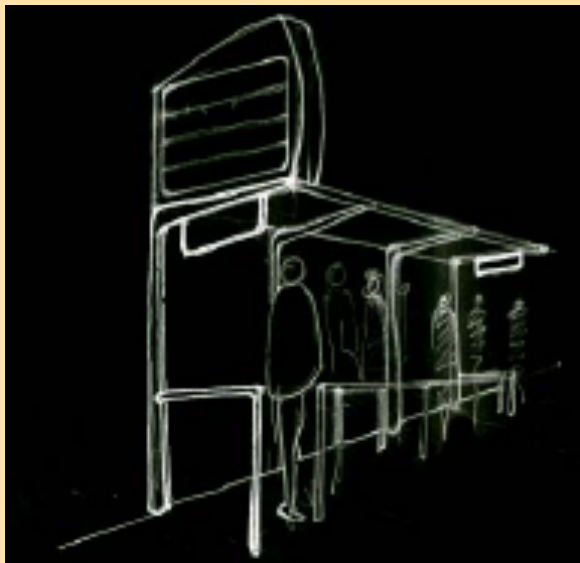
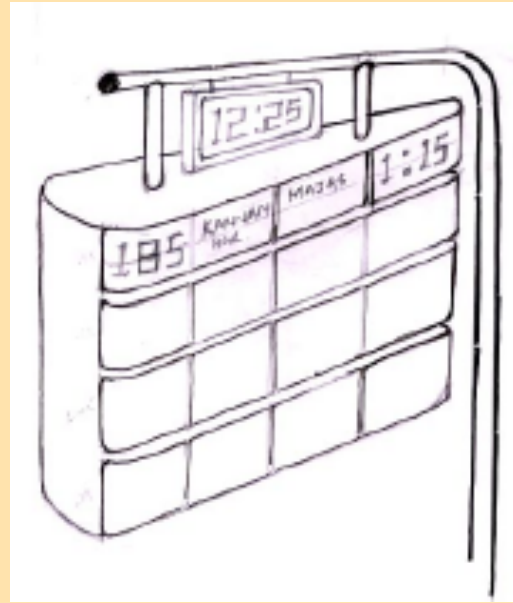
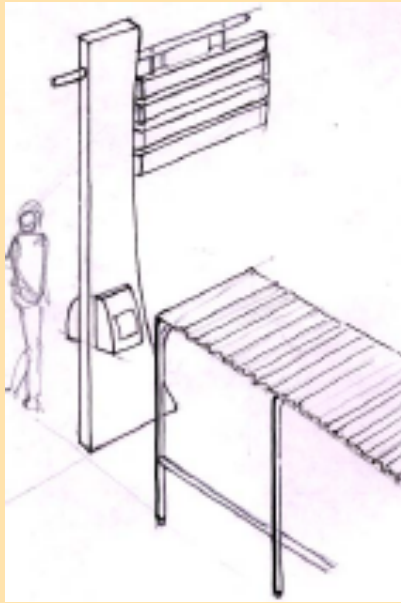
- Type of bus (non AC / AC / Ltd)

- Fare information.

Manual Info = any scenario/ situation, interaction happens verbally with the person sitting at **BEST call centre**

Design process :

Concepts of proposed product :



Design process :

Product brief:

- Product should be portable.(by size)
- Product will deliver bus information to commuters (bus number/ destination / expected time) from any part of Mumbai.
- Product to be compact / integrated and user friendly.

Compact – overall size

Integrated - product has two technology :

- Phone facility (call centre)
- Interactive screen (gives only standard information)

- Product has to be modular with multiple possibilities of attaching it to wall, keeping it on the stand.

- To consider ergonomic factors (product height / screen angle)
 - To have optimum readability in any ambience.
 - To have minimum keys for operation.
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Design process :

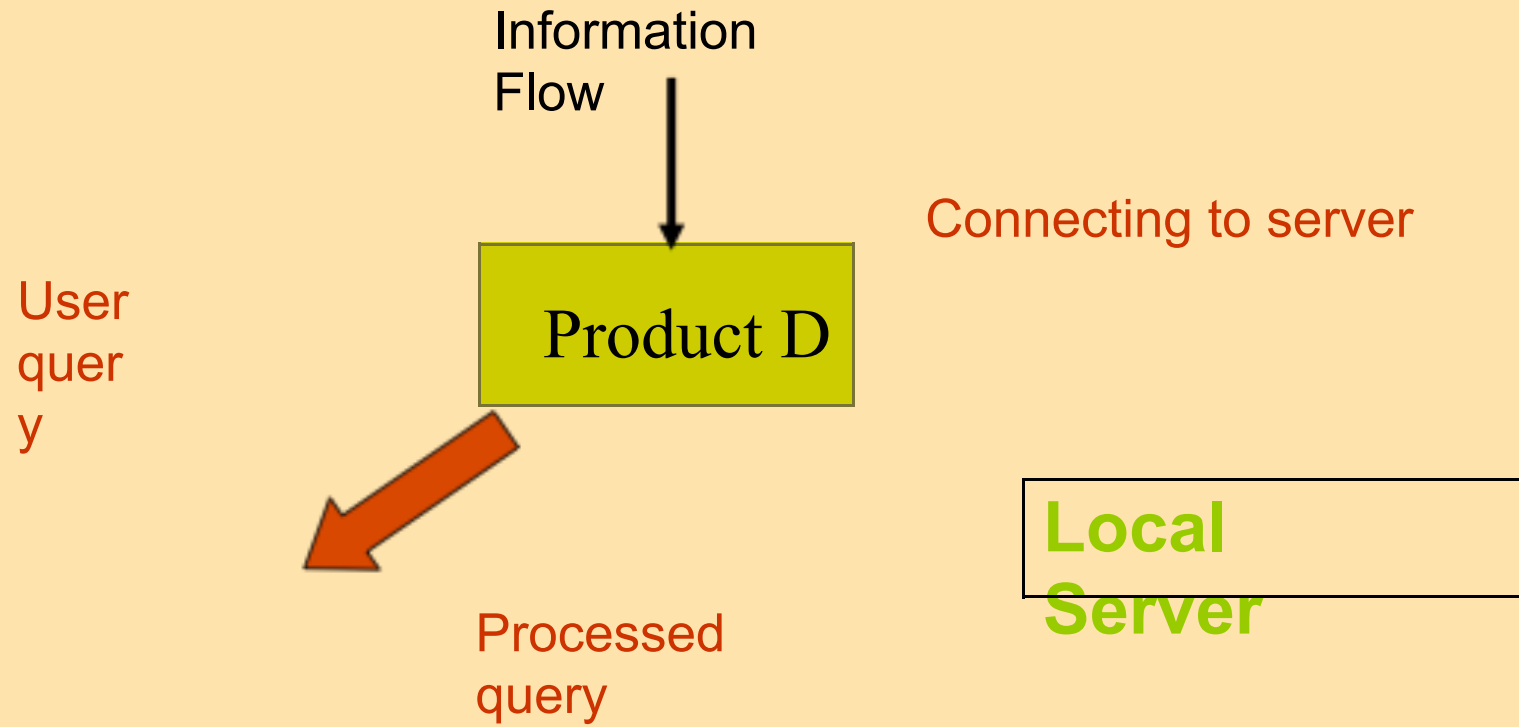
Product brief:

- Product will have in built receiver.
 - Data bank will be in the product, there is no central server required.
Information will be received/ display from local server.
 - Product can be covered in some situations
(uncovered bus stop, any public area).
 - Product should be easily accessible for service. (Maintenance)
 - In case of emergency , product will have UPS.
 - To maintain the element of hygiene in the system/ product , while using the call centre.
 - system used in the product is upgradeable to DGPS, and any random change or addition in the routes of Bombay.
(Differentiated global positioning system)
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Existing interactive and communication product:



Design process :



Design process :

Individual components:

Processor

Lcd screen

Microphone

Speakers

UPS

SMPS



Design process :

Product usage by users

Regular commuter :

- Regular commuter will use the product, in situation of changed route/ new route
- In situation of break journey (Andheri – Dader /Dader – church gate)
- If bus breaks down on the way, and commuter is on the new route
- In case of emergency.

Non regular / novice user:

- When user wants to know the bus number of the bus, going to desired destination.
 - To know the Type of bus. (Regular bus / AC / Ltd).
 - At type B bus stop , where the displays are not needed, this device can display the information about the buses related to that particular stop
-

Design process :

Concepts: 1

Product proposed is an interactive product, as it's going to be in public areas, **interface navigation with regard to time** to retrieve an information is seen as a significant aspect of design.

product proposed has two modes to operate - **one is giving standard information**, (as mentioned earlier) to the user and incase enquiry asked doesn't fall in the standard info. slot > **the inquiry goes to call center** > BEST person picks up > BEST person finds out the information from the computer > same information appears on the commuters end.



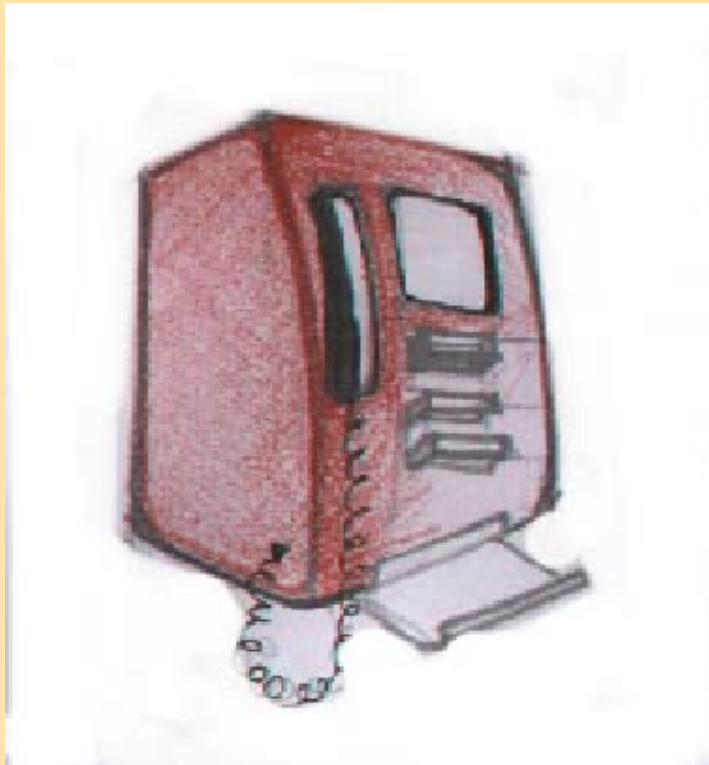
Design process :

Concepts: 1

Usage

- >Commuter lifts the phone,
- >gets the feed back saying press 1, 2, 3 for opting the language
- > After choosing language commuter asks for information (iit – andheri), bus numbers (verbally asked)
- > System replies back on a product screen, at commuters end.

Advantage - All users including literate, illiterate can use the system.



Design process :

Concepts: 1

Problems :

Expecting verbal text to be converted into computer text. System is difficult to run as India has so many dialects, Pronunciations of commuters will differ. If language is only English, then the system can be made smart enough to judge the inquiry asked.

In this concept, to attend calls at call centre, BEST will have to employ people. (BEST, is already over employed)



Design process :

In our context , Product only connects to the BEST call center, so information of any nature / scenario can be retrieved by the commuter. This facility can be easily used by illiterate commuters (illiterate knows their destination verbally)

So, there are two interactive, independent products

- one have interaction with screen.**
- second is call center (verbal navigation).**

**As there is so much data , (as mentioned) to be arranged and displayed, challenge lies in how to display information like bus number / destination names in Mumbai
(approx 2500 bus stops/ destinations, told by best)**

Design process :

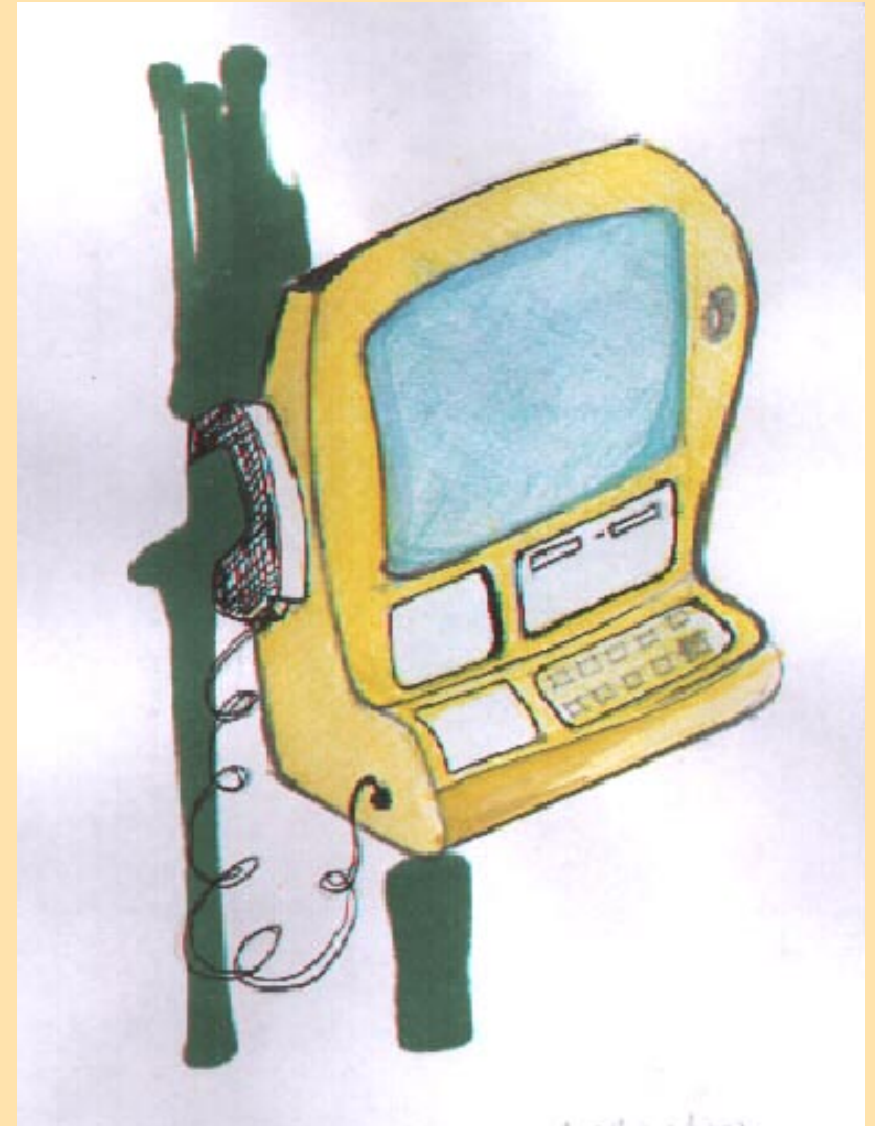
Concept- 2

Product has a screen + keys + receiver:

- 1) Receiver has no connection with the screen.
 - 2) Navigation happens by choosing the destination from the screen and feeding destination code in a given slot
- Receiver could be used for manual inquiry by illiterate & literate users
 - Both the **products are integrated, giving an option to the user.**

Disadvantages: -Displaying data at the same time on screen makes it difficult for commuter to locate the destination.(All the destination were displayed,simultaneously on the screen)

Product has a numerical key board



Design process :

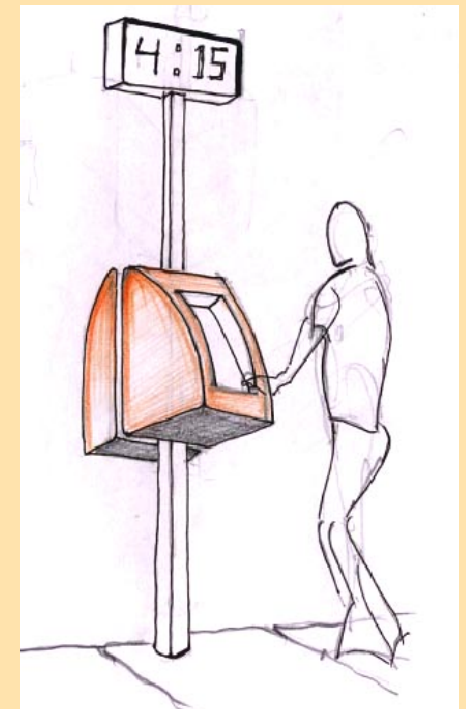
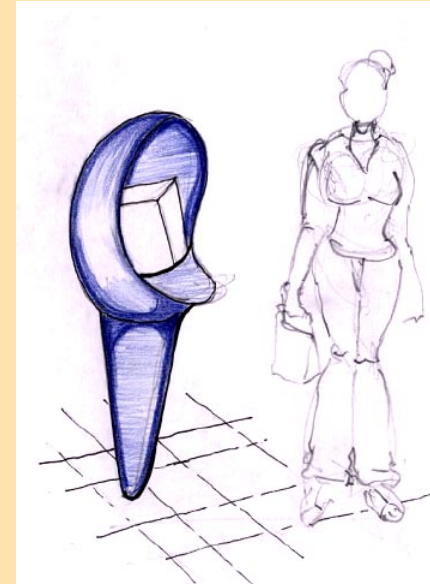
Concept- 2

Navigation with screen:

Choose destination code from the menu > feed the code in the box given > enter > information appears >

Navigation with receiver:

Commuter picks up the receiver > if lines are busy, music comes > once line is clear, call is attended by the BEST employee > information asked, is browsed in computer > The information is located at the call centre > same information is displayed on the product screen, at the commuters end.



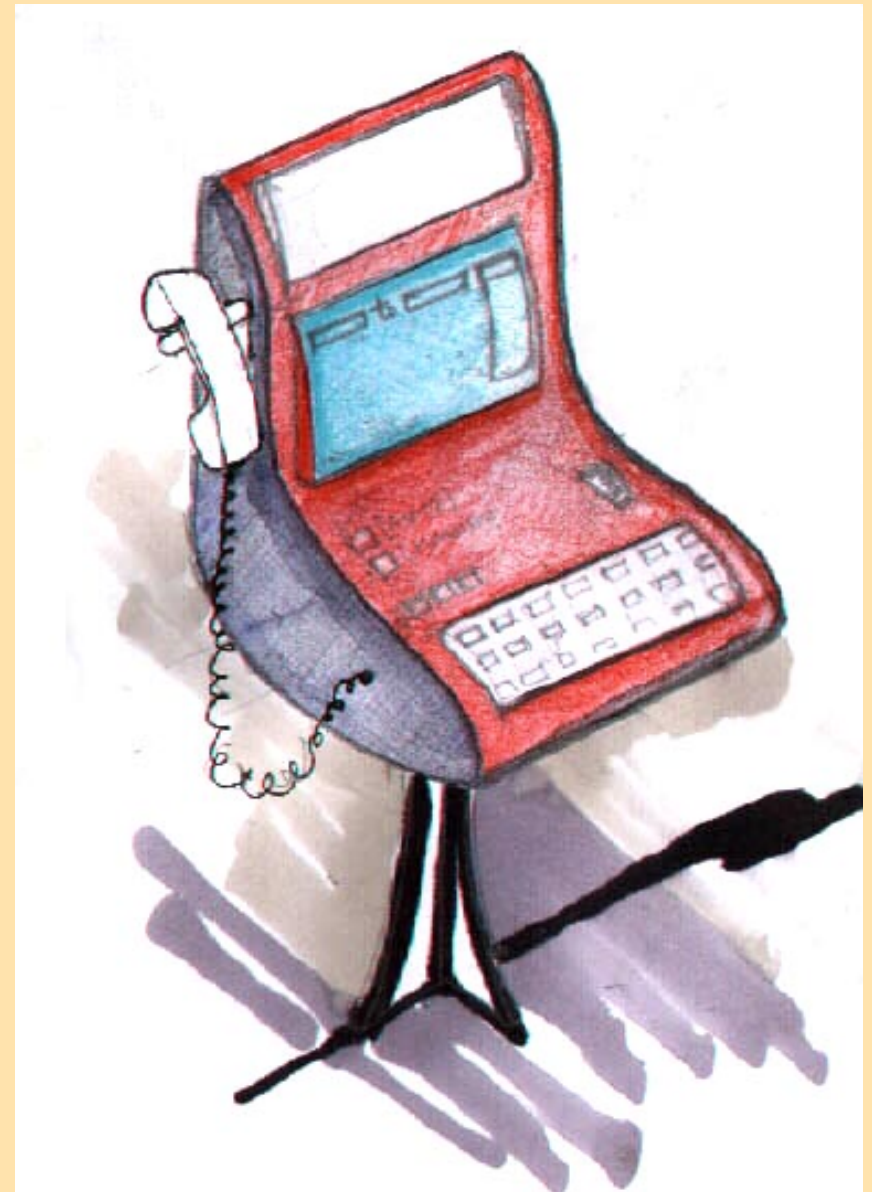
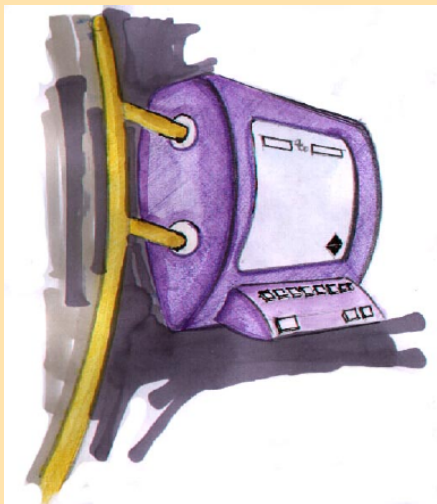
Design process :

Concept- 2a

Usage: Press alphabet A > all the stops with A appears, So **concept tries to categorize the information into 26 parts**, so basically data bank of destinations is now distributed.

Only **drawback of the system** is – it is **keyboard dependent**, which means keys to be strong/ rugged enough to sustain rough use by commuters.

Alphabetical literacy is necessary to activate the screen.



Design process :

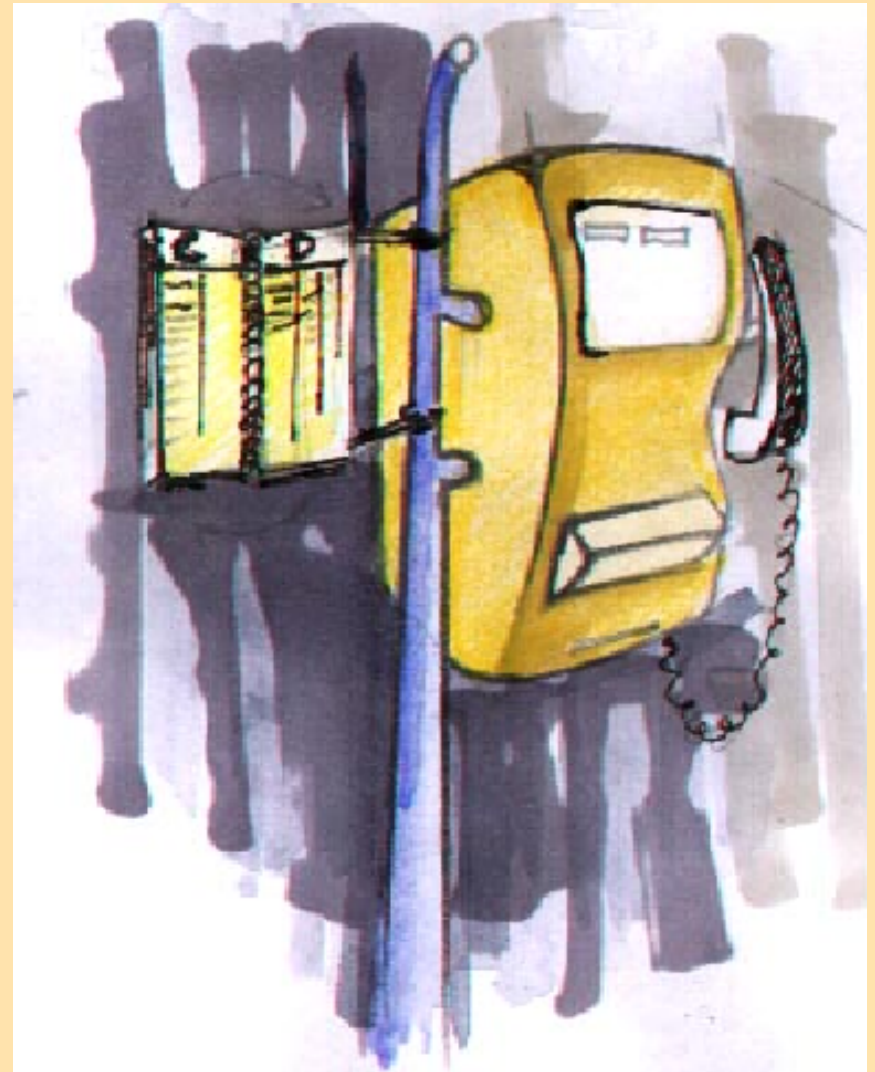
Concept- 3

This concept, explored the possibilities of displaying destination in simpler way. **concept has booklet +screen + call center + digital panel.**

Concept has a **mix of latest technology and old print media like booklet.**

booklet is laminated and contains destination names, by alphabetical order

Layout of the page is destination / code
(codes are allotted)



Design process :

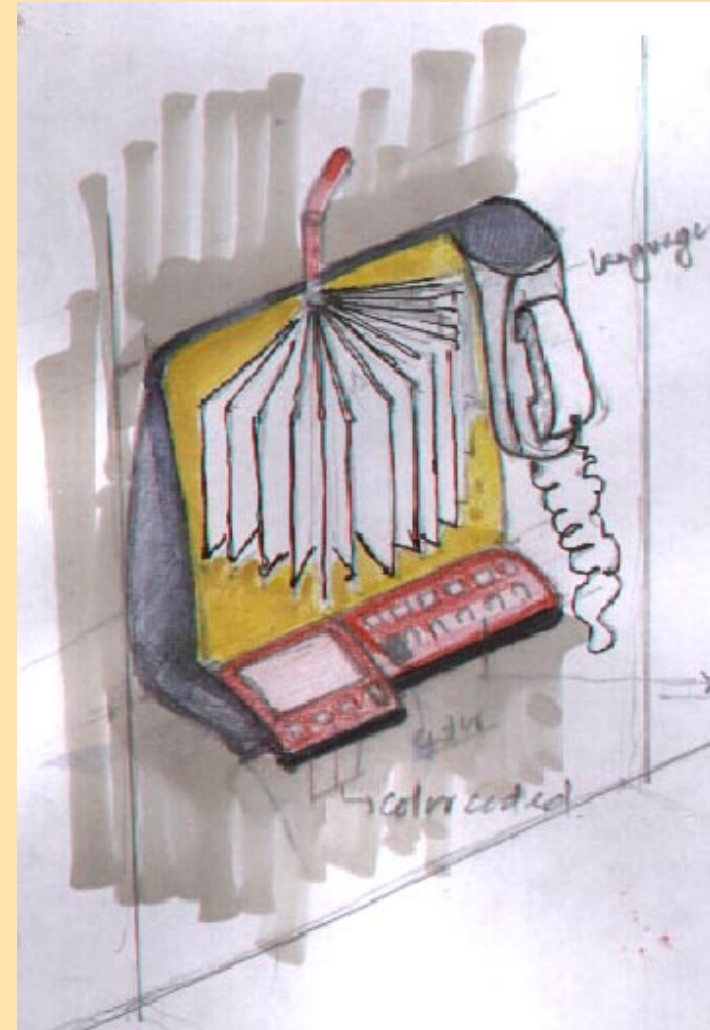
Concept- 3

Design Issues of various kind, were questioned like:

what happens when user lifts the receiver ?

what function can happen without lifting the receiver ?

when the product is not in use, then what happens ?



Design process :

Concept- 3

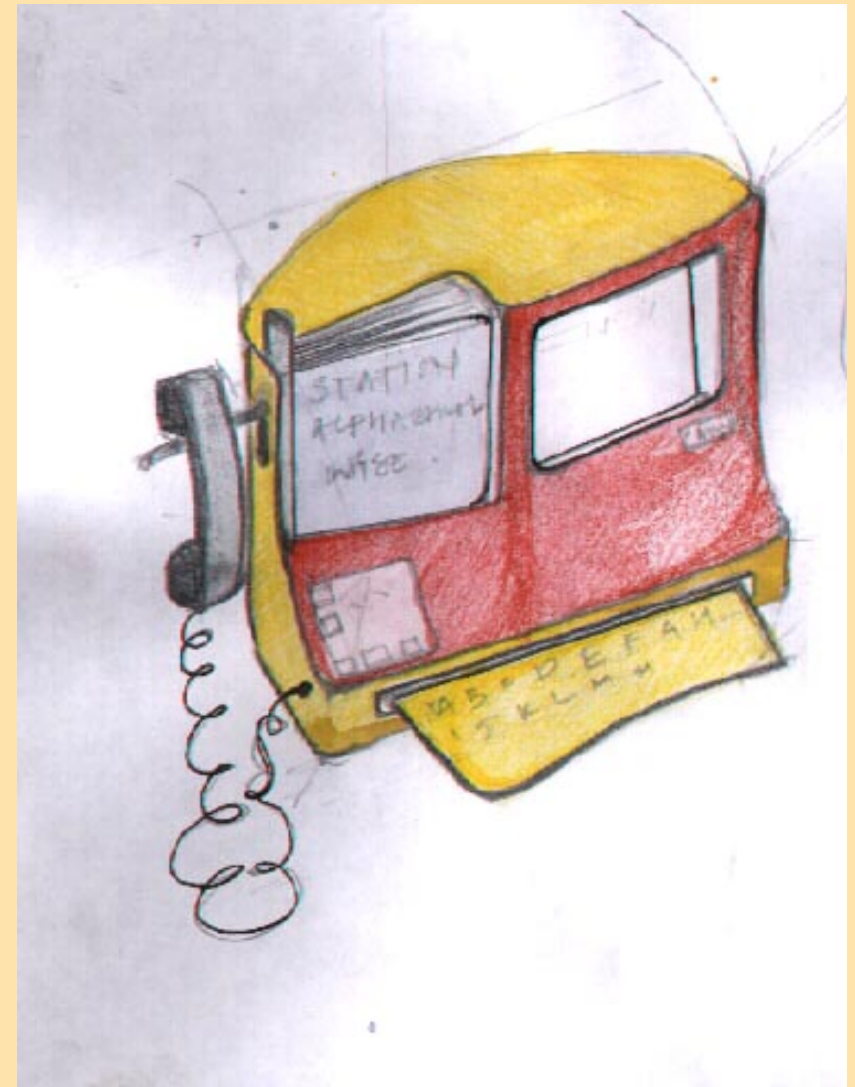
Navigation on screen :

commuter look for the destination in booklet provided > Feed the code > enter > Information appears > Option for printout .

Navigation on phone :

commuter lifts the receiver > Press button > call goes to call centre > ask the Information > BEST locates the information > same information appears on product screen > option of print.

Booklet has a **drawback**, if any destination has to be added, then every time BEST needs to replace the page.

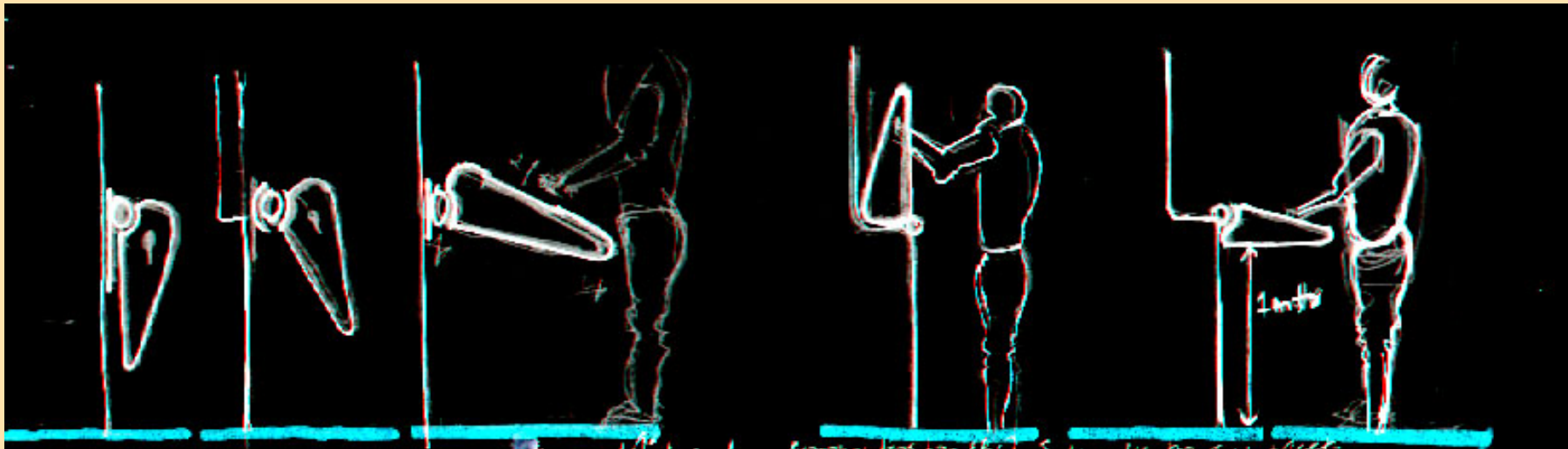
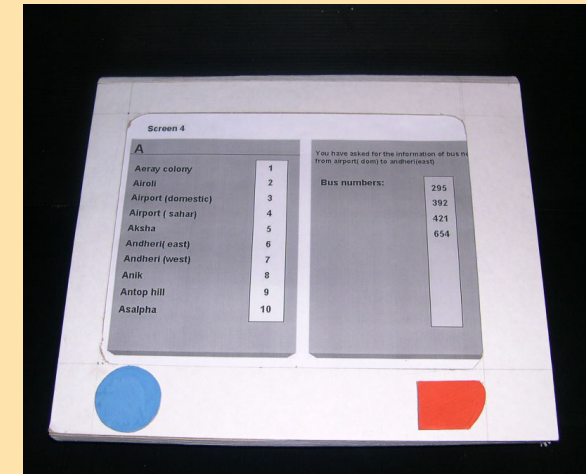


Design process :

Concept- 4

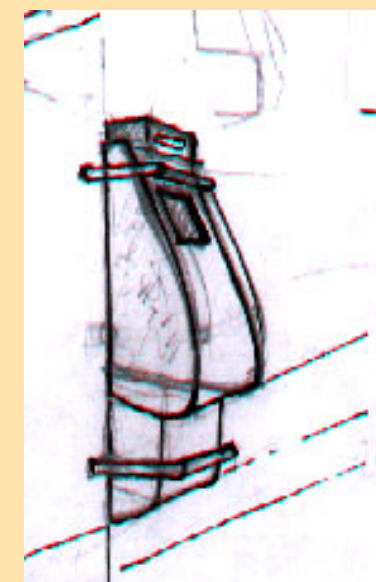
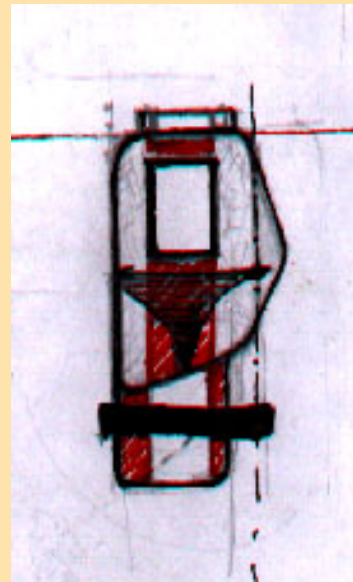
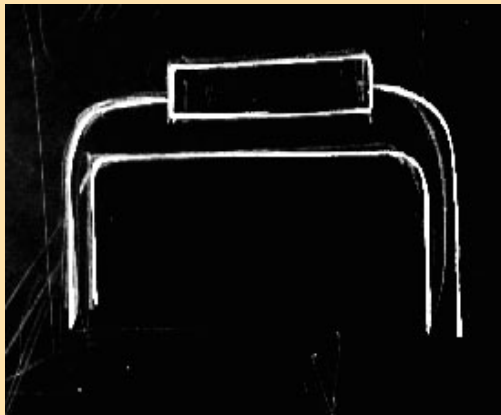
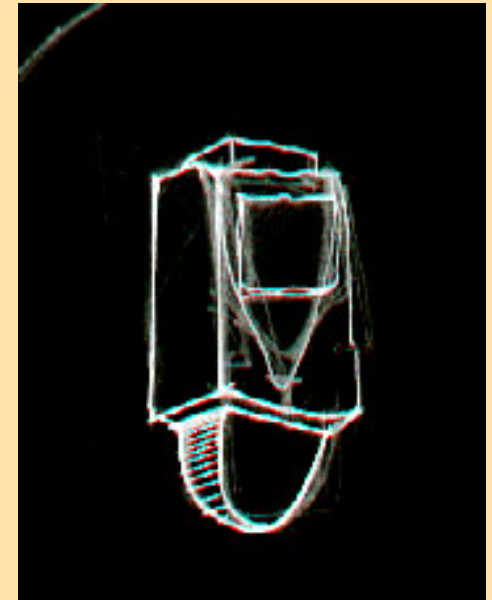
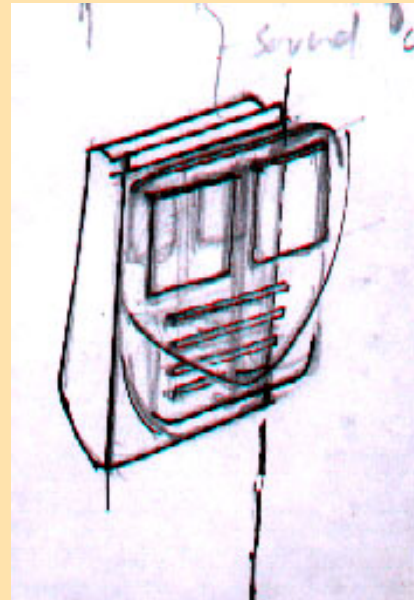
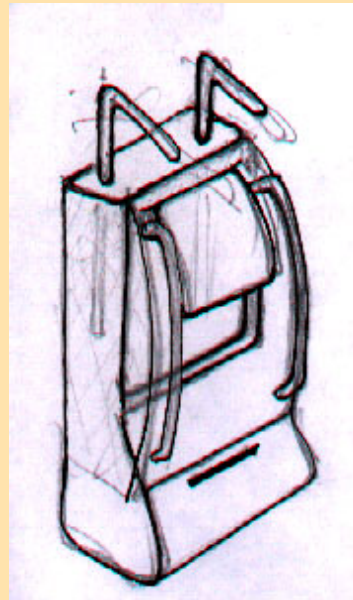
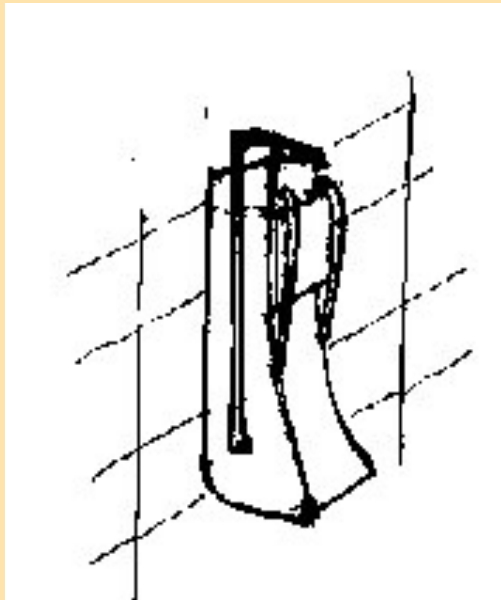
Concept idea is to have electronic pages, which scrolls up.

Its a bilingual system, as required by the commuter, screen changes the language.



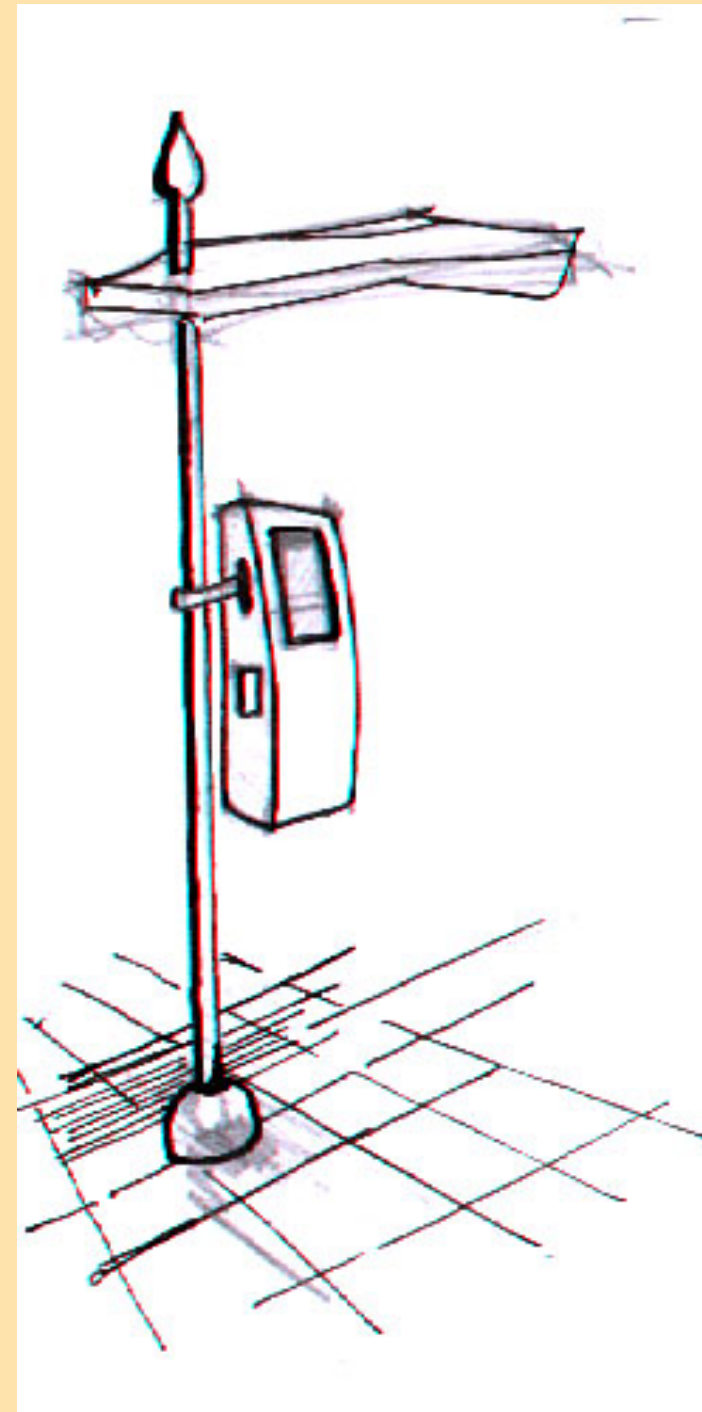
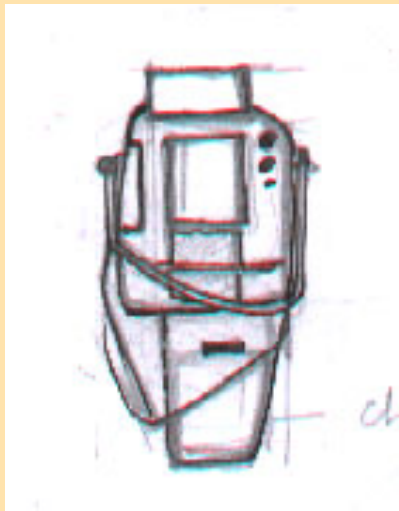
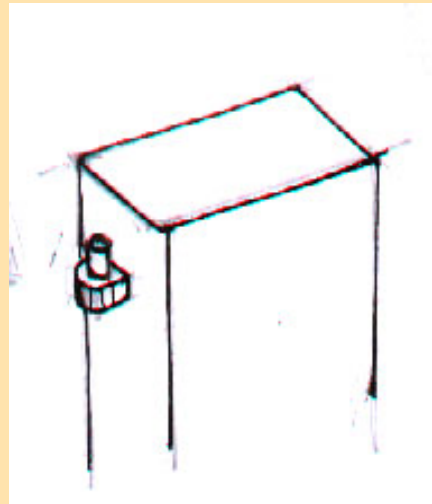
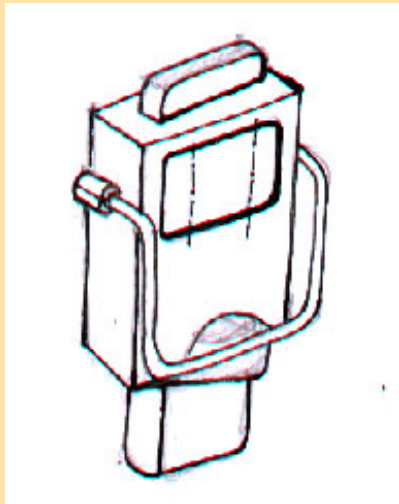
Design process :

Concept- 4



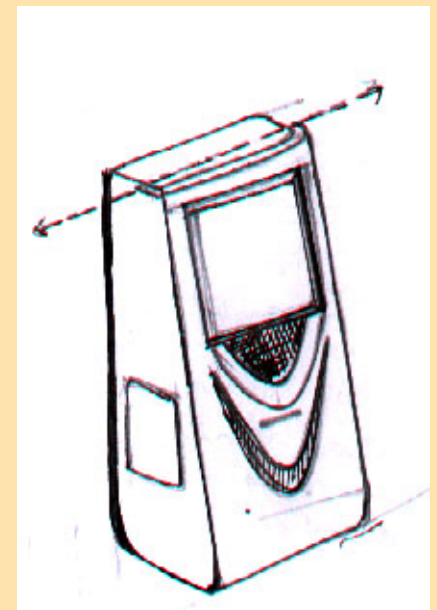
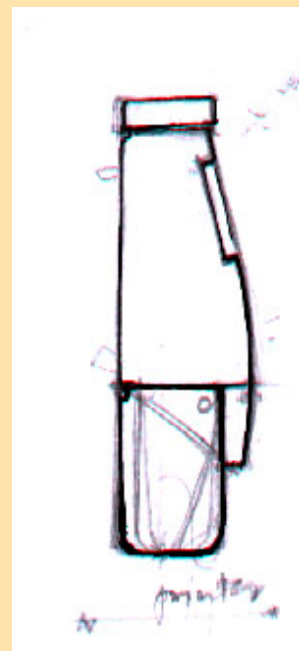
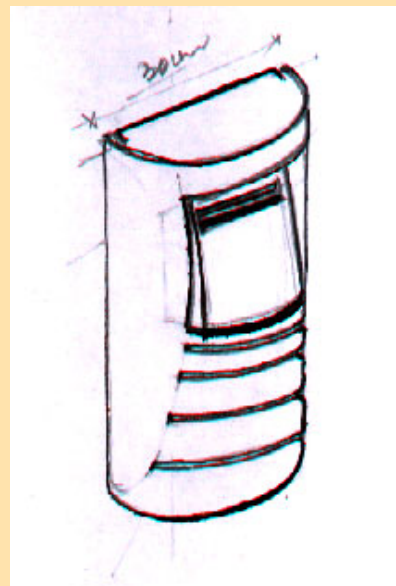
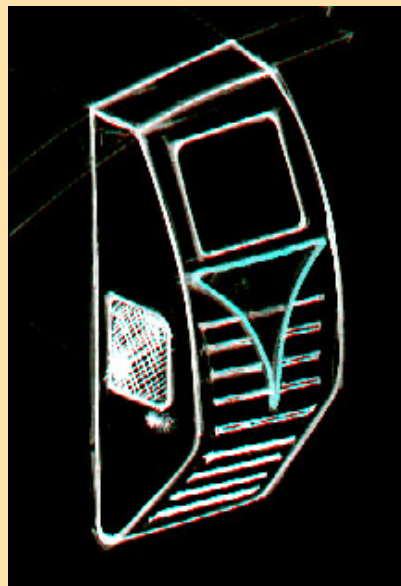
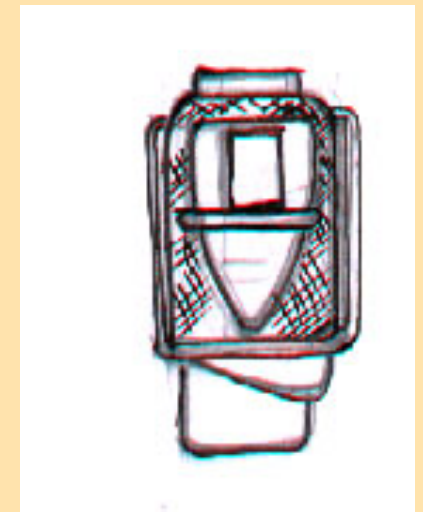
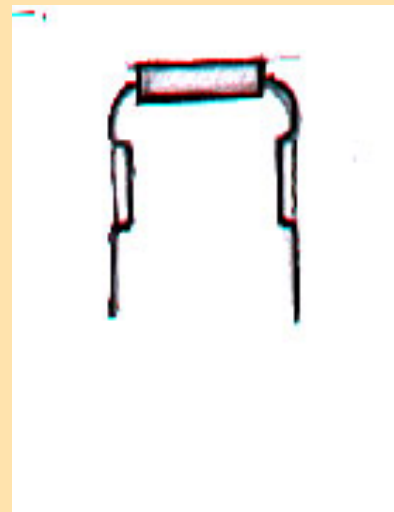
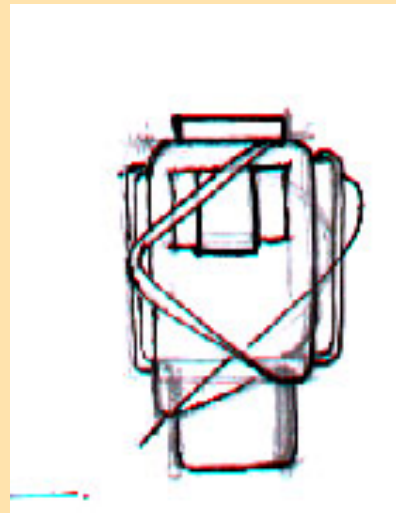
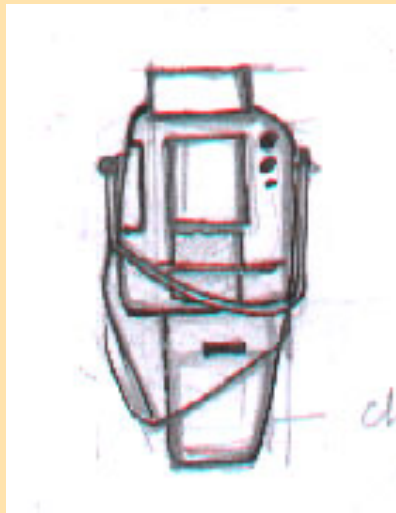
Design process :

Concept- 4



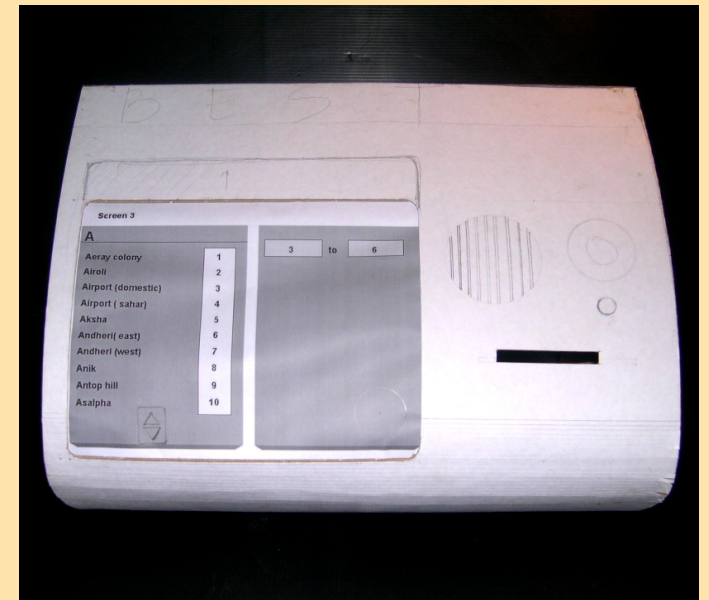
Design process :

Concept- 4



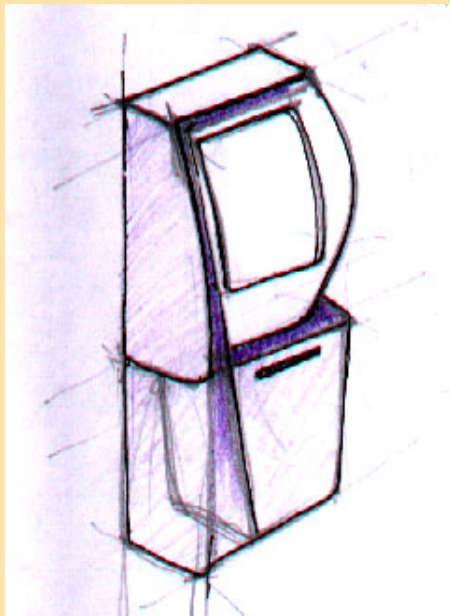
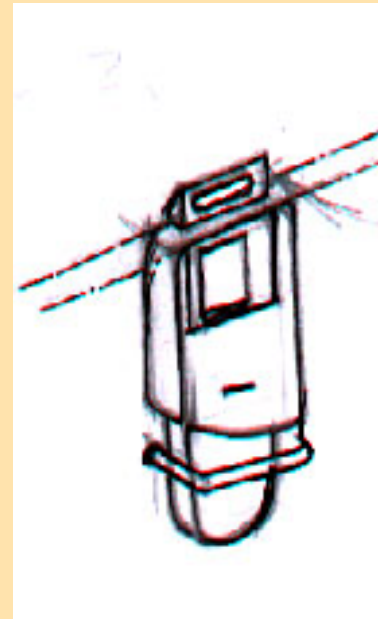
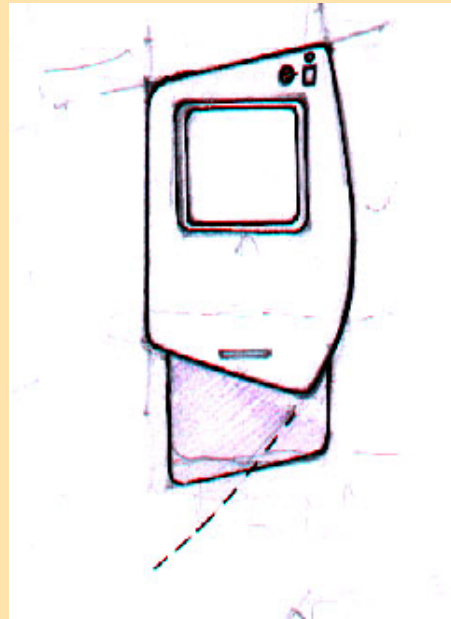
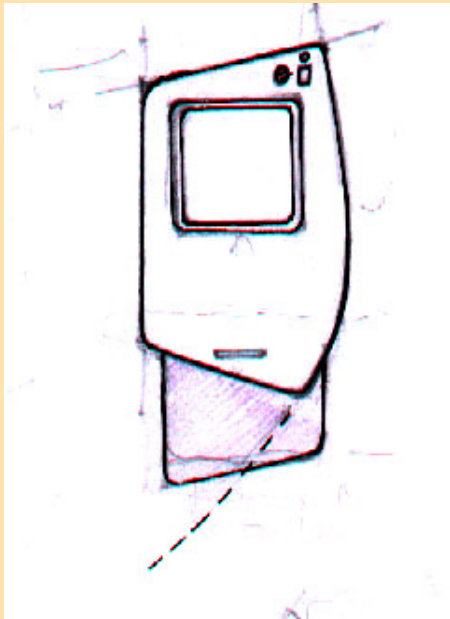
Design process :

Concept- 4



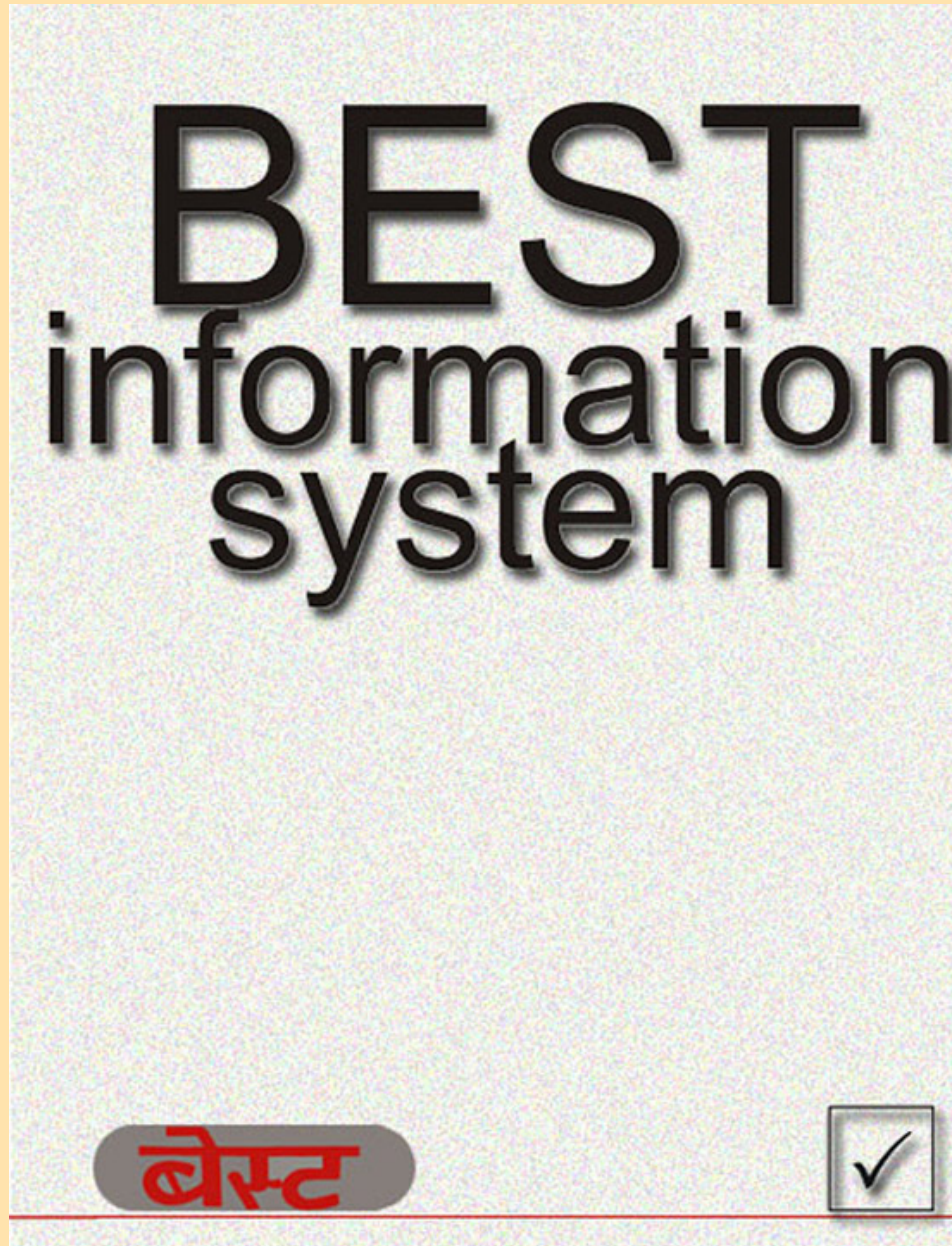
Design process :

Concept- 4



Design process :

final Concept:



Design process :

final Concept:



Design process :

final Concept:

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Airport to Andheri

✕ ✓

1	Aarey Colony	12	Aarey Colony
2	Airoli	13	Airoli
3	Airport (Dom.)	14	Airport (Dom.)
4	Airport (Int.)	15	Airport (Int.)
5	Aksha	16	Aksha
6	Andheri (East)	17	Andheri (East)
7	Andheri (West)	18	Andheri (West)
8	Anik	19	Anik
9	Antop Hill	20	Antop Hill
10	Asalpha	21	Asalpha
11	Andheri (West)	22	Andheri (West)

▲ ▼



Design process :

final Concept:

A B C D E F G H I J K L M

N O P Q R S T U V W X Y Z

Airport

 to

Andheri

✕

✓

You have requested information on route numbers between:

Airport (Domestic) AND Andheri (West)

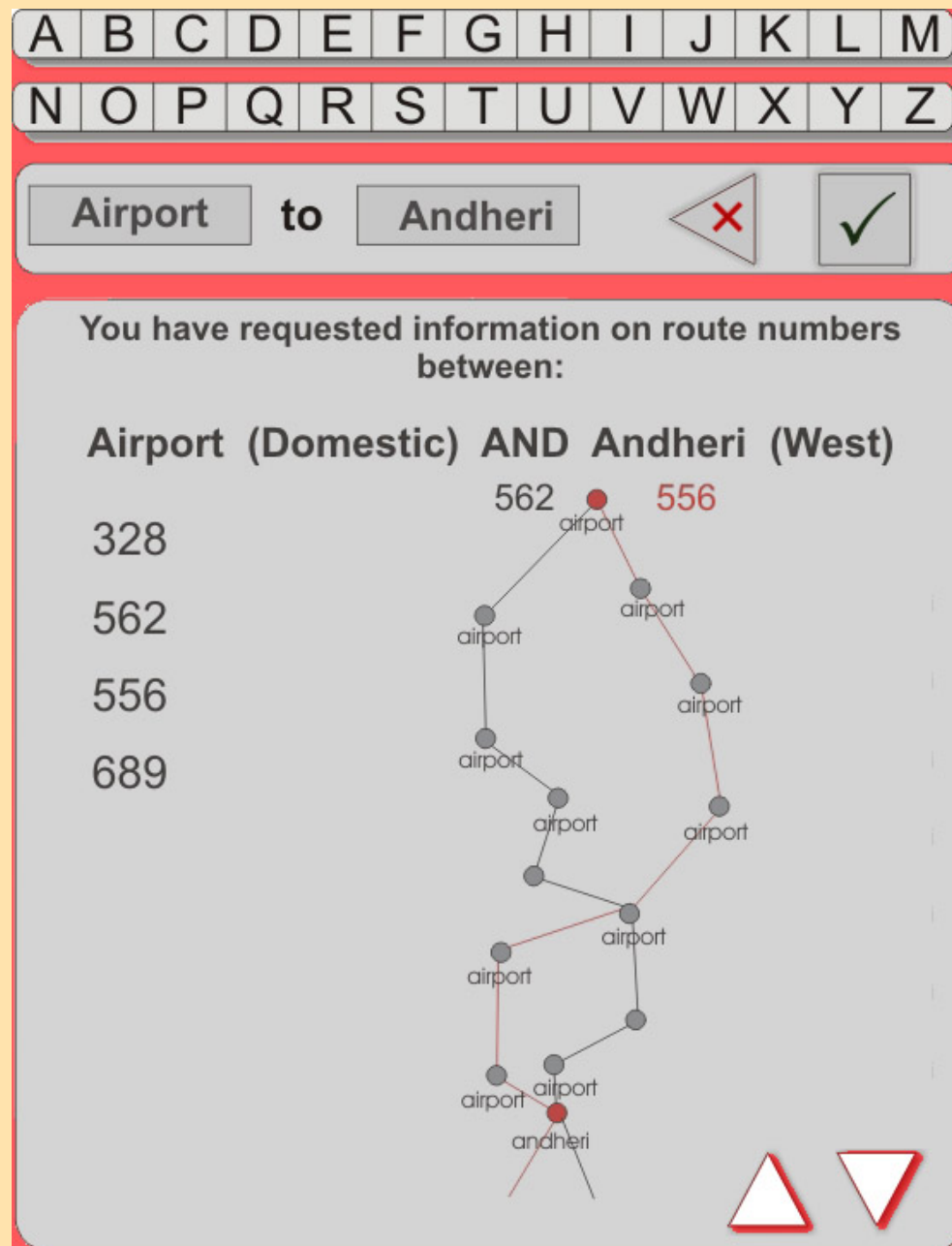
	328	562	556	689
328	airport	airport	airport	airport
562	andheri	andheri	andheri	andheri
556	andheri	andheri	andheri	andheri
689	saki naka	andheri	andheri	andheri
	andheri	saki naka	andheri	andheri
	andheri	andheri	andheri	andheri
	andheri	andheri	andheri	andheri
	andheri	andheri	andheri	andheri

▲

▼



final Concept:



Design process :

final Concept:

A

B

C

D

E

F

G

H

I

J

K

L

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Y

Z

Airport

to

Andheri

X

✓

Sorry. There are no direct bus routes available between Airport (Domestic) and Andheri (West).

You can reach Andheri (West) by the following routes:

Airport (Domestic) to Mahim Bus Stn.	328	
	562	
	556	
Mahim Bus Stn. to Andheri (West)	84	
	168	
	226	

▲

▼



Design process :

final Concept:



Design process :

final Concept:



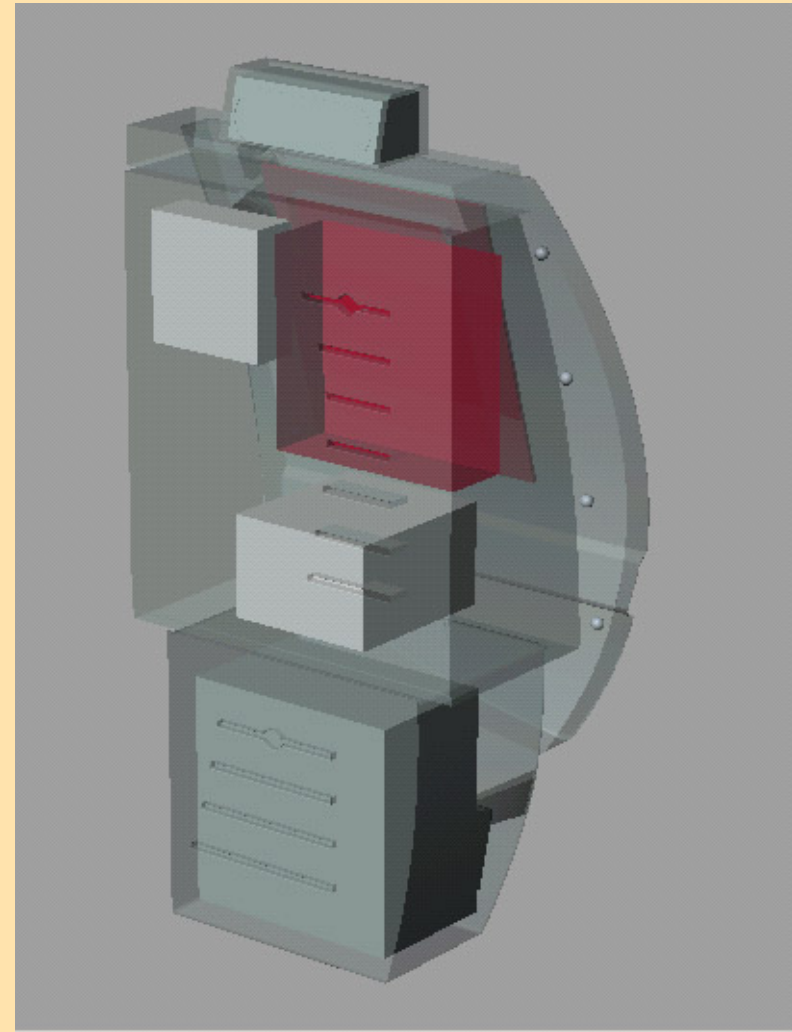
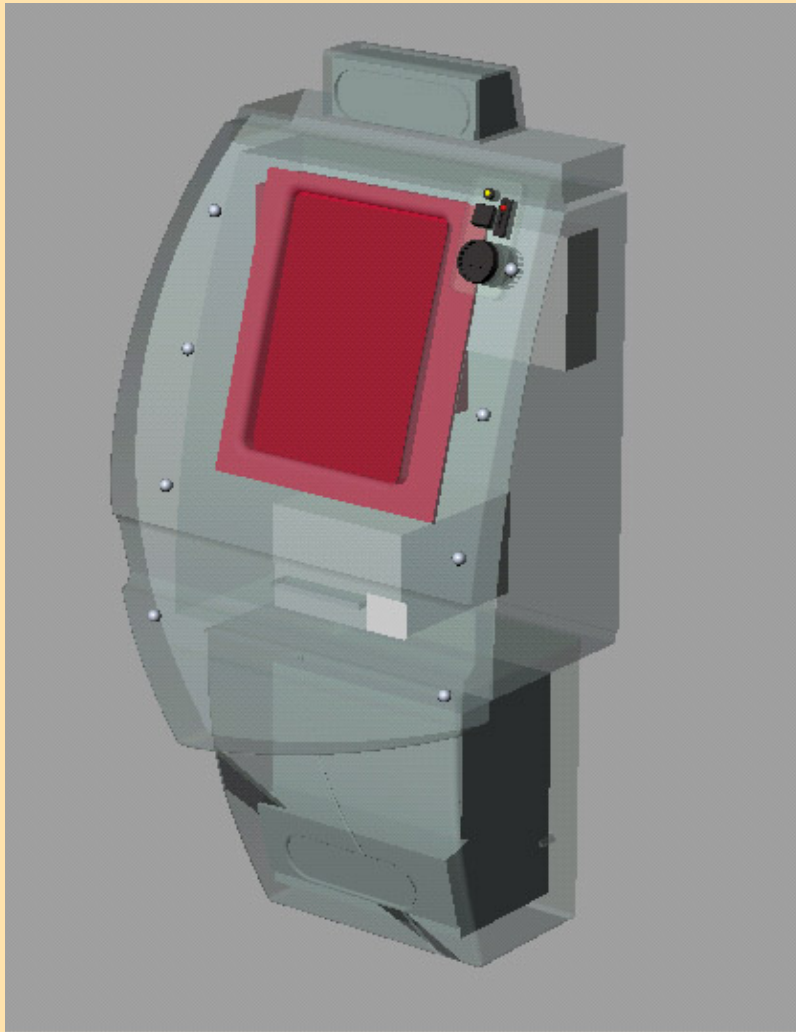
Design process :

final Concept:



Design process :

final Concept:



Design process :

final Concept:

