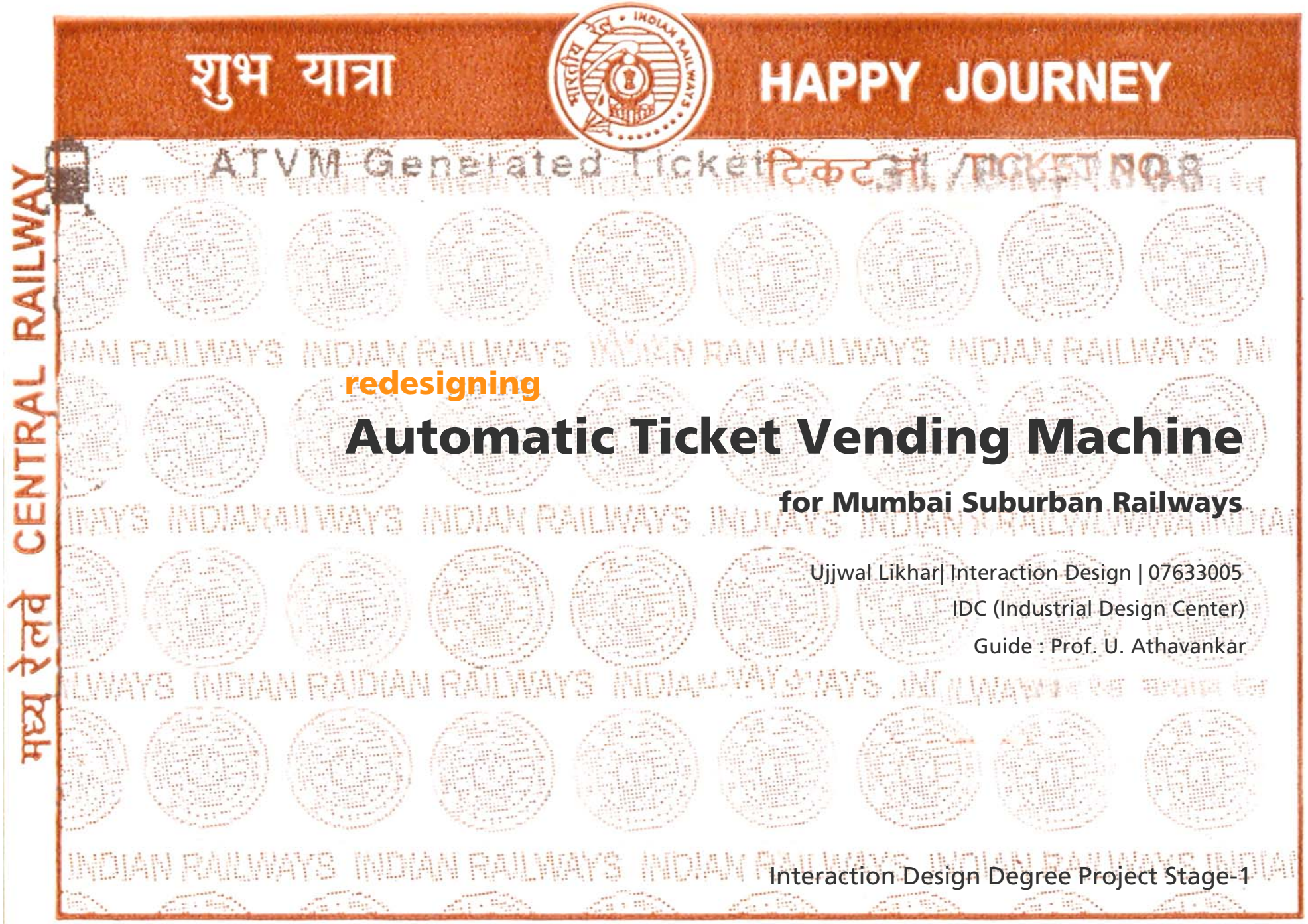

redesigning

Automatic Ticket Vending Machine

for Mumbai Suburban Railways

Ujjwal Likhar| Interaction Design | 07633005
IDC (Industrial Design Center)
Guide : Prof. U. Athavankar

Interaction Design Degree Project Stage-1

Approval sheet

AUTOMATIC TICKET VENDING MACHINE
FOR MUMBAI SUBURBAN RAILWAY GUIDE

Interaction Design Project 2

Guide - Prof. Uday Athavankar

Approved for the partial fulfillment of requirement for the degree of

Masters of Design in Interaction Design
at Industrial Design Centre,

by – Ujjwal Likhar, Roll No 07633005

Guide : _____

Chairperson : _____

Internal examiner : _____

External examiner : _____

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Extra special thanks to the enjoyable people who sit around me in my class making this time in the institute fun and worth remembering for a lifetime :)

Abstract

Redesigning Automatic Ticket Vending Machine for Mumbai Suburban Railways

Mumbai being India's commercial capital attracts migrants from all over the country. Thus Mumbai suburban railway serves people with high heterogeneity in terms of language they speak and also the literacy level.
Commuters number is increasing everyday but ticket windows are limited.
Due to these reasons queue at the ticket window is increasing day by day. Therefore to save commuters time is one of the objective of project.
Getting change for ticket is also problem for the commuters and ticket vendors.

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Motivation:

This project aims to develop a system which will help people to book ticket for Mumbai local easily. The main objective of the project is to reduce the queue at the ticket counter and thereby saving waiting time, which is the main concern for the people in large cities.
Being the cheapest and fastest means of transport more and more people are turning towards local trains. Hence commuters no. is increasing every day.
Commuters also face money change problem.
Now a day we have ATM cards, Smart cards, credit cards, etc because of which we don't have to carry much cash.
So using a smart card or per paid cards is good option for booking ticket.
In such a fast life where every single minute is important for the people it has been observed that people are experiencing longer wait times in queue at the ticket counter.

Sometimes if the queue is too long people travel without ticket and then get caught by the ticket checker and have to pay fine of Rs.250/- and sometimes for not taking the platform ticket and using the railway bridge .

Keeping all this in mind and after initial observation I thought that there is lot of scope to change the existing ticketing system which required people to stand in long queue and consumes a lot of time. Hence I decided to work on this problem and to come up with a better system for buying tickets.

Coupon validating machine

Study of Existing System

CVM coupons:

To use this machine one needs to get a booklet of coupons from the counter. These booklets cost are Rs. 30, Rs. 40 and Rs. 50. and Each booklet consists of coupons of four different denomination namely Rs. 1, Rs. 2, Rs. 3 and Rs. 5

Number of coupons in a booklet varies depending on the cost of the booklet.

To use these coupons one needs to tear the coupons to sum of the fare value and get the coupons validated against the coupon validating machine. Without validation the coupons will not be considered as a valid ticket.

Problems :

-Tearing coupon from the booklet is difficult. Sometimes it tear at the wrong place and then the coupon is of no use.

-While validating the coupon, it needs to be properly aligned with the slot in the validating machine otherwise the machine will not accept it.

GO MUMBAI card

Study of Existing System

GO MUMBAI card :

One can obtain these cards at the station near the ticket counter. These are rechargeable cards.
A user has to scan the card at the departure and arrival station in the machines. There are separate machines for first class and second class.
Advantages of using this card are its paperless and users need not worry about change for the ticket.

Disadvantages of this system are that user needs to scan the card twice and the machines are placed near the ticket counter and the user need to go to that counter area to scan.
Also if one forget to scan at the destination station then farthest destination fare will be charged.

Smart Card

Existing ATVM

Study of Existing System

Automatic Ticket Vending Machine :

An Automatic Ticket Vending Machines uses a smart card, which costs Rs.100 including Rs.50 non refundable deposit. The smart card is valid for six month from the time of the last recharge. The card can be recharged from Rs.50 to Rs.2000 in multiples of Rs.50. These smart cards can be bought at railway counter and can also be used to purchase platform tickets. A user gets a Rs.5 bonus for every Rs.100 recharge of card.

To purchase a ticket using this card user needs to place the card on the machine scanner, press the destination station and select the other options required for booking the ticket. According to the local train officials time taken to print a ticket using this card is less than a second.

Disadvantages:

- The map on the screen is confusing. It is divided into zones which is difficult to recognize by the user.
- On the zone selection screen a user tends to select the destination station and does the same on the next screen which is destination selection screen.
- There is no proper feedback.
    - Distance between card slot and ticket is large so sometime people may tend to forget the card.
- There is an unnecessary cursor on the screen which confuses the user

Normal ticket form ticket window

Study of Existing System

Normal Ticketing from ticket window :

This is the traditional method of getting a ticket. One just have to be in the queue (length of the queue varies depending on the time of the day and the station) and when turn comes then one has to tell the destination station, number of passengers, single or return to get a ticket.

Disadvantage of this system is that the queue is long and it is expected from the users that they carry exact currency change. This currency change problem becomes frustrating for the user if he or she is denied the ticket because of it after waiting for a queue for long.

Field Study:

From field study it was found that the station area is really crowded and due to long queues at the ticket window the ticketing area is divided ,so people from one side cant see the other side area.

So the placement of the route map and the machine should be such that commuters should directly see the machine.

Even proper advertisement are also required for machine like what are the benefits of using machine , how you can save time and money.

It rescues you from long queues, etc.

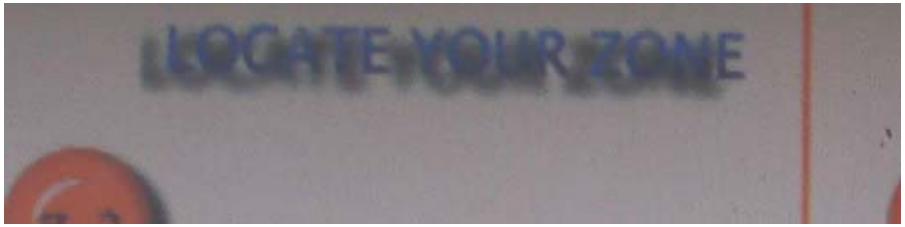
Educating people about usage of ATVM is also necessary because people still are not that comfortable booing ticket using machine, so at station we can run video explaining the complete procedure to use machine.

Direct shift from window to machine is not possible it will take some time. But educating people will definitely help.

Field study done as a part for this project brings out the following:

- Route maps are not properly positioned.
- Ticket Vending machines is not positioned appropriately and not easily visible to the users. Route maps and vending machines should be placed on location so the commuters should be able to see those directly.
- Commuters are not comfortable booking ticket using machines and they should be educated on how to use the vending machines and ATVM and its advantages like avoiding long queues.

Existing ATVM machine map



Map Study:

- LOCATE YOUR ZONE : bad readability because of shadow.

- Zones (Z1,Z2,Z3…) are unrecognizable.

- Tracks looks very complicated and chaotic .

- No bullet or marking of station on tracks because of which it feel as if there is no relation between the two.

- Stations are not properly aligned, haphazardly arranged.

- The cursor on screen is confusing.

- Because of small screen size, stations are very closely placed which gives feeling of selecting two stations by mistake.

- Small font size therefore low clarity.

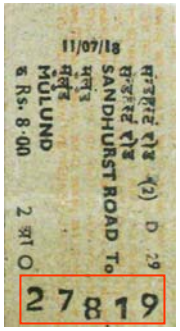
- No. stations in zone are very random (like some zone has 20 station and some has 4 stations)

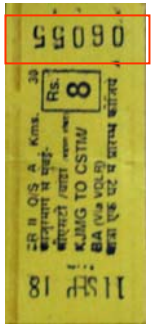
Map Study:

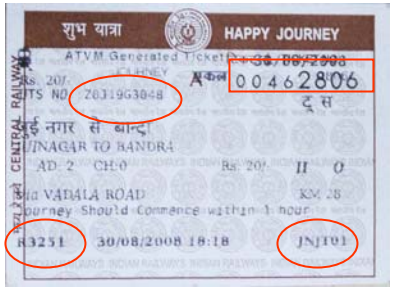
Map study is also an important issue to solve as far as the project is concerned as it will be the first thing with which commuters will interact on screen.
Maximum time of commuter is wasted in finding their destination station on map, so to save ticketing time I need to reduce the searching time.
So the map should be simple, clear, and it should help people to find their end station as fast as possible.

Mumbai route study :

The geographical map of Mumbai metro is very chaotic and finding ones destination station is very difficult, and one gets confused.
Further study of map reveled that the complete Mumbai metro route is divided into three routes (central, western and harbor). Which itself is the differentiating characteristics and can be considered while redesigning map.







Ticket Study:

Ticket study reveals that there are some information on the ticket which is not useful for the commuter.(marked on ticket images)
From commuters point of view the cost and the destination is important and from security point of view the time and date of journey and starting station is important.
To reduce printing time some fixed information which may or may not be important for user can be pre-printed

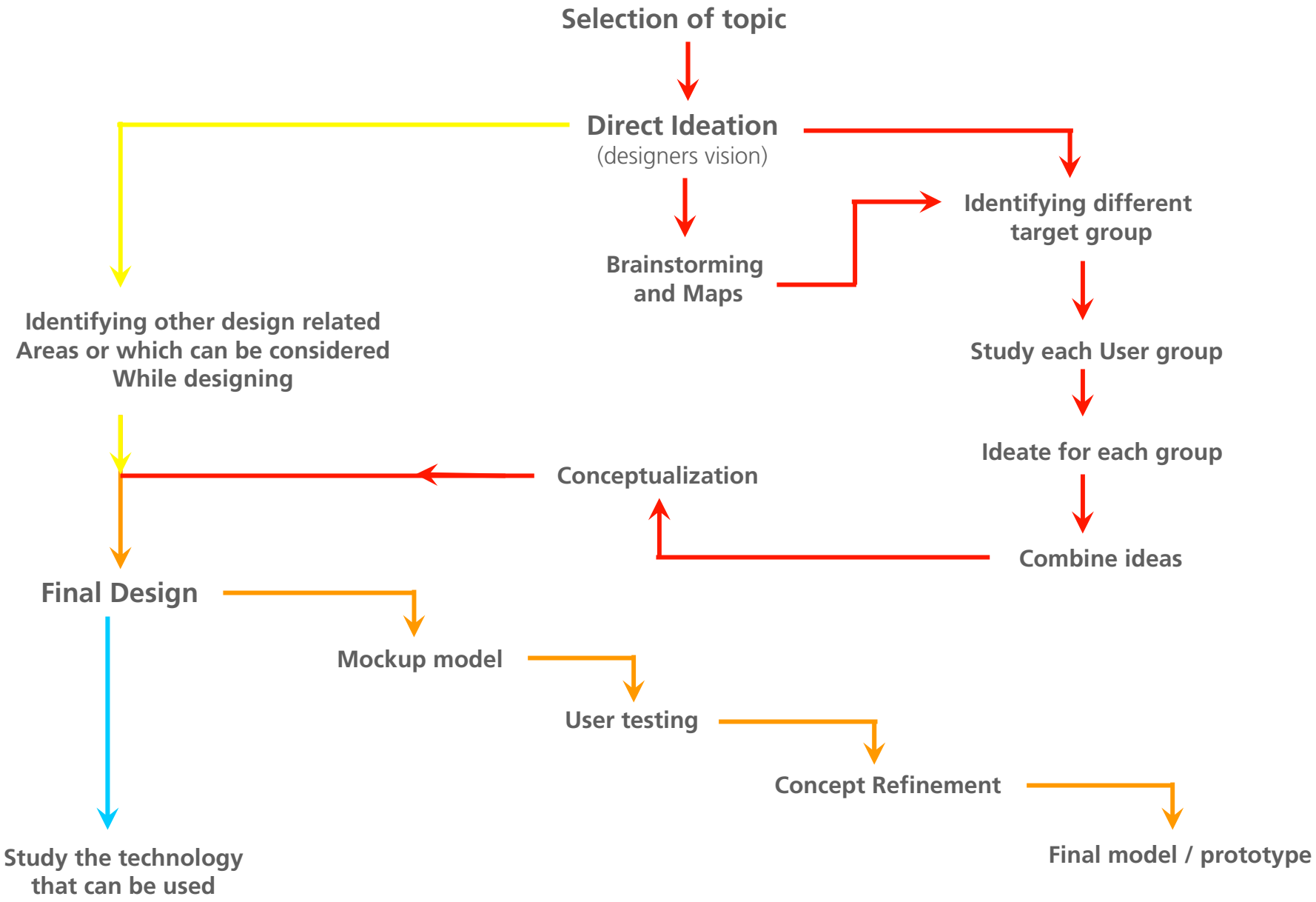
Pre- printed:

- ATVM generated ticket
- Journey should commence within 1hr.
- Central railway and western railway.
- Happy journey
- railway logo.
- logo printed all over the ticket area as back ground.

Problems:

- Date printed twice on ticket.
- Printing over problem.
- readability problem because of pre printed background.

Design Process and Methodology

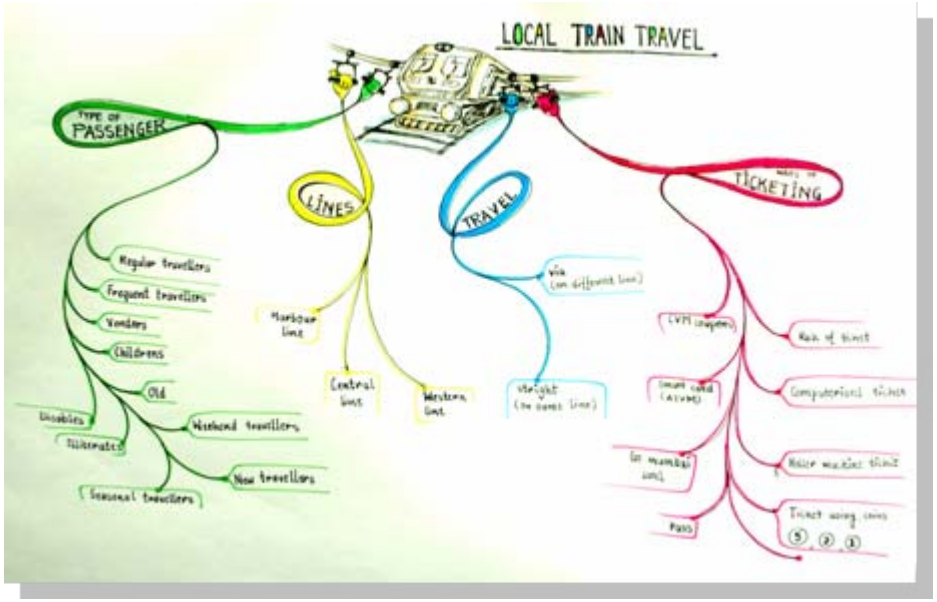


Design brief:

As per my observations what problem people face with the existing ATVM is to interact with the map and to finding their destination station.
Bad quality touch screen (have to press 2-3 times for single press option) makes the interaction difficult ,repetitive, irritating and frustrating for user.
As the no. of screen increases the time to interact with it increases and thereby increases the ticketing time.
In window ticketing system commutes have to face long queue and money change problems.
current systems uses route map for booking directly or indirectly.
Advantage of using map on screen is that it can become dynamic and multiple languages can be used ,which can help people who don't know English.
Larger size map is used so commuters with eye sight problem (specially elderly) or spectacles can operate machine with ease.
If some stations have landmarks or monuments (like Siddhivinayak temple in dadar) then it can help commuter searching station. Or people can find their station with reference to that station may be by counting no. of station above or below.
Map on the screen can be duplicated and printed (bigger size) and can be put up above the machine to maintain consistency
So people standing in queue can locate their destination station while they are standing in queue, which can reduce the searching station time on the map on the machine.
So I will take all these problems as my design challenge and try to solve maximum in my design.

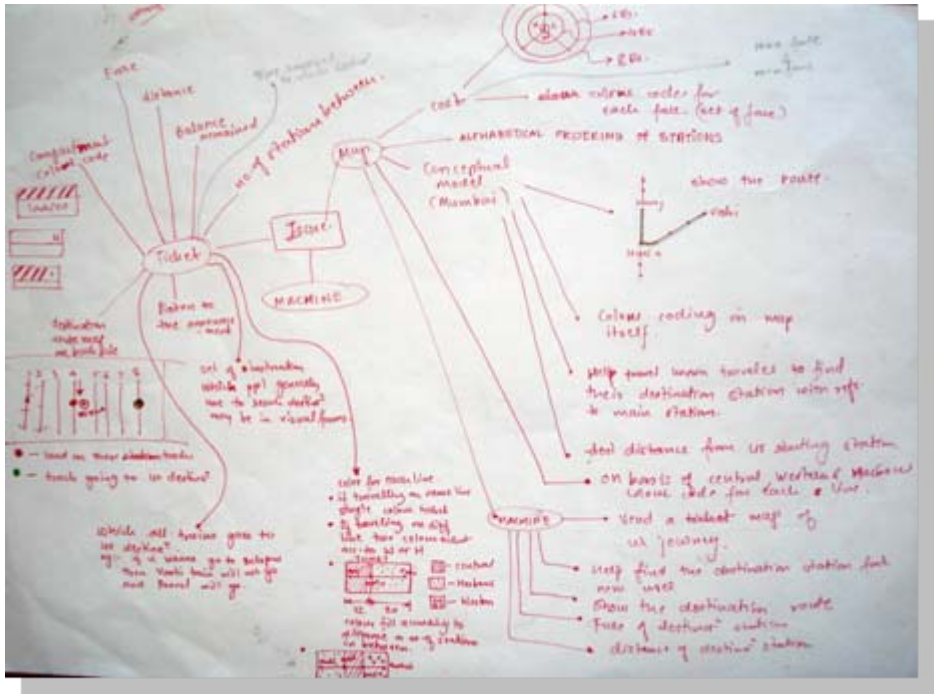
Problem definition:
The project aim to provide easy and fast ticketing to familiar /unfamiliar , multilingual and handicap commuters.

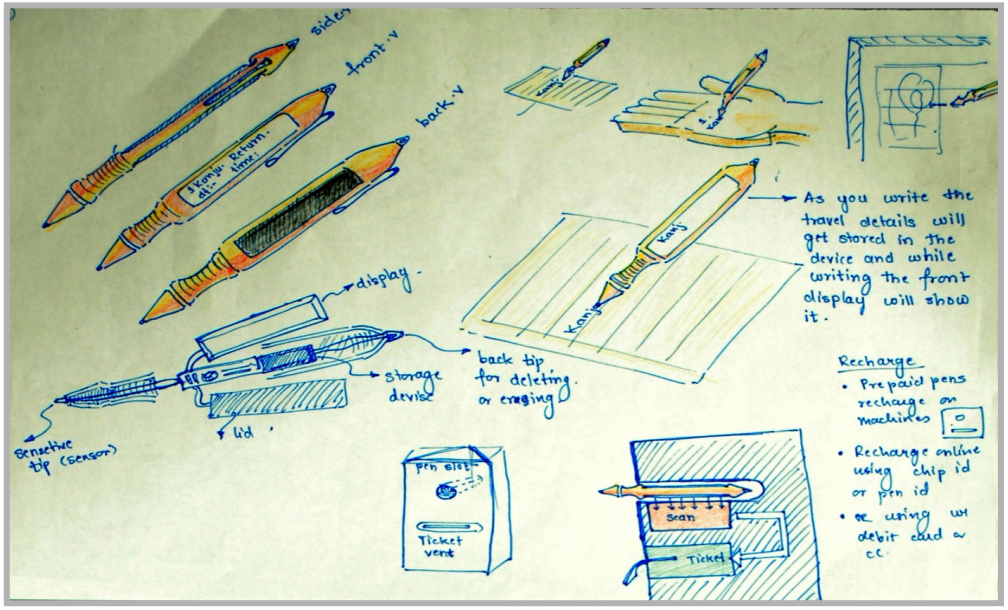
Mind Maps:



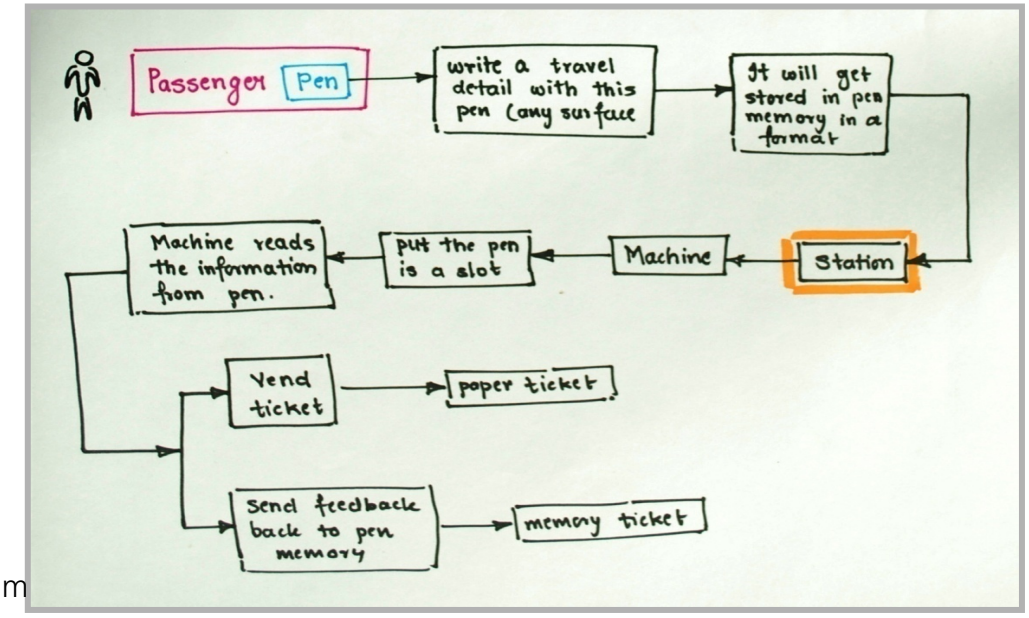
This mind map lists out the different kind of passengers travel through local trains, different routes (central, western and harbor) in which the complete suburban railways is divided, kind of travel and various ways of ticketing.

In this map issues related to ticket, map and machine are discussed and quick ideation on solving those problem.
In ticket what different information can be added, similarly whether maps could help in any way and how machine can help out commuters is discussed.





Design Idea



Flow diagram

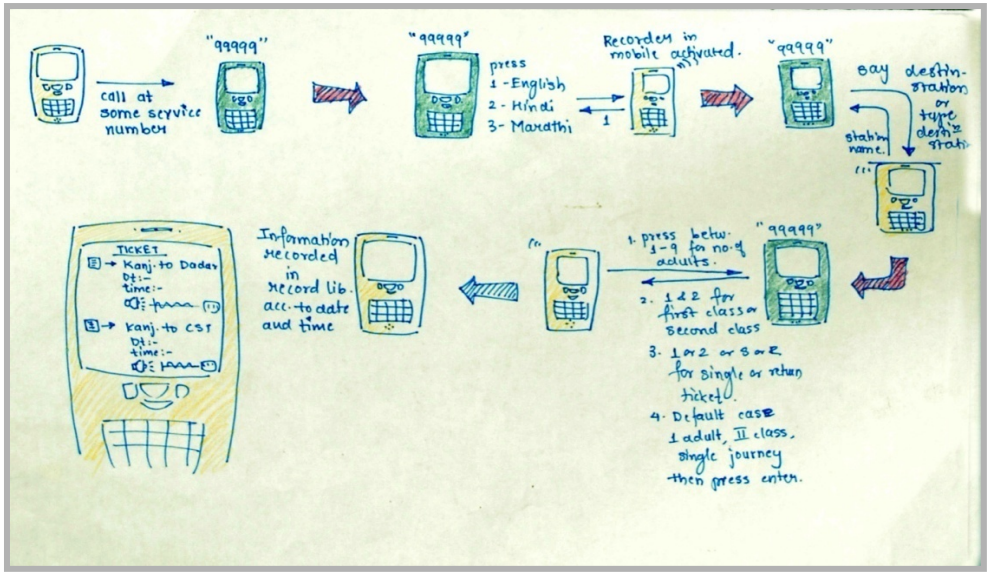
Design idea 1 :

Write n book

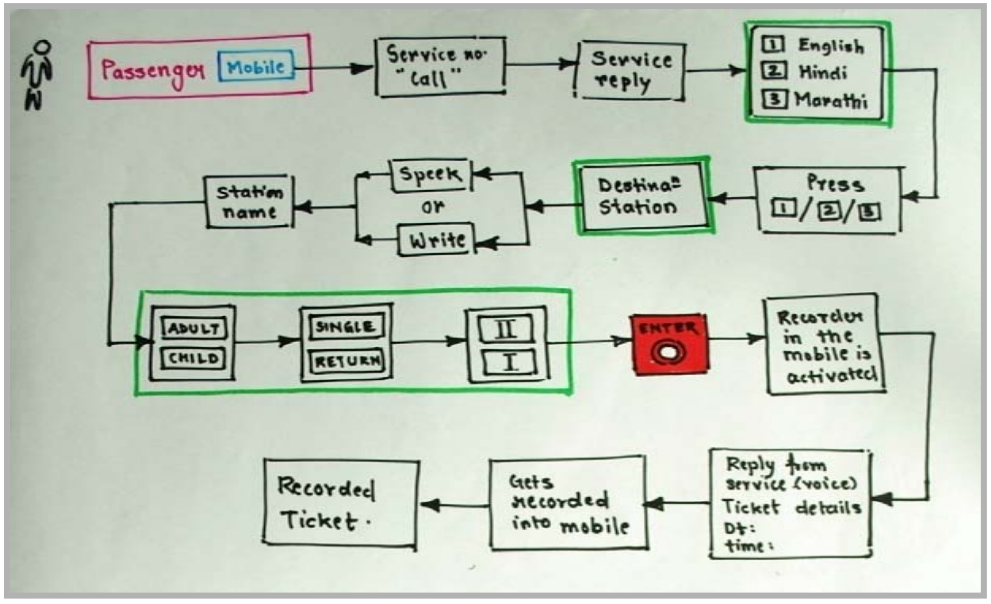
This design idea comprised of a high tech pen which can store whatever is scribbled by it. A user will have to write the details of their travel which gets stored in a memory of pen. Pen will have a display which shows the travel detail.

At the station there will be a device which can read or scan the information from the user pen and vend a ticket or store ticket in the pen itself.

Design Idea



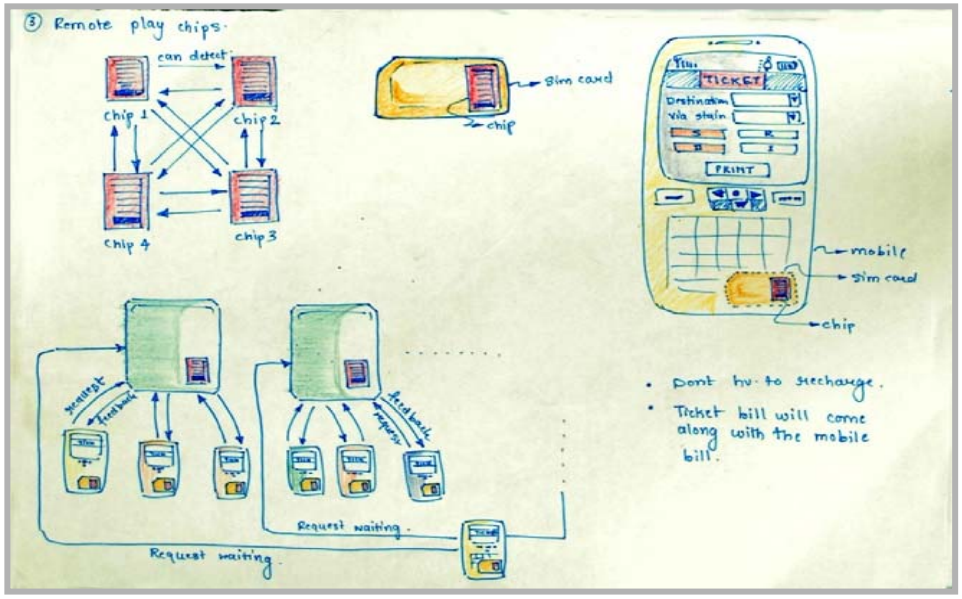
Flow diagram



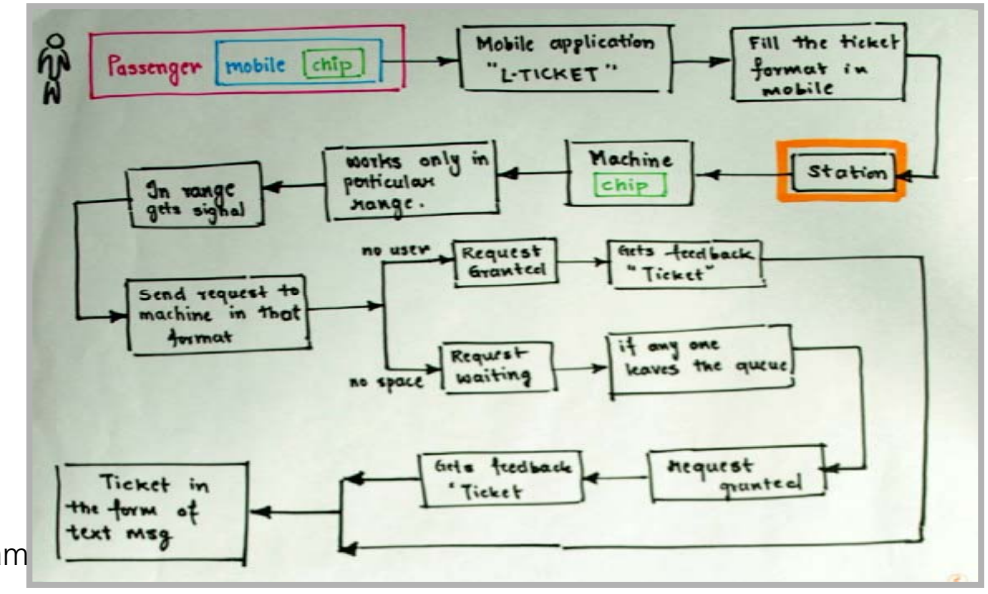
Design idea 2 :

Mobile ticketing

Call your service for local ticket , reply from service to select the language by pressing 1,2 or 3. then it will ask for the destination station, and other information required for ticketing. The ticket will be in the form of recording which will get activated automatically when service speaks your ticket.



Design Idea

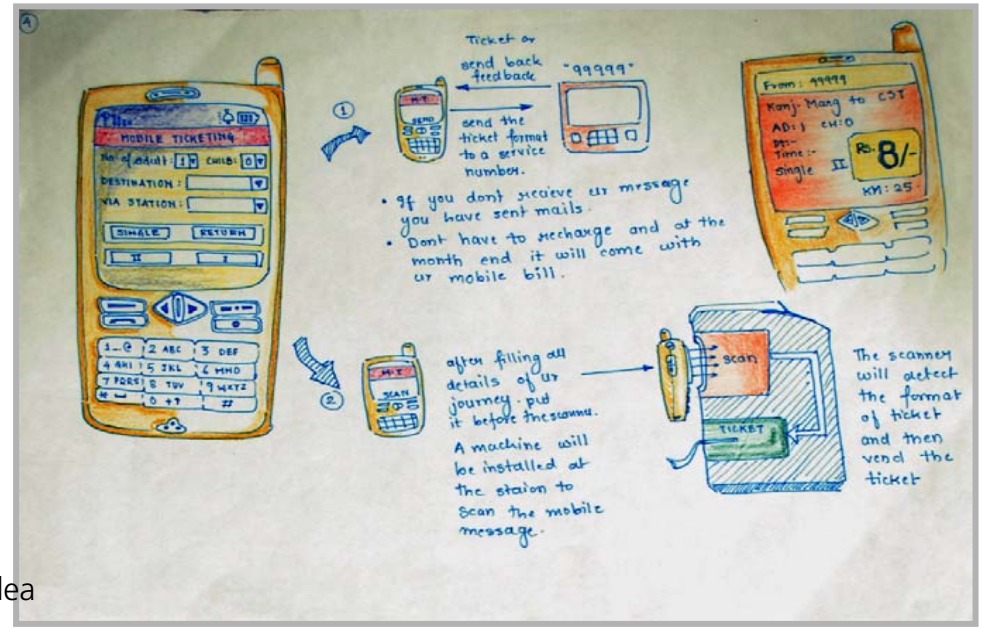


Flow diagram

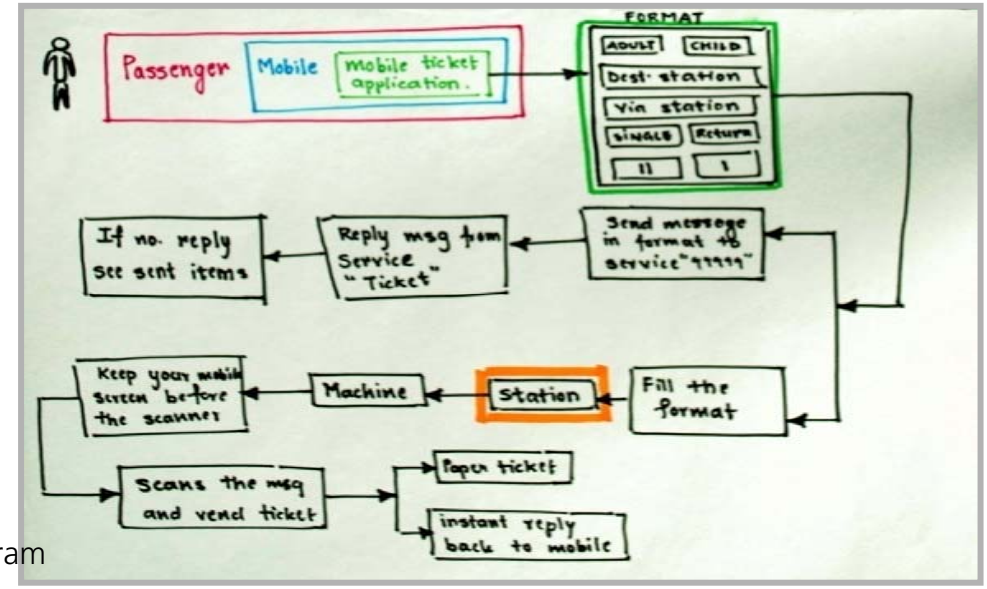
Design idea 3 :

Mobile ticketing

This idea is based on small memory transmitter chips called RFID's, which will be integrated with the cell phones. A user will enter his travel details using cell phone (entering codes for station) and those details will get stored in that chip. The RFID reader will reads the details when the chip comes within the range of the reader. Each chip will have an account associated with it and the ticket fare can be deducted from that account.



Design Idea



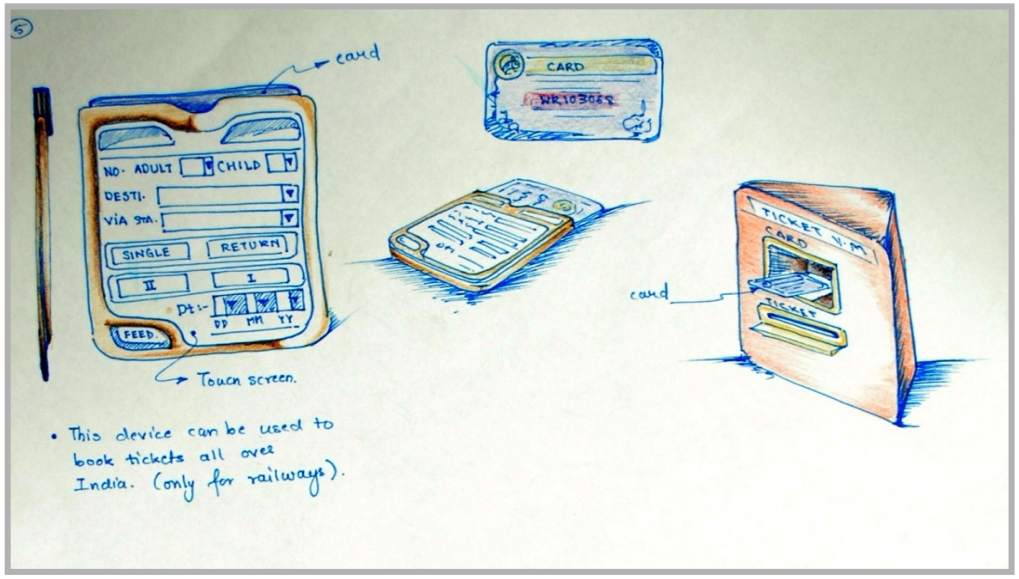
Flow diagram

Design idea 4 :

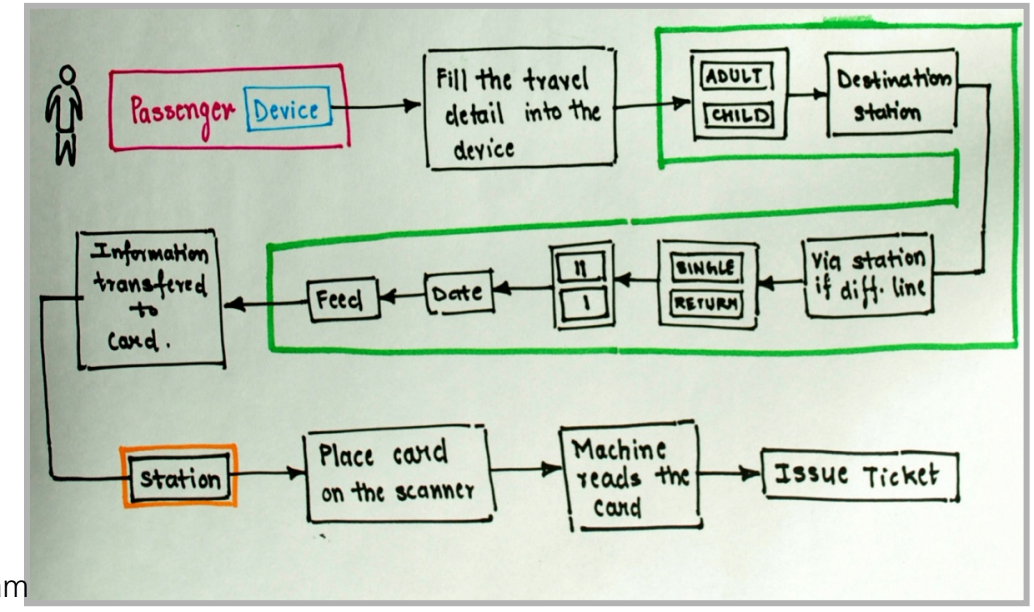
Mobile ticketing

It is based on using mobile sms service to obtain a ticket. A user will send a message with the travel details and appropriate service code to the centralized mobile service center of the station. Each mobile number will be associated with an user account. After processing the request the service center will charge to the user account and send out a confirmed sms ticket to the user.

Design Idea



Flow diagram



Design idea 5 :

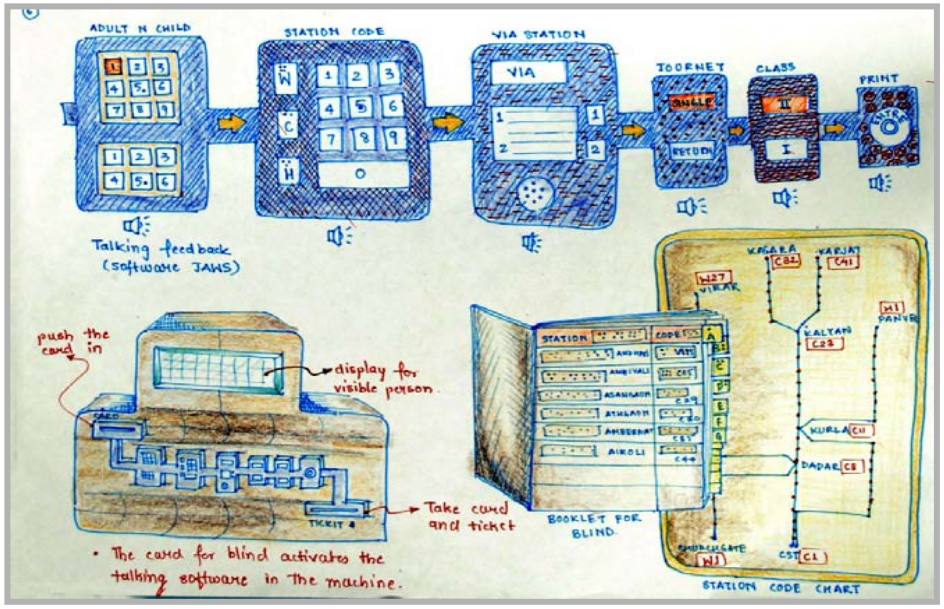
Ticketing Device

This concept make use of a card and with a associated interactive device which can read and write details in the card. A user can fill in the travel details using the device and that will get stored in the card. At the station the user will just need to put that card in the card machine and it will render a ticket to the user based on the information entered.

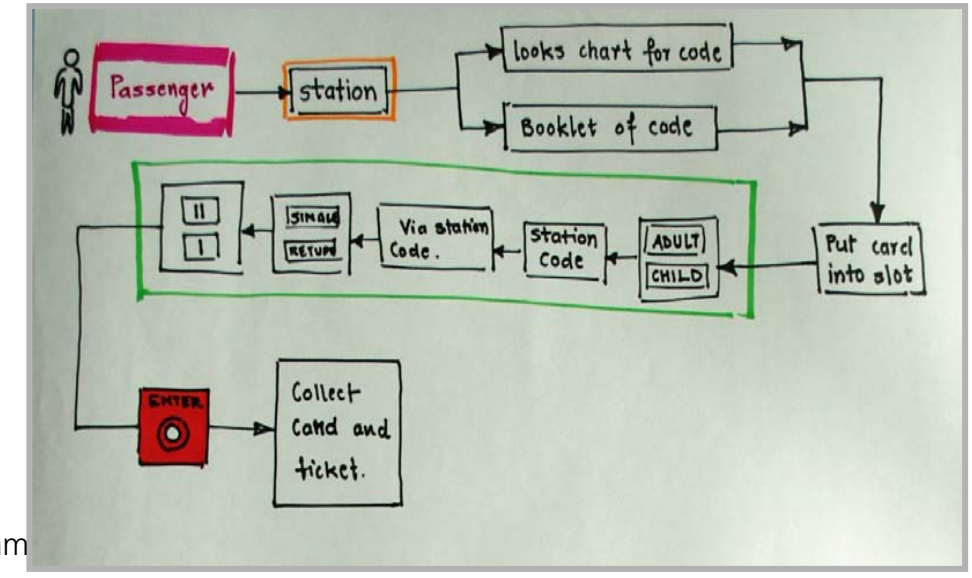
In this concept you have a device on top surface and a card inside which can be pulled out, the display will have a ticket detail format.

So when you plan to travel you just fill all information to it and it will get transferred to card and at station there will be a machine which will scan your card and vend you ticket.

Design Idea



Flow diagram



Design idea 6 :

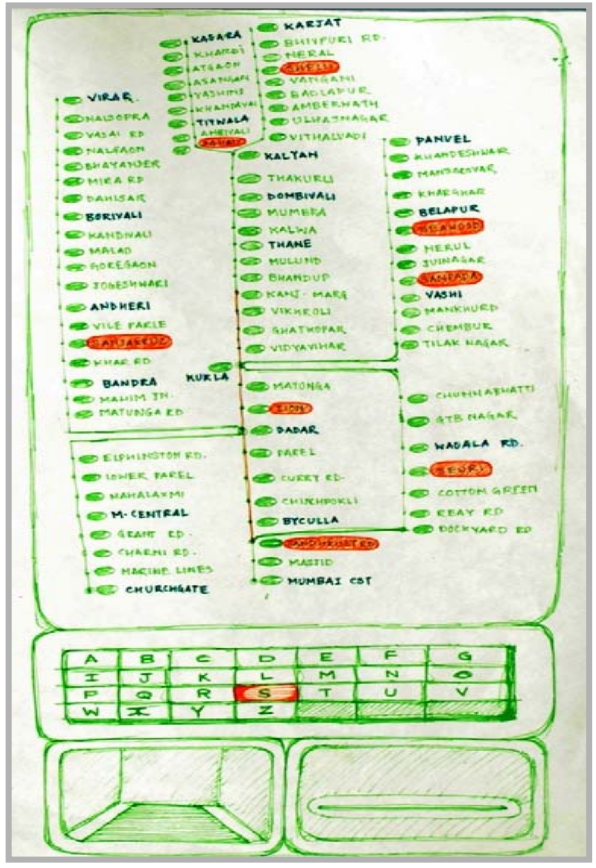
Press code and book

This idea uses voice interactive system and station code book. A user will have to enter the travel details in code in the vending machine. The code book will have the codes for the station in Braille script. With the voice interaction and Braille code book concept this idea takes care of the blind people very well.

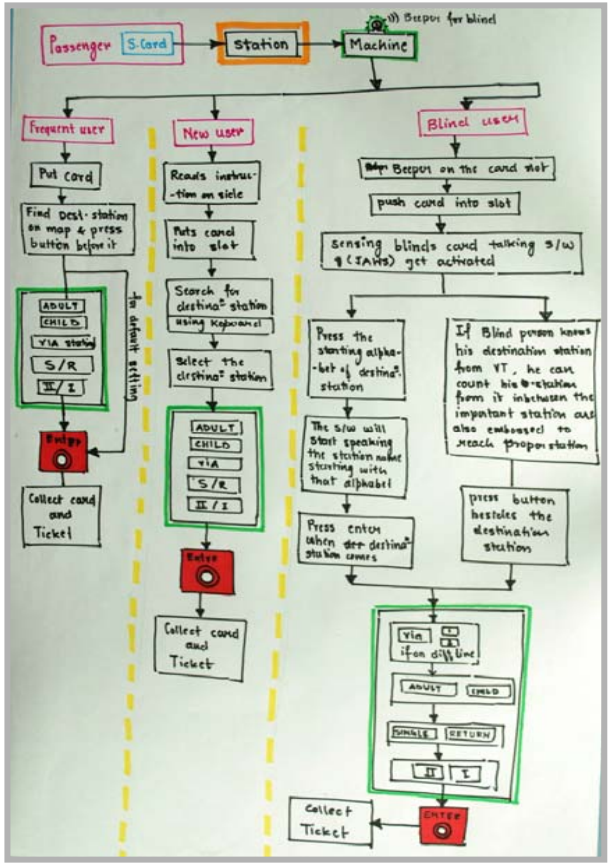
In this idea a code is given to each station. For blind there will be a code booklet in Braille script.

For booking ticket you need to press the destination station code and other travel details and press print for ticket. There will be a voice feed back for blind..

Design Idea



Flow diagram



Design idea 7 :

Smart card Ticketing

In this idea a user has to place the smart card, press button before the destination station, press the other travel details and get the ticket. Key pad will be provided for a new user for searching station. They just have to press the initial alphabet of the station and all station starting with that alphabet will start glowing and thereby reducing the searching option.

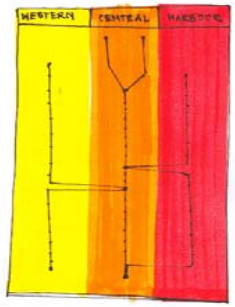
Extracted from ideation:

-In all these exploration cash payment for ticketing is avoided and pre paid cards are used

- Placing map behind the machine will help commuters save their time to search for the destination station.

- Using map on screen can solve the different language problem and maintaining consistency between map on wall and on screen will help commuters.

1.



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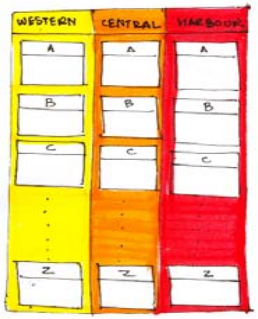

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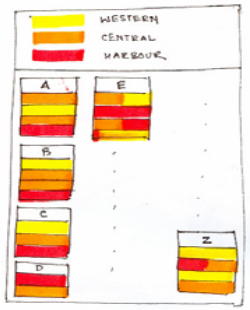

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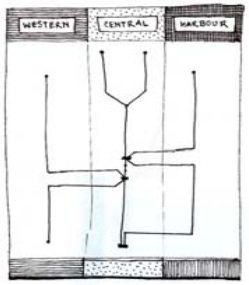

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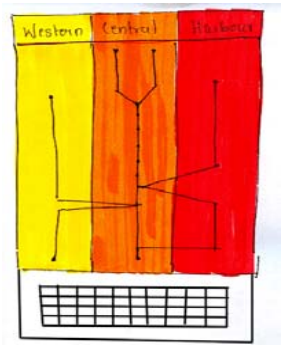
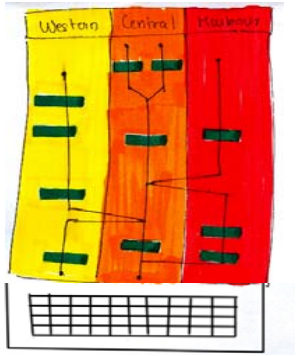




Map idea:

- In first concept each LINE or route (western, central and harbor) is painted different color. The same color code can be used for trains, tickets, etc.

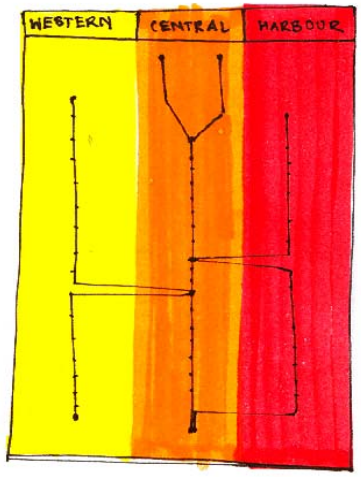
- In second concept there are different codes for each station and stations under each route are arranged in alphabetical order which makes station search easier.

- In third concept there is color code for each line, all stations are arranged in alphabetical order and then stations under the route are highlighted as per the color code of their respective route.

- In fourth concept instead of color different patterns are used for each route.

- In fifth concept an alphabetical key pad is used to search a station from map, which will be a completely dynamic map

Map



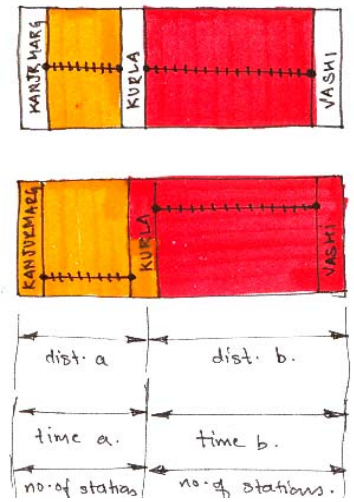
Ticket idea 1:

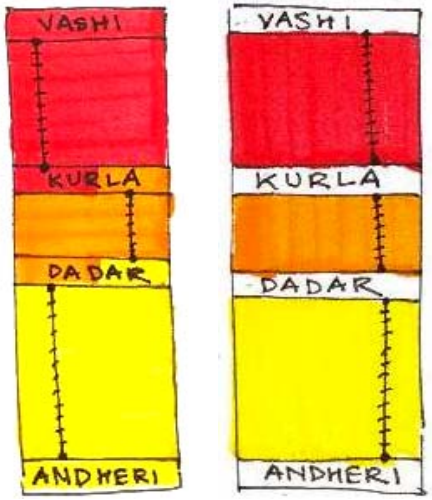
To make ticket more helpful a rough conceptual map is printed on back of ticket. In this the color given to each route is used to represent that station. Also the color magnitude may change according to distance between two stations, or time required to reach that that station or number of station in between, if user want to go to another line.

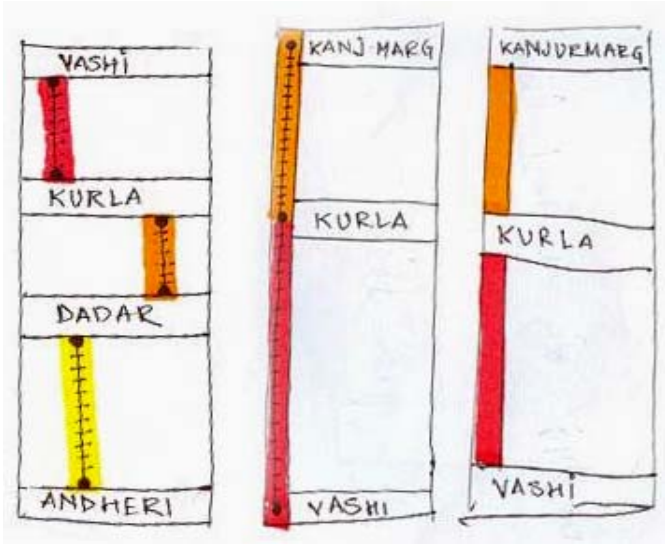
For example to show KURLA which is junction of Central and Harbor line it can be colored half with central color and half with harbor color.

Instead of coloring whole ticket a color strip can also be printed.

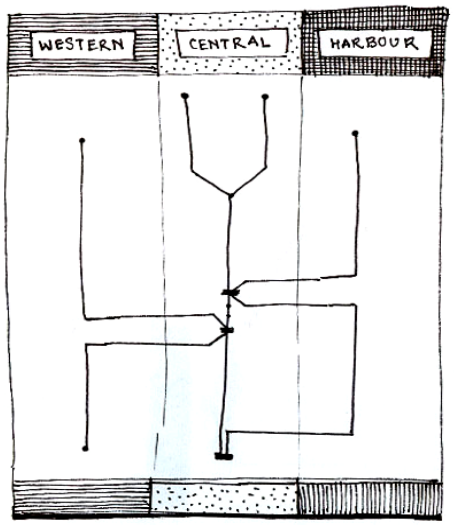
Tickets







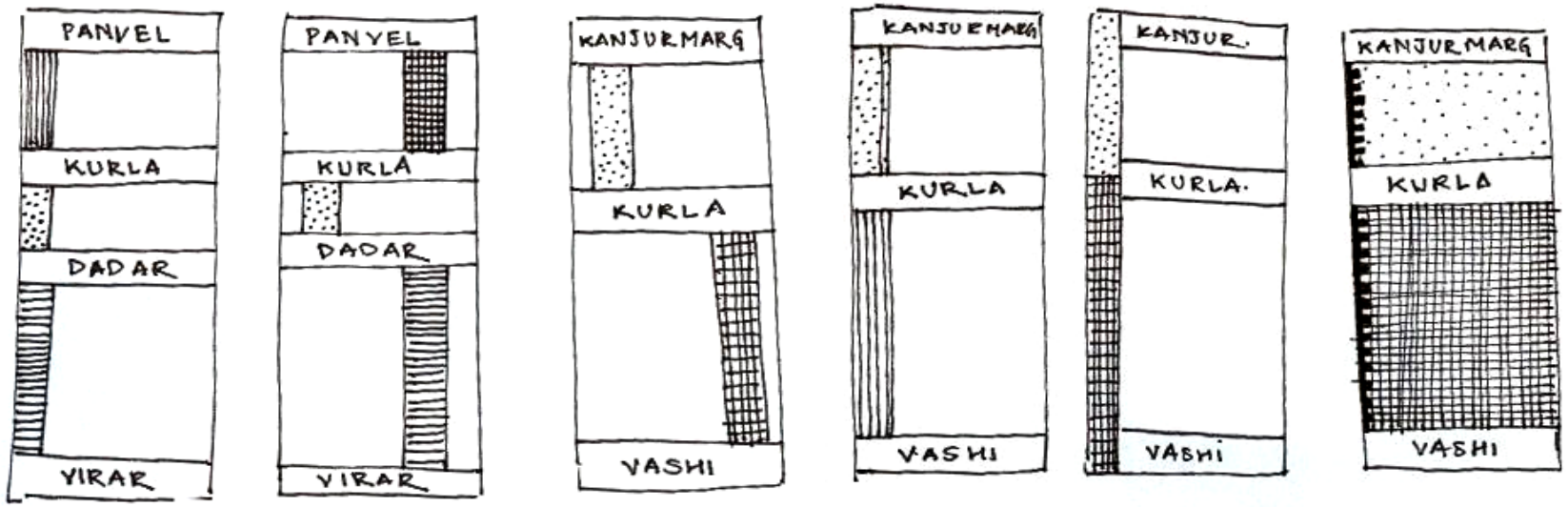
Map



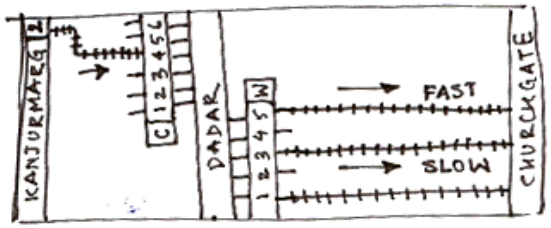
Ticket idea 2:

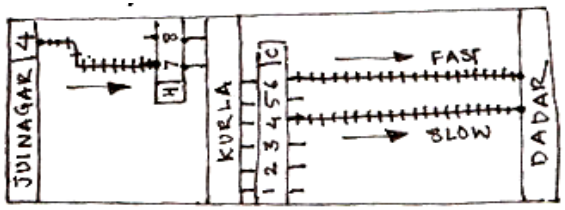
To make the same idea completely independent of color, separate pattern can be used to represent each route or line. Same pattern can be used then on the ticket to represent the station of that route or line .

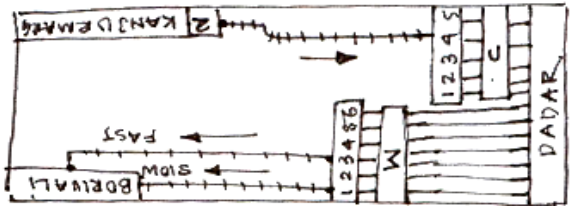
Tickets

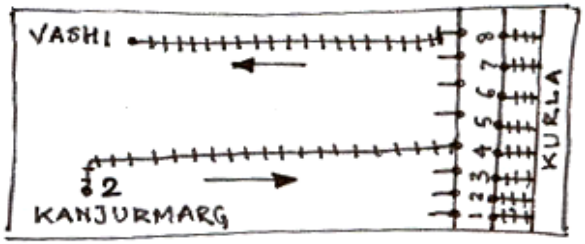


Tickets







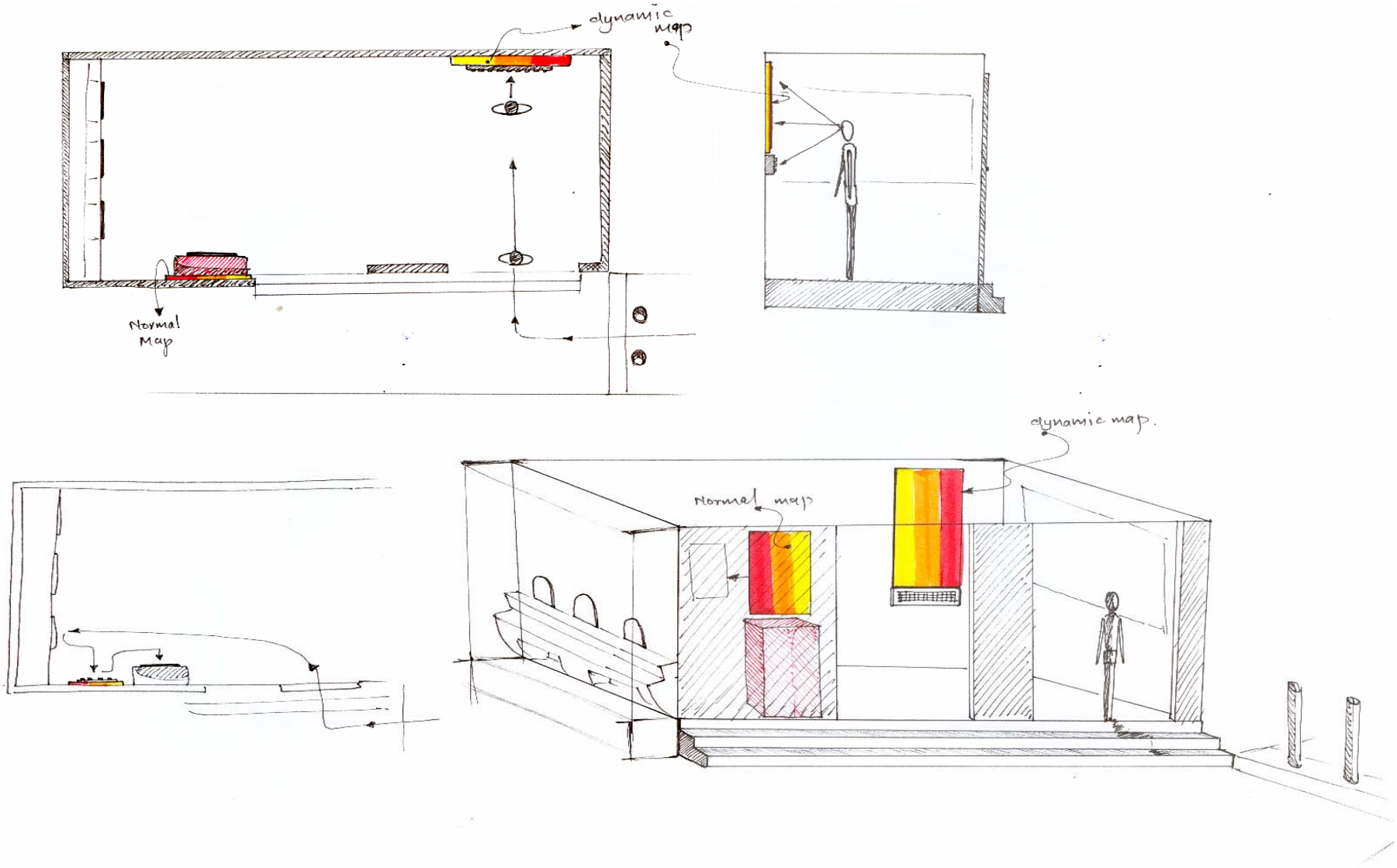


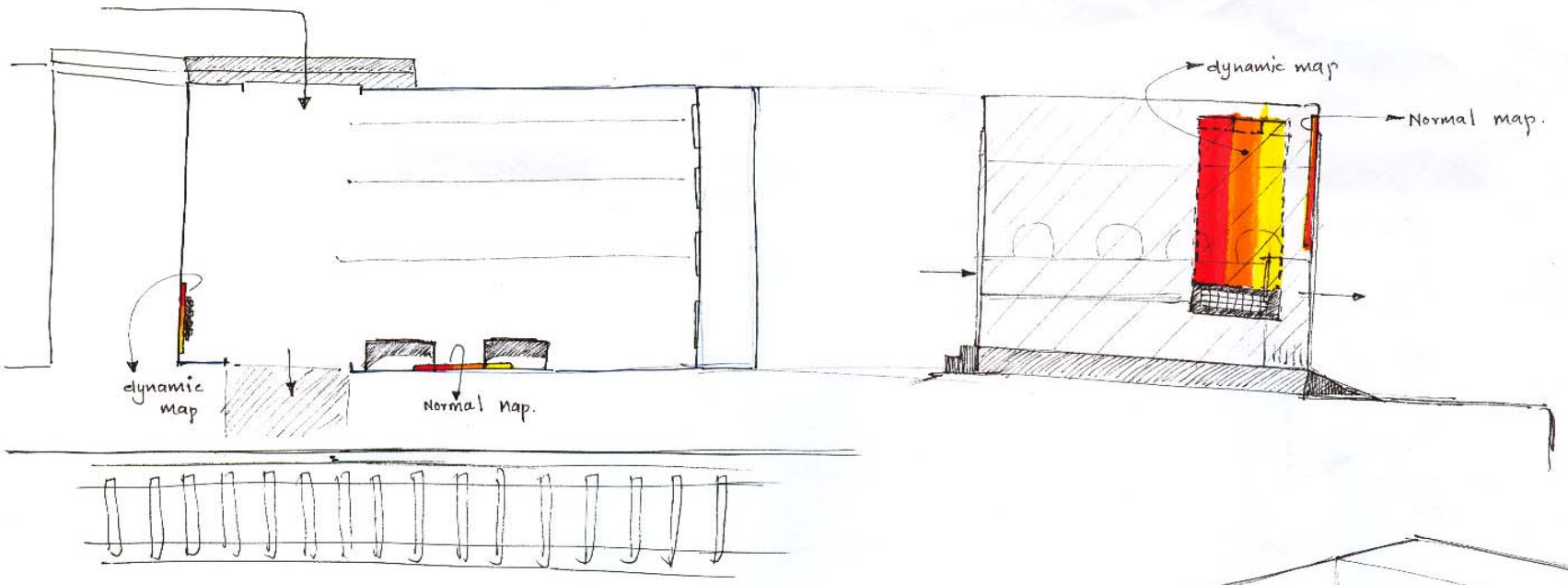
Ticket idea 3:

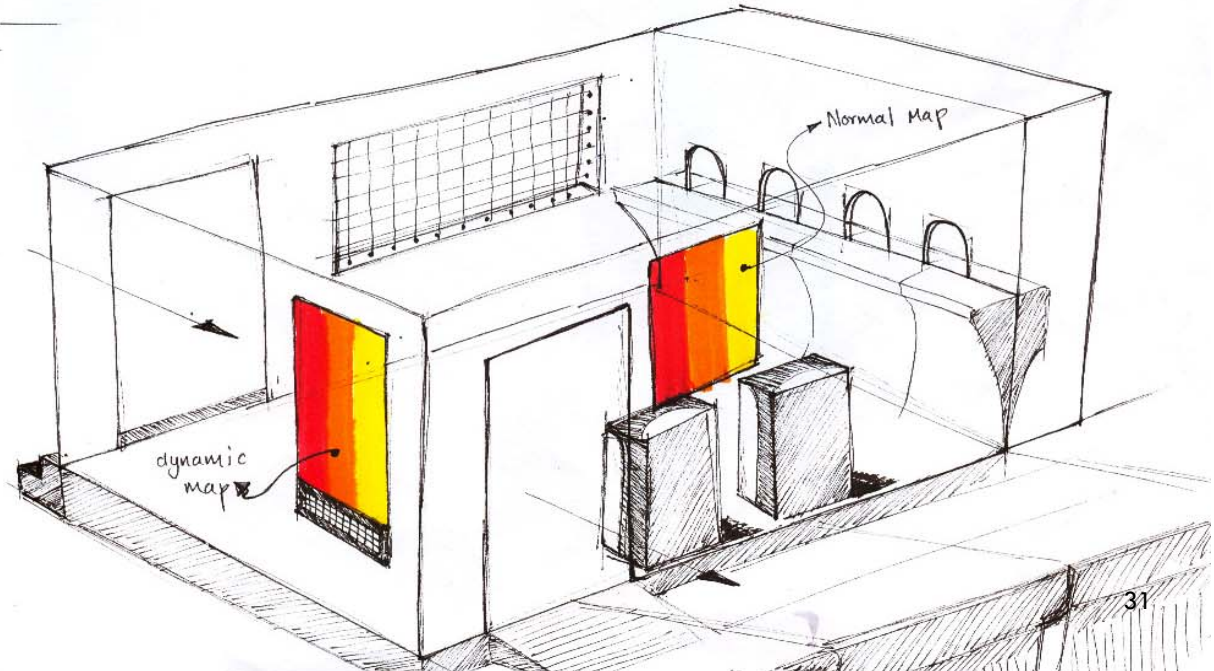
One more idea to help new people to reach their destination is to provide them a conceptual map from where they are starting their journey to the destination.

This map can show from which platform to board the train from departing station, on which platform the train will arrive at destination platform and from there from which platform to take another train if traveling to other line station

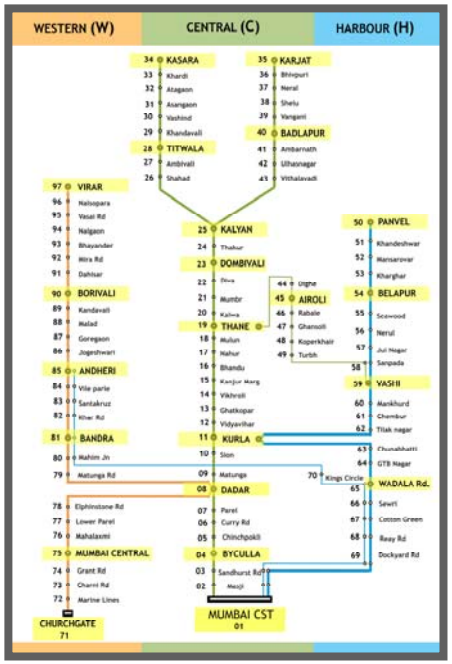
Map and machine placement on station : Kanjurmarg Station







Map and machine placement on station : Vikhroli Station



Map

Machine

Machine concepts:

To use this ticket vending machine a user needs to know the station code. User can get the station code from map.

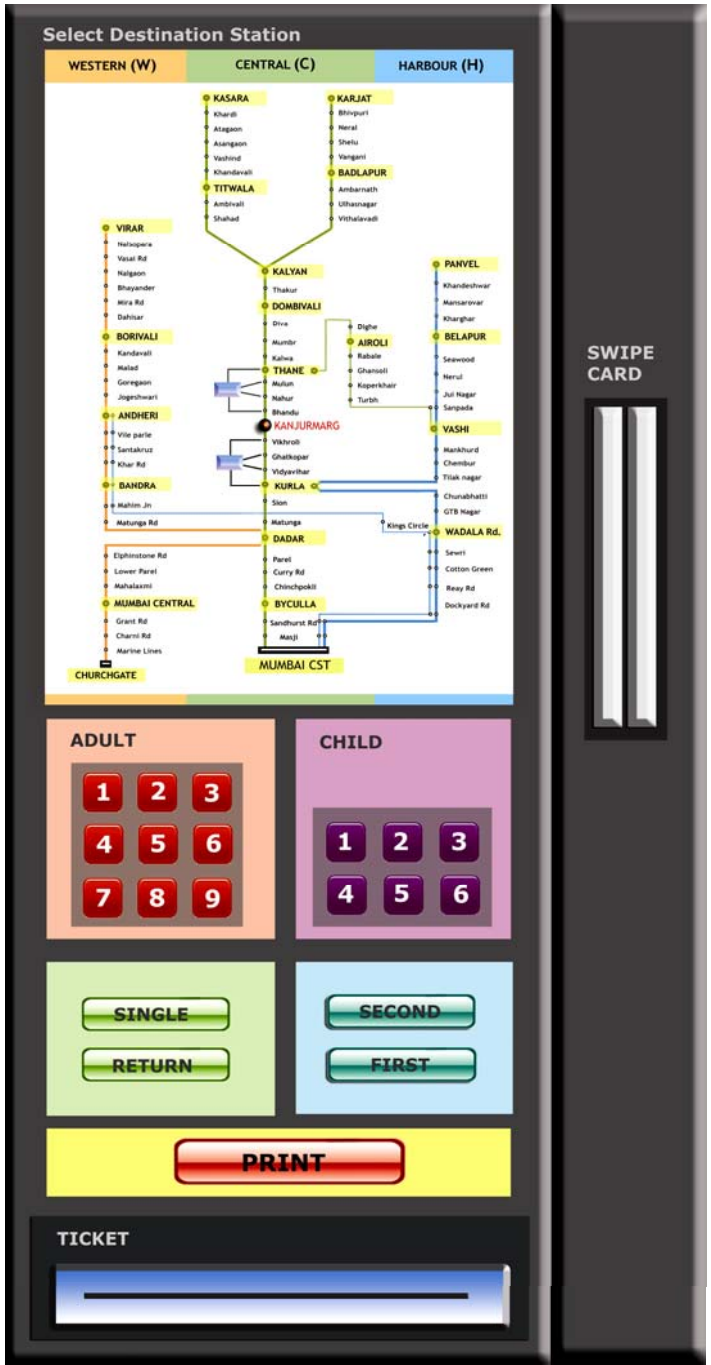
Once user have found the code of destination station he or she have to follow the five simple steps to get a ticket.

- Insert the card into the machine card slot. Press OR ENTER? the destination station code.
- Press OR ENTER no. of passengers (adult and child)
- Press journey type one way or round trip.
- Press class second or first
- Collect the ticket and the card

There is a back light behind each option which glows in sequence and guides user to follow the steps to get a ticket.

A small display above the card slot shows which option is selected by the user.

On right side there is an instruction set and on the top screen instruction video is played



Machine concepts:

On the screen of the machine a map will be displayed using which user has to select the destination station.

Steps to follow:

-Swipe the card

- Press or ENTERE? the station on screen
- Press OR ENTERE? no. of passengers (adult and child)
- Press journey type (one way or round trip)
- Press class (first or second class)
- And finally press print for ticket.

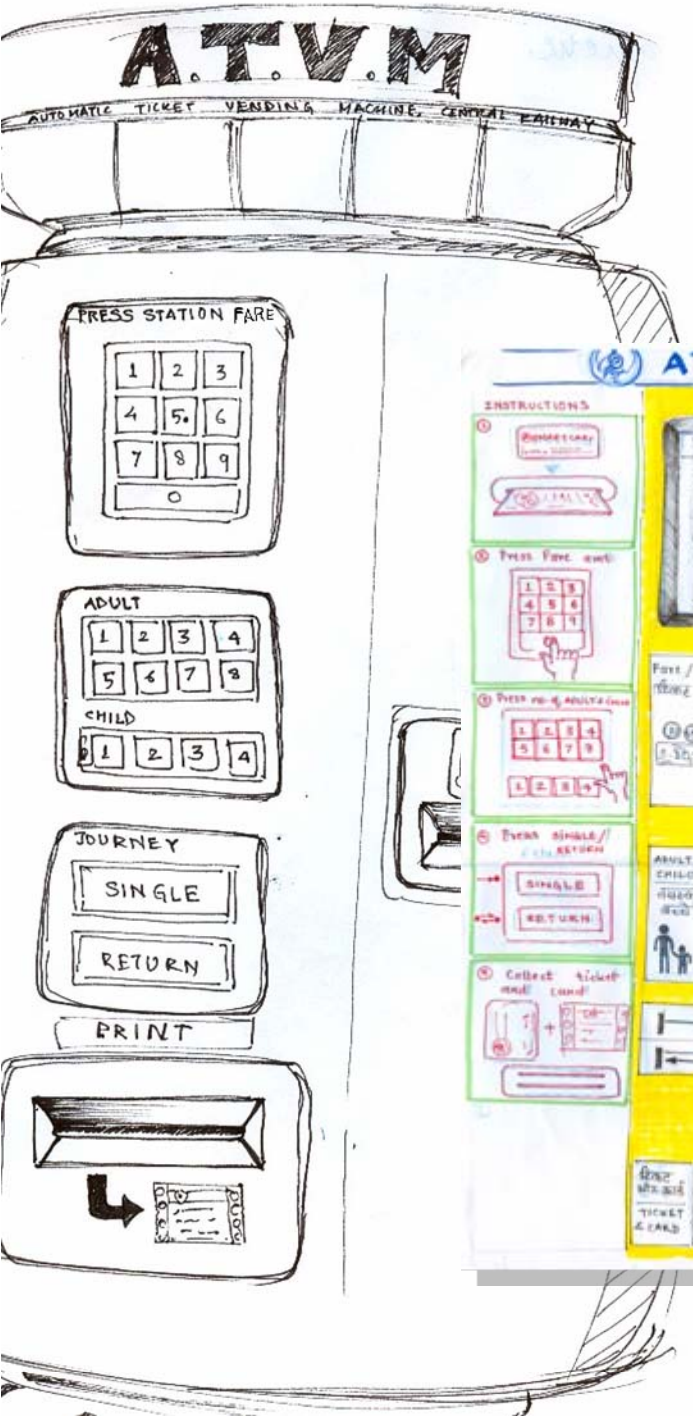
A set of default values will be provided as follows

-No. of adult (1)

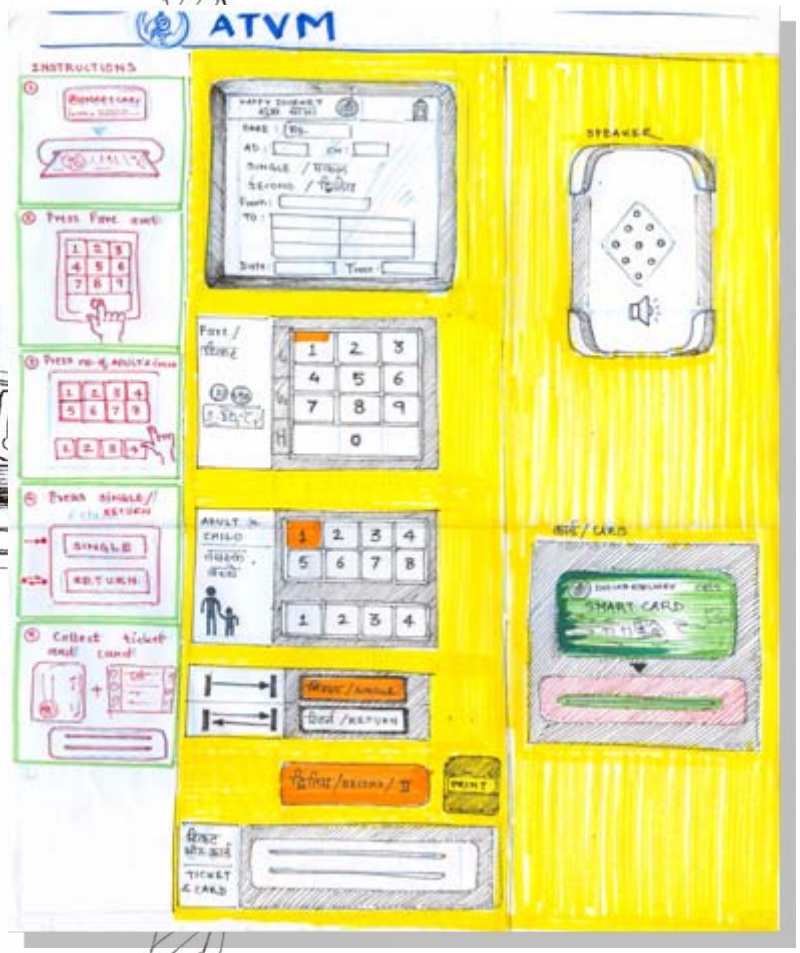
-Single

-second

If the user options fall under default values, the user will just need to press print after selecting the destination from the map.

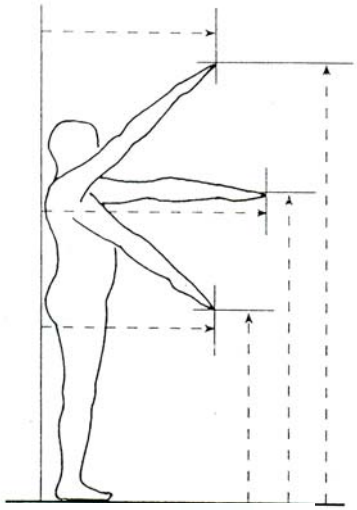


Machine



Machine concepts:

In this concept of buying ticket user should know the fare of commute. The fare can be searched from the fare chart at station.
Once the user know the fare they have to put the smart card into the slot,
Press or ENTER? the fare of destination station, press no. of passengers (adult and child) , press single or return and finally press print button for ticket.
Collect ticket and card.
The machine has a voice feedback system for blind people.
From research and observation it is found that people taking first class ticket are negligible, so this machine will vend only second class ticket.
And if the user has to travel to the other line station then the machine will charge for a ticket of minimum distance router.
Instruction set is on the left hand side.

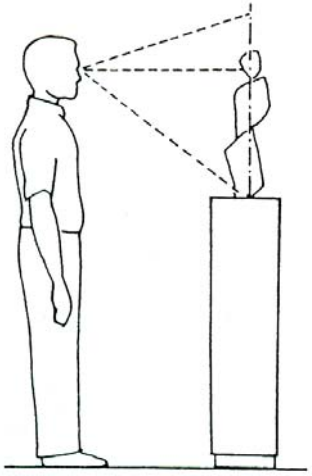


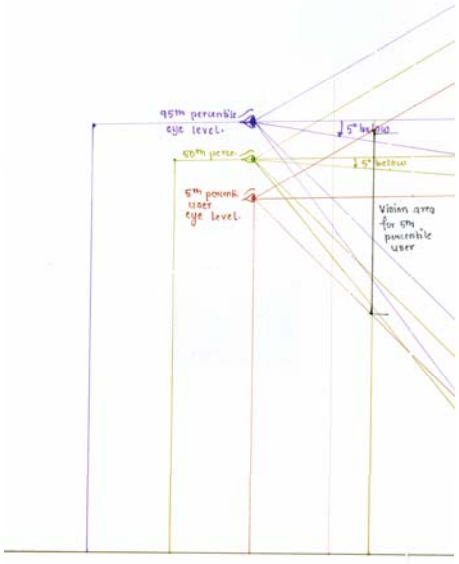
Ergonomics :

Lower position length male 5th percentile – 419mm

Lower position height 5th percentile female – 619mm

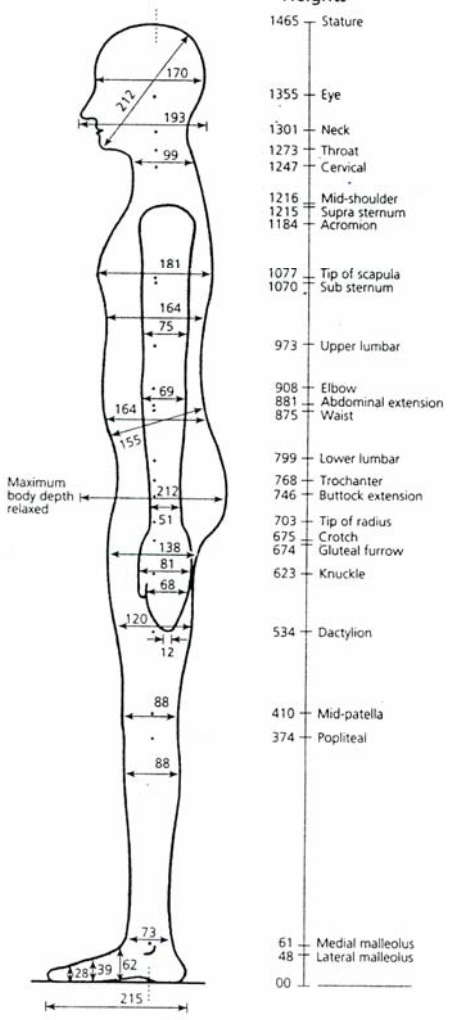
Forward mid position 5th percentile female - 619

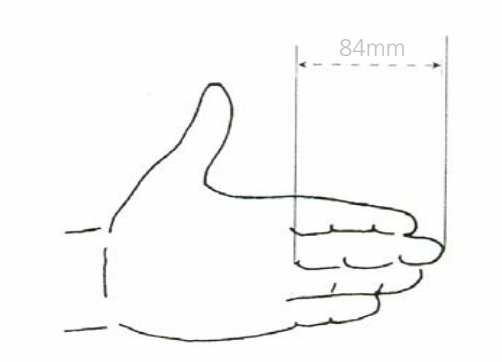




Eye level height 5th percentile user

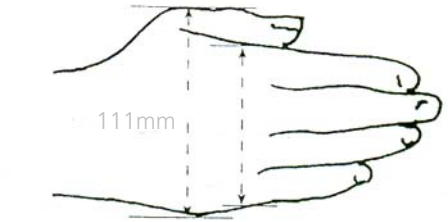
For masses 50th percentile elbow height – 1022mm



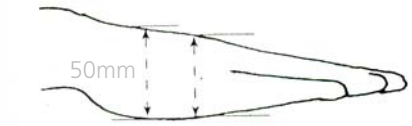


Ergonomics :

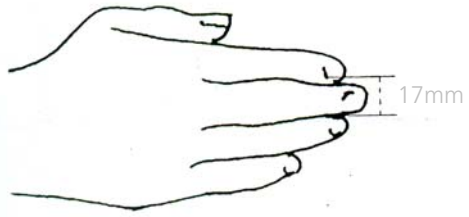
For 95th percentile user -84mm



Hand breadth with thumb for 95th percentile user - 111mm



Hand depth at thumb base for 95th percentile user - 50mm



Finger tip breadth for 95th percentile user - 17mm

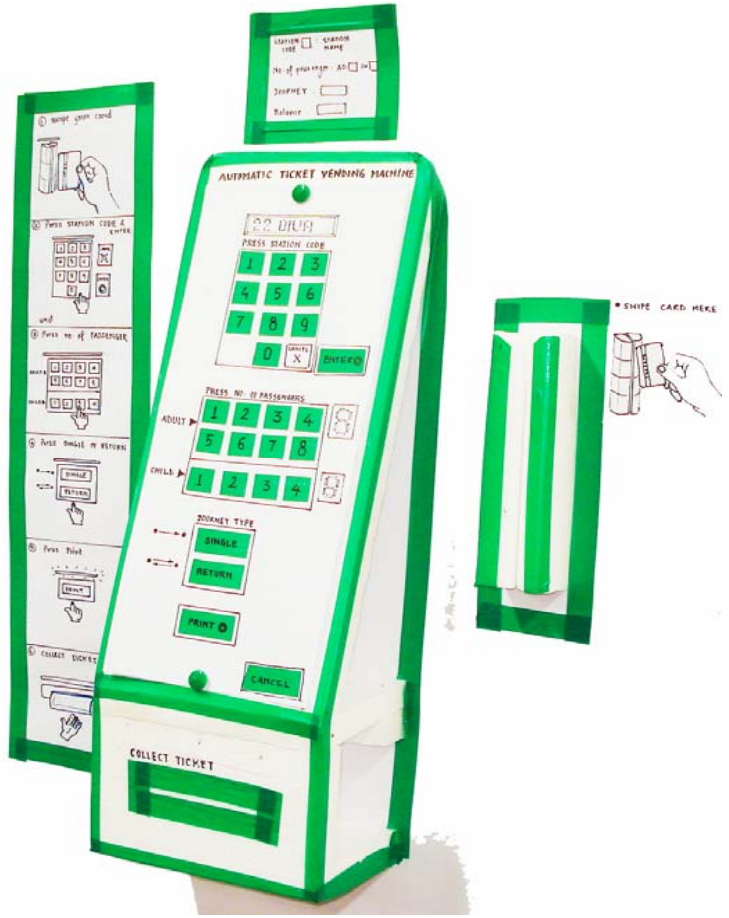
Distance between two buttons is ¼ of finger tip breadth.

95th percentile user

75th percentile user

5th percentile user

Mockup model 1: Ergonomic testing of model



Mockup model 2: Ergonomic testing of model

95th percentile user

75th percentile user

5th percentile user

FORM FINALISATION :

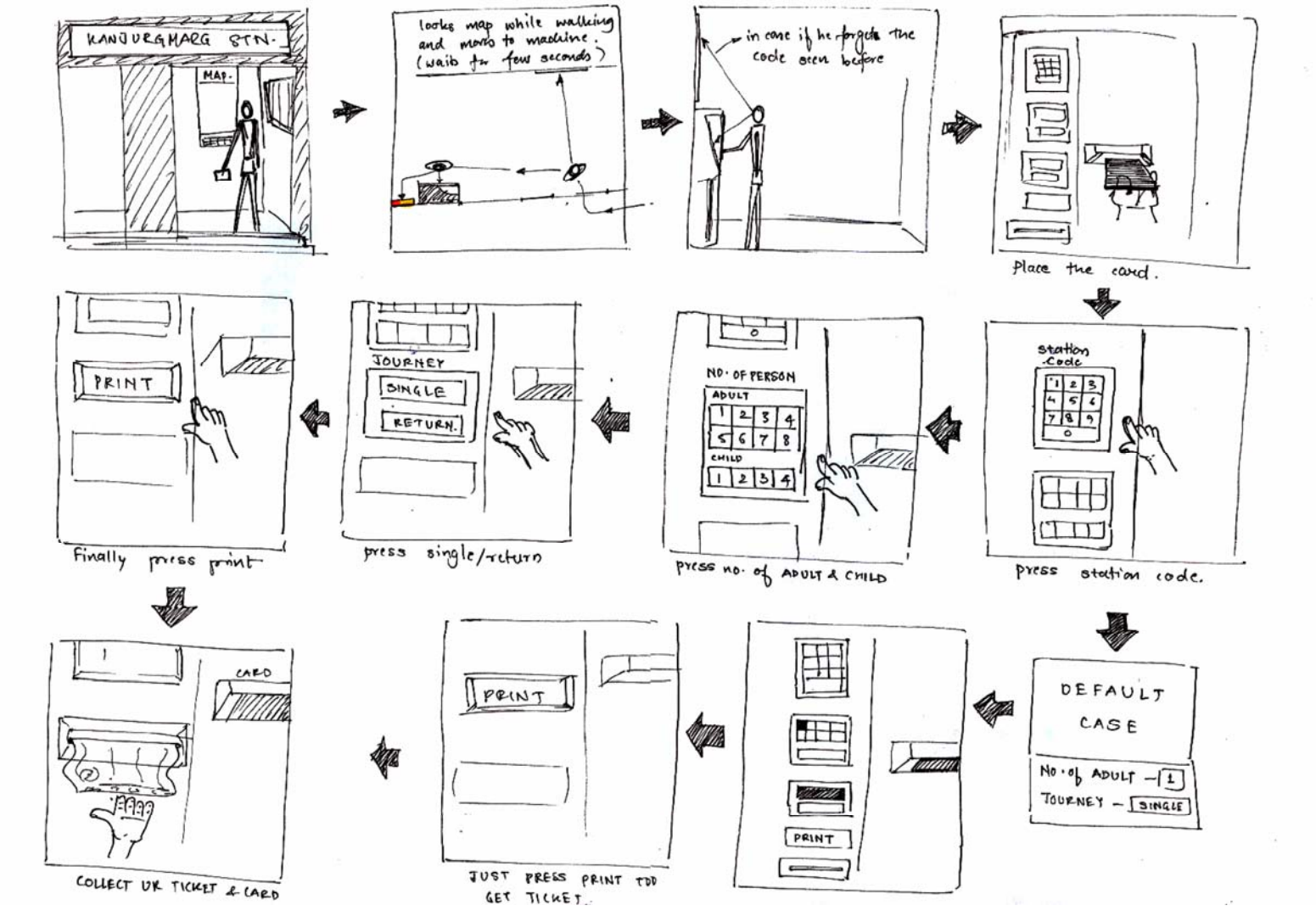
From observations and user feedback

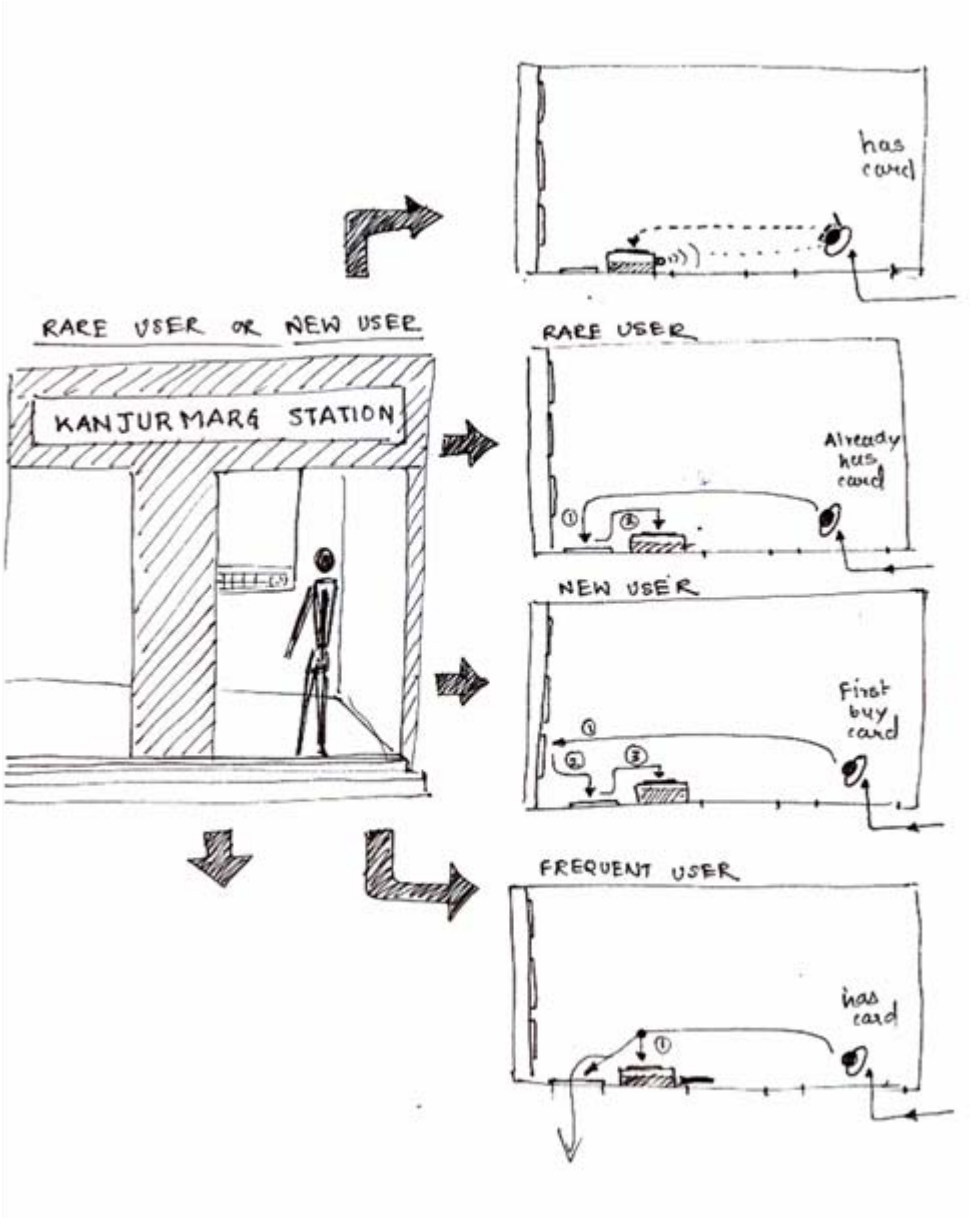
- dust problem with model 2

- user have to bent neck more than the other model which is not ergonomically good.

so model 1 is finalized.

Scenario:


KANJURGMARG STN.
MAP.
looks map while walking and moves to machine. (waits for few seconds)
in case if he forgets the code seen before
Place the card.
station code
1 2 3
4 5 6
7 8 9
0
Press station code.
NO. OF PERSON
ADULT
1 2 3 4
5 6 7 8
CHILD
1 2 3 4
Press no. of ADULT & CHILD
JOURNEY
SINGLE
RETURN.
press single/return
PRINT
Finally press print
DEFAULT CASE
No. of ADULT – 1
JOURNEY – SINGLE
PRINT
JUST PRESS PRINT TOO GET TICKET.
CARD
COLLECT UR TICKET & CARD



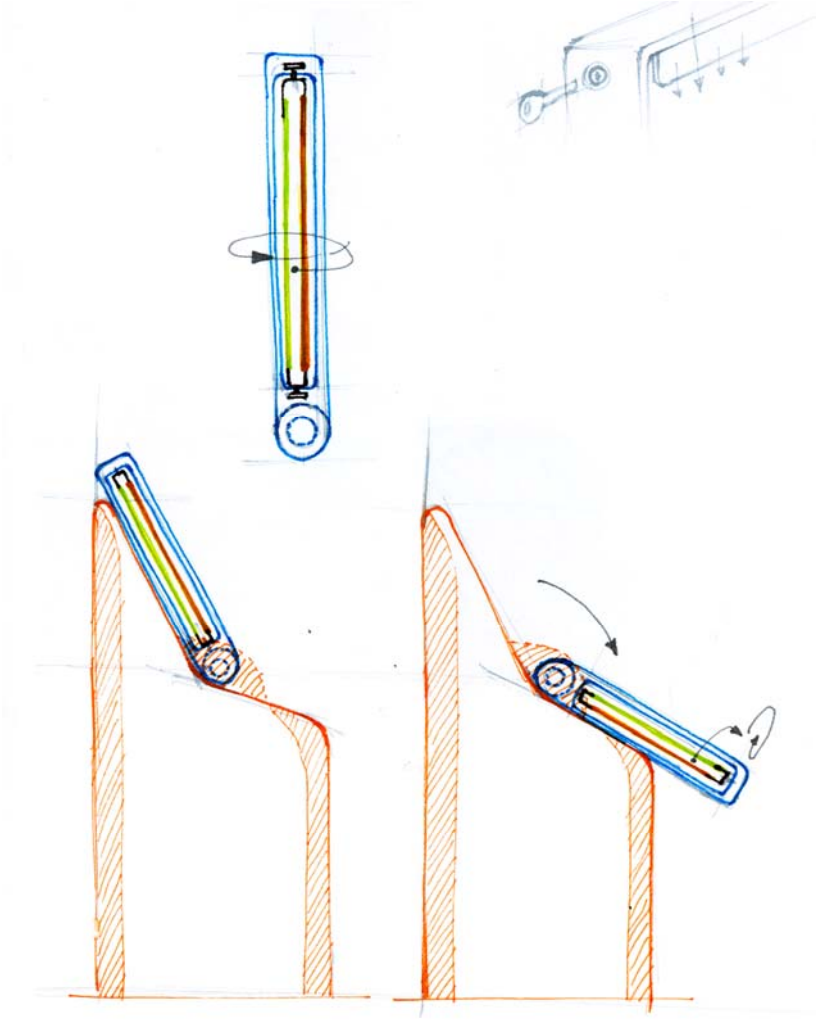
Different user cases :

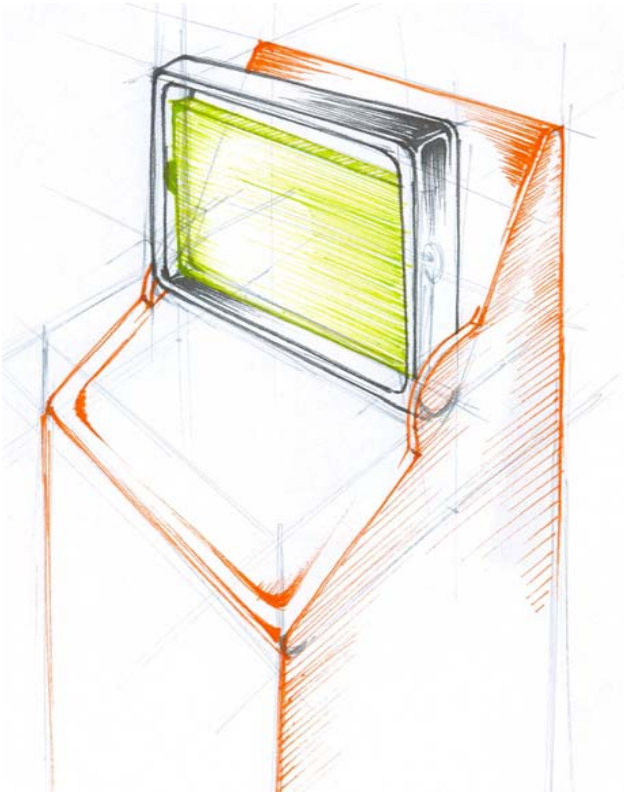
Depending upon the type of user and their comfort level with the machines the time taken by the user to obtain a ticket from the machine will also vary.

- Users who use local trains frequently will not take much time to search for the destination station, so they will not take much time to book ticket.

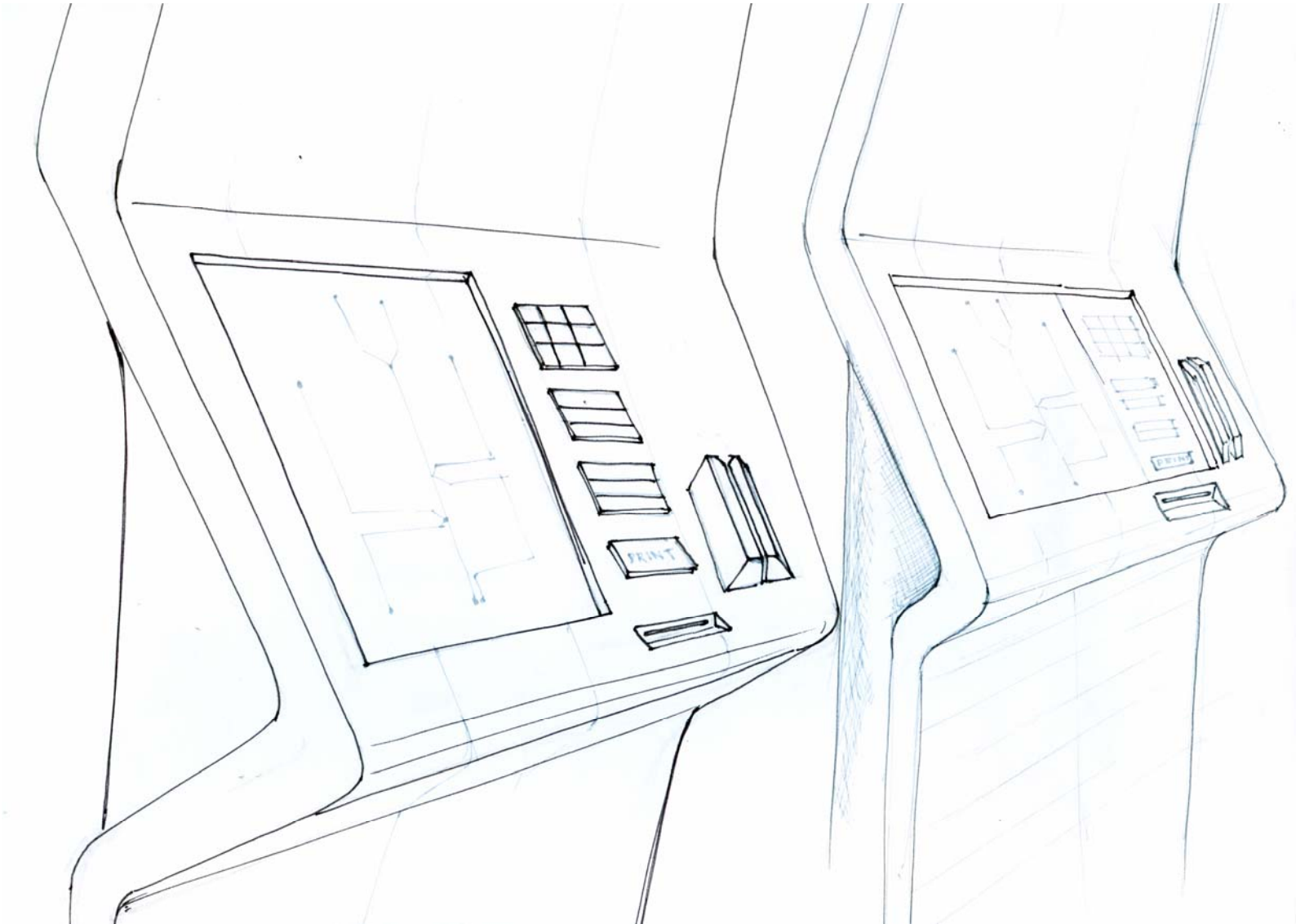
-Users who are familiar with Mumbai and who travel rarely will need some time to search for the station and book the ticket.
- Users who are not familiar with Mumbai will take more time to search the map for station, to buy a new card and to book a ticket.
- A new user will take most time to buy a ticket.
- Blind users will have a station code booklet in Braille script. For a blind user they will have a station code booklet in Braille script, and if the user is from Mumbai itself then before leaving user can see the code. On station the user will directly approach the machine and book the ticket.

Form explorations:

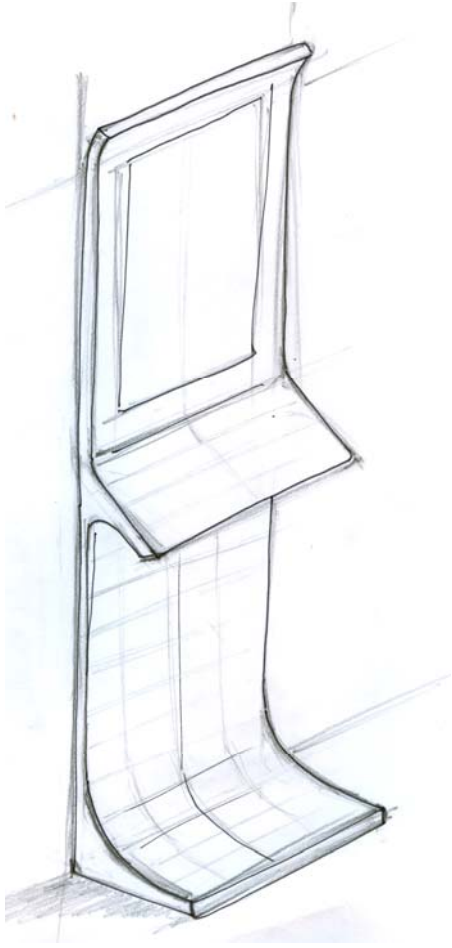


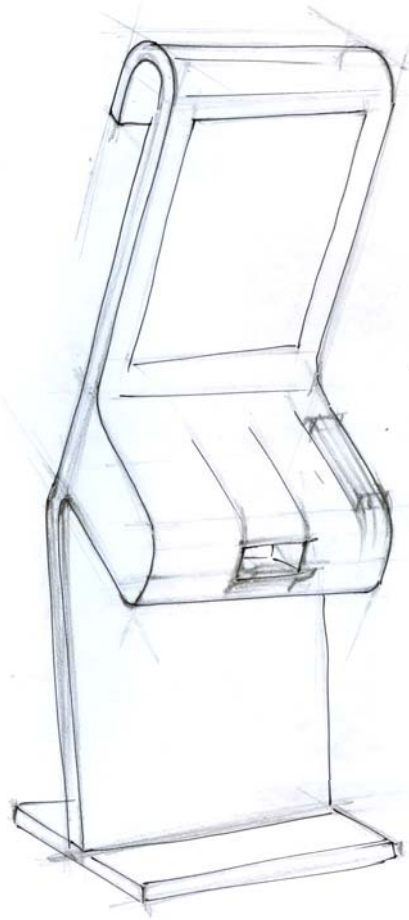


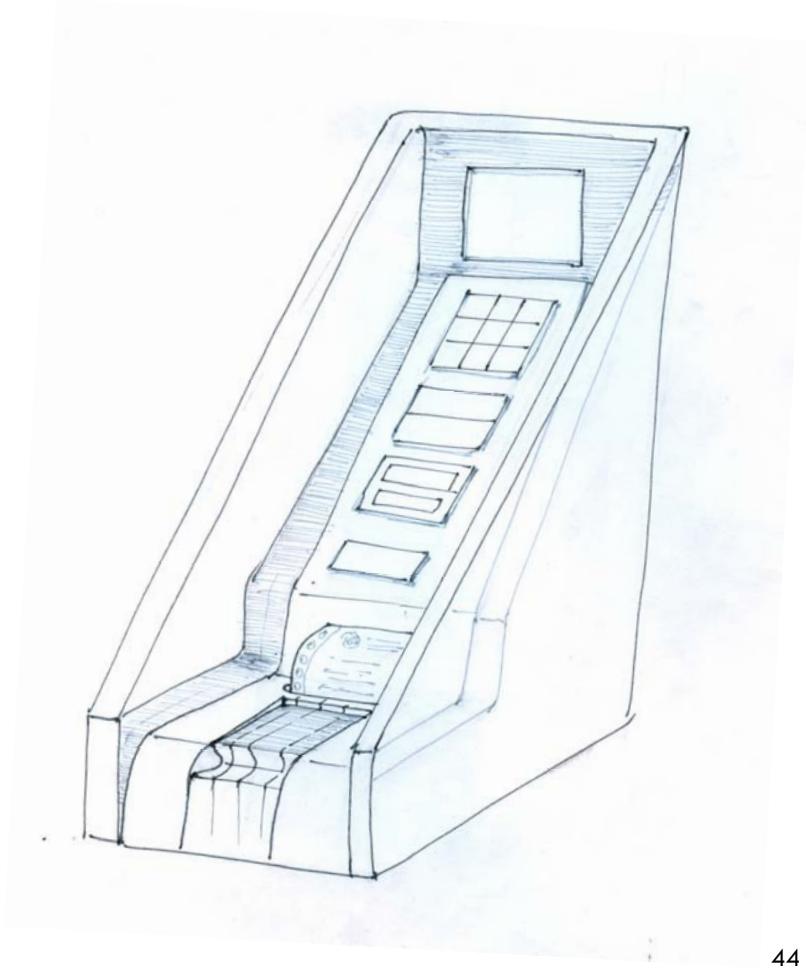
Form explorations:



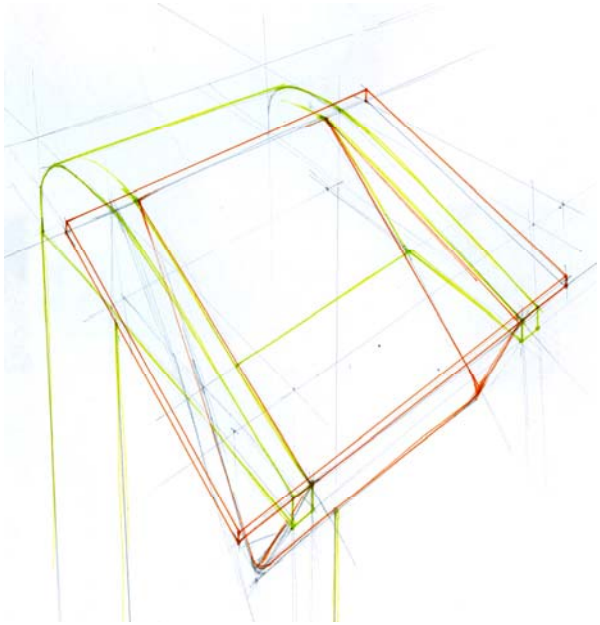
Form explorations:

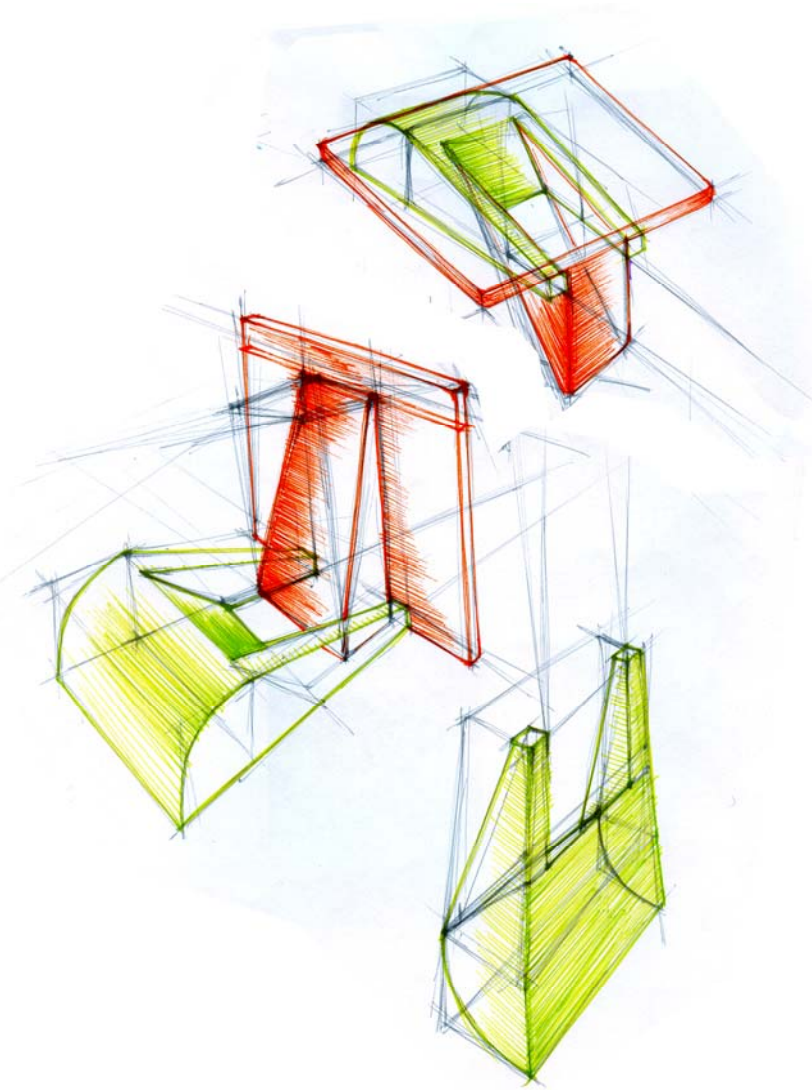


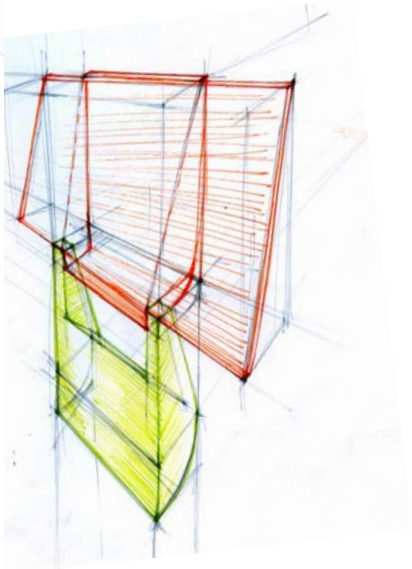




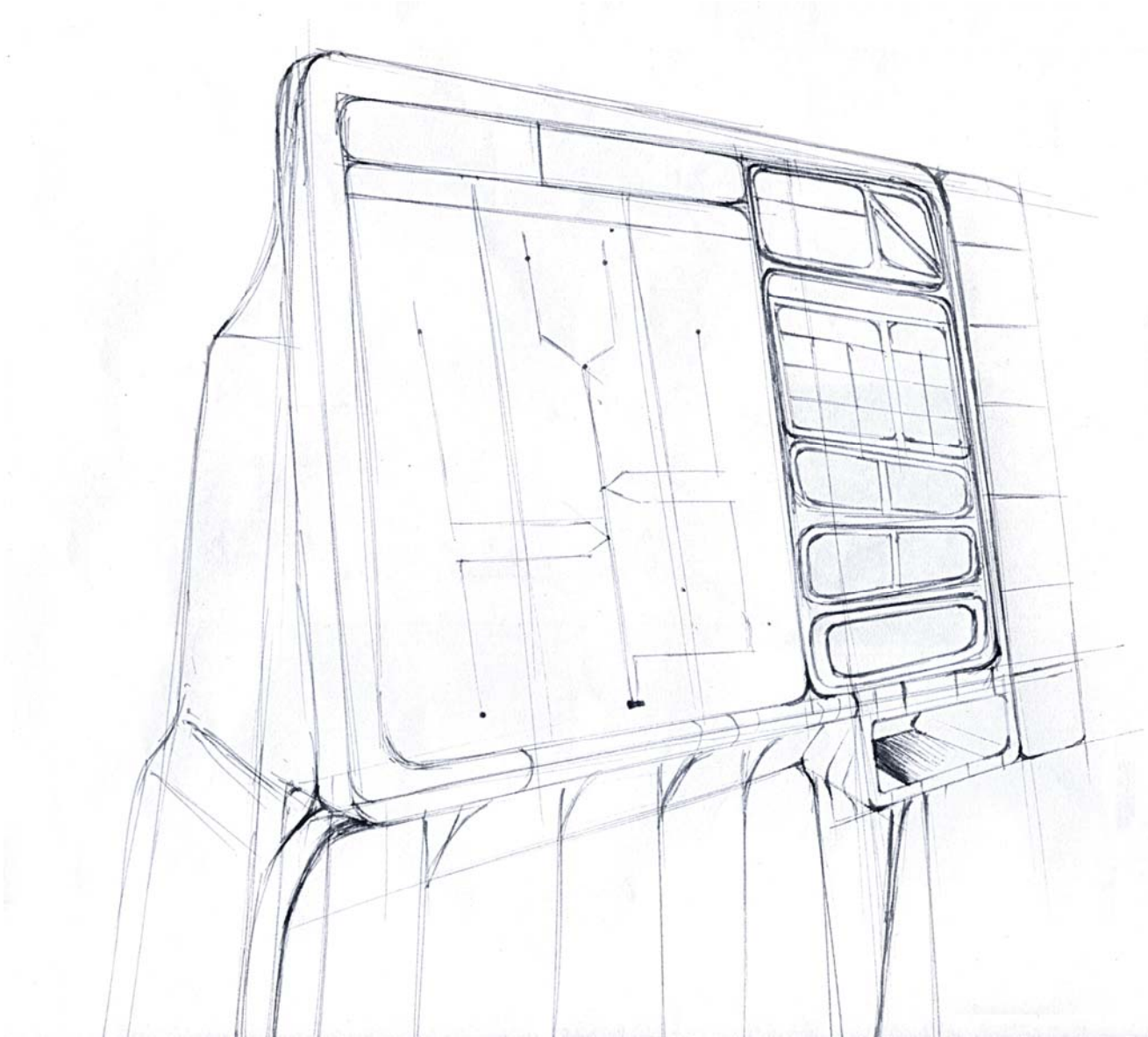
Form explorations:





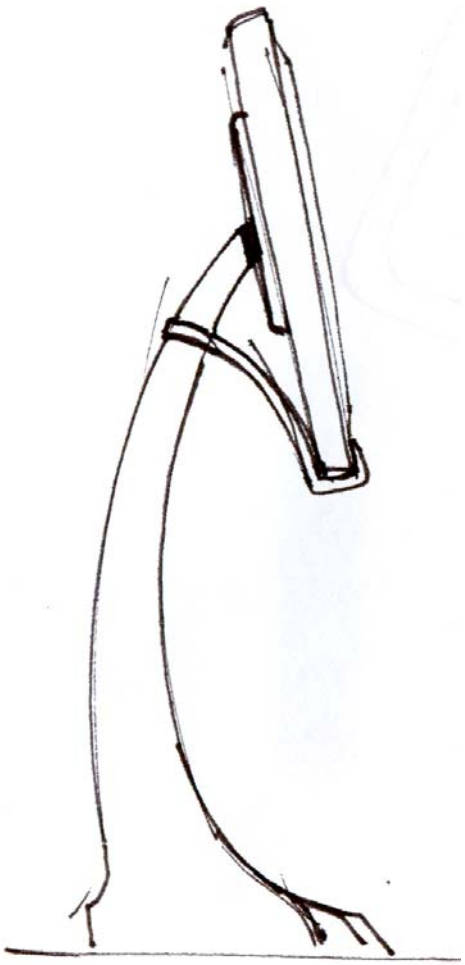


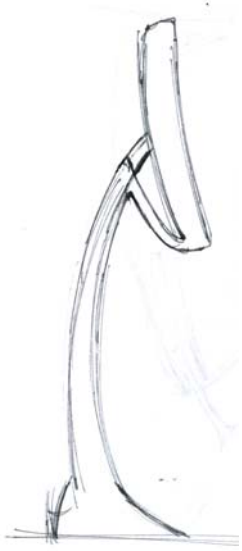
Form explorations:

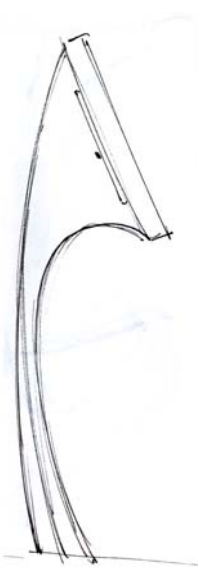


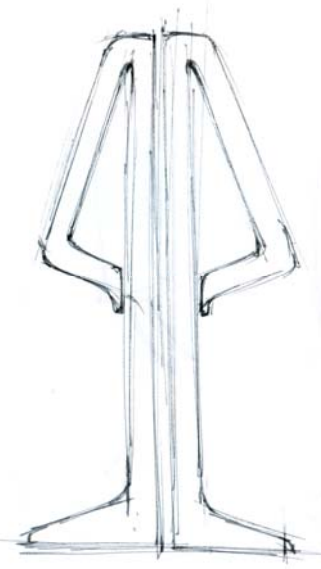
Concept Development

Form explorations:



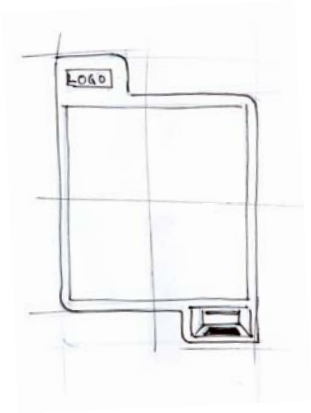


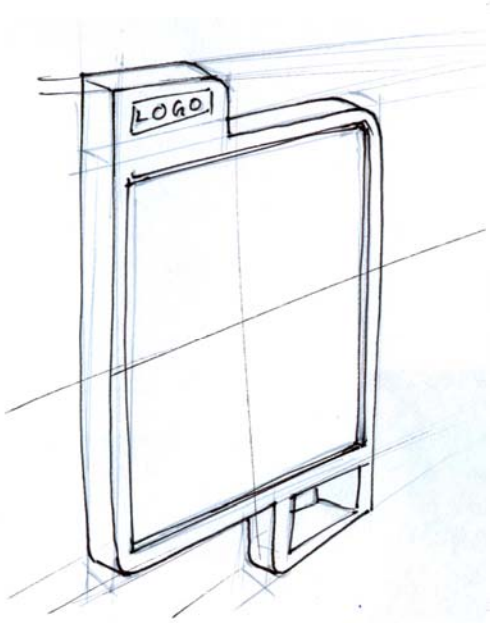


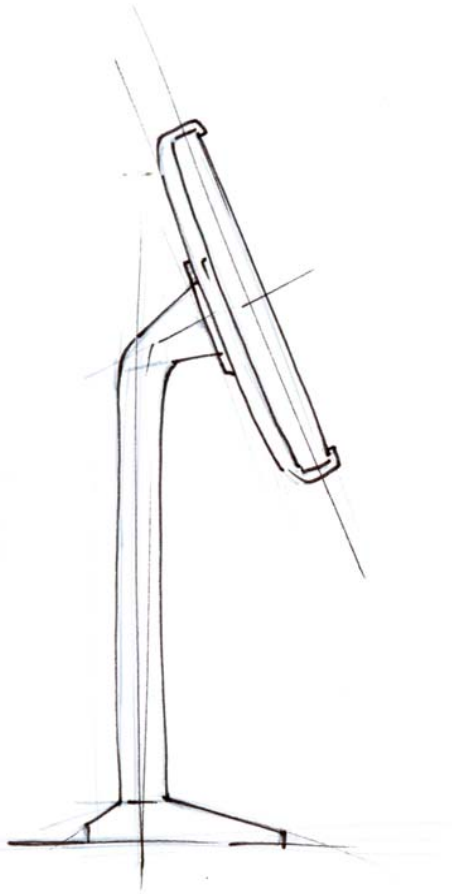


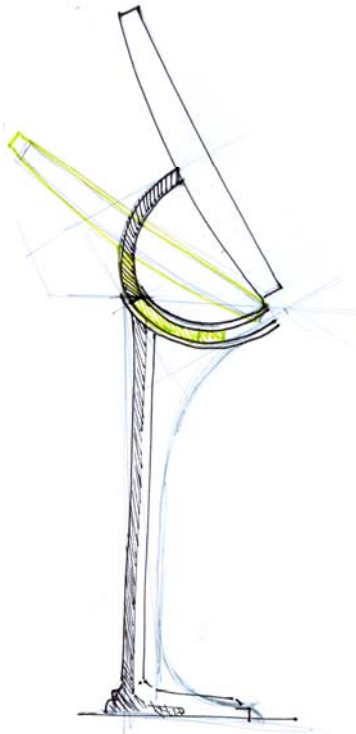
Concept Development

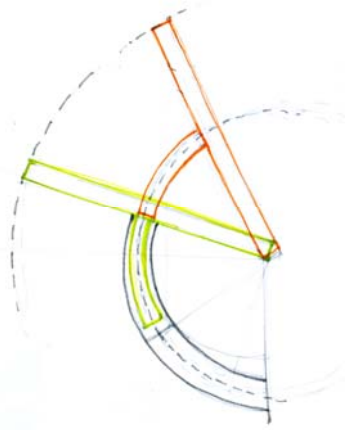
Form explorations:

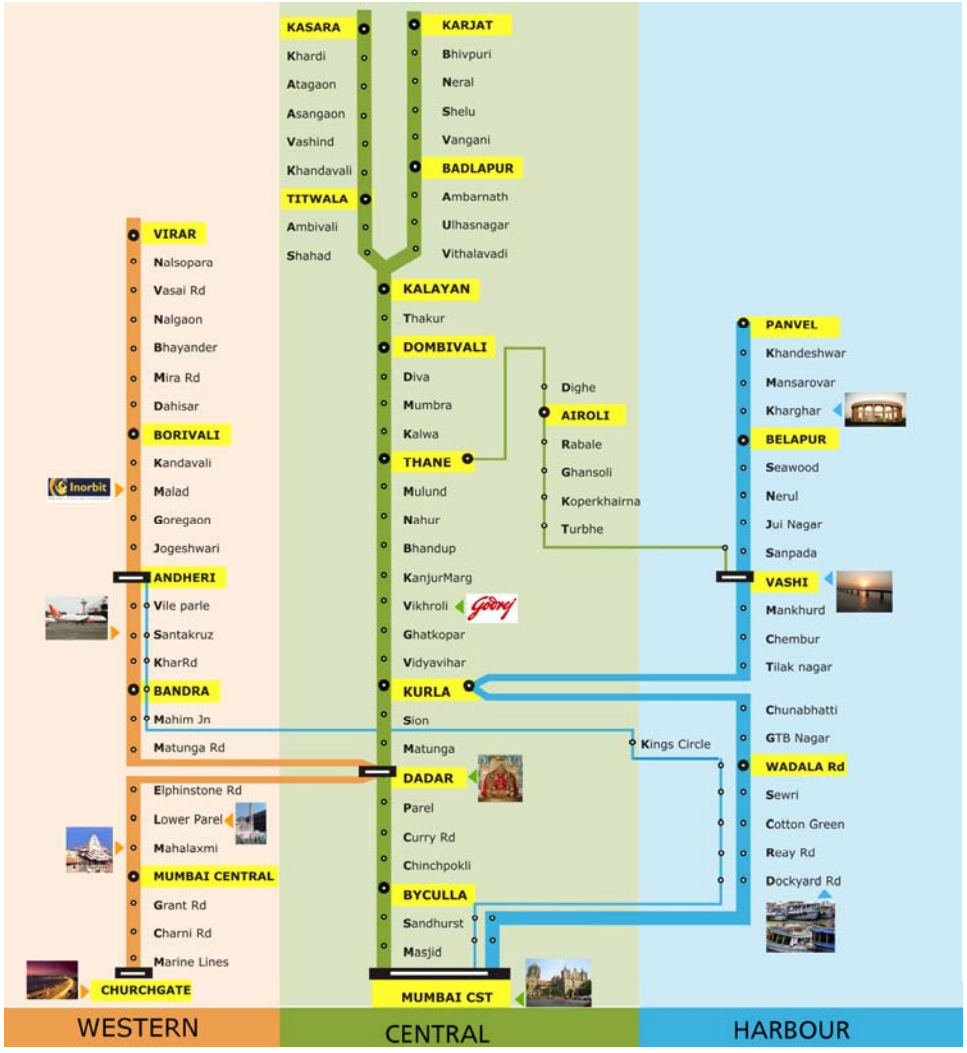












Final map :

Features of the map

- Bold and highlighted main stations. Which can help people to find there destination by taking it as a reference.

- left aligned stations. People generally have tendency to search the initial alphabet if they are unfamiliar with the route. So this arrangement can help commuters.

- Bold initial alphabet. This will emphasize more on initial alphabet which helps in searching.

- color code for each route . If unfamiliar commuter knows address like the destination station lies on central, western or harbor line then he or she just need to search within that line.

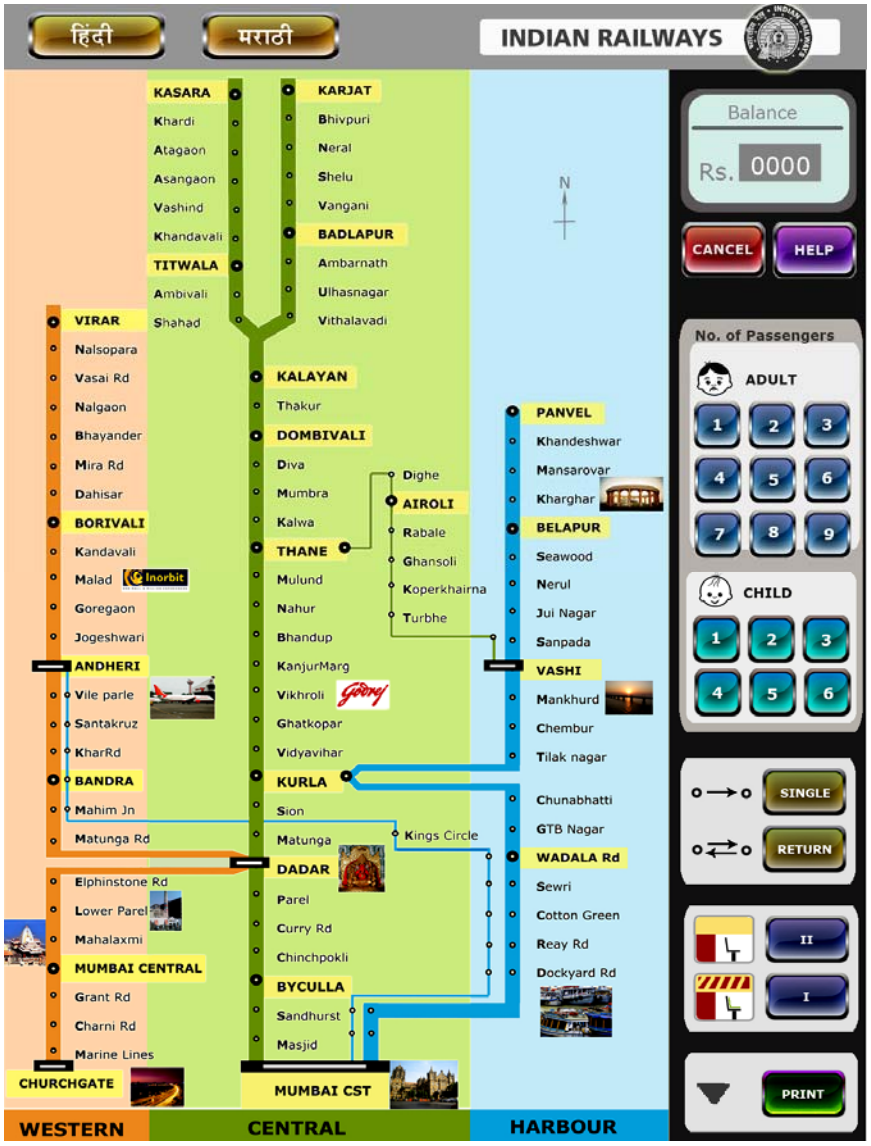
- photographs of monuments or landmarks besides that station.
-.

Mockup model

User testing and feedback

After completing user testing I got some valuable feedbacks

- Confusion where to place card.
- Number the instructions.
- Confusion because of the line parting ticket slot and card
- Placing card instruction .should be placed in sequence with other instructions
- Colors of button too bright.



Final interface :

Features:

-A 20'' touch screen is used in vertical form (total active area is 308mm x 406mm with aspect ration of 4:3)

-Hindi and Marathi options for commuters who don't know English

-.

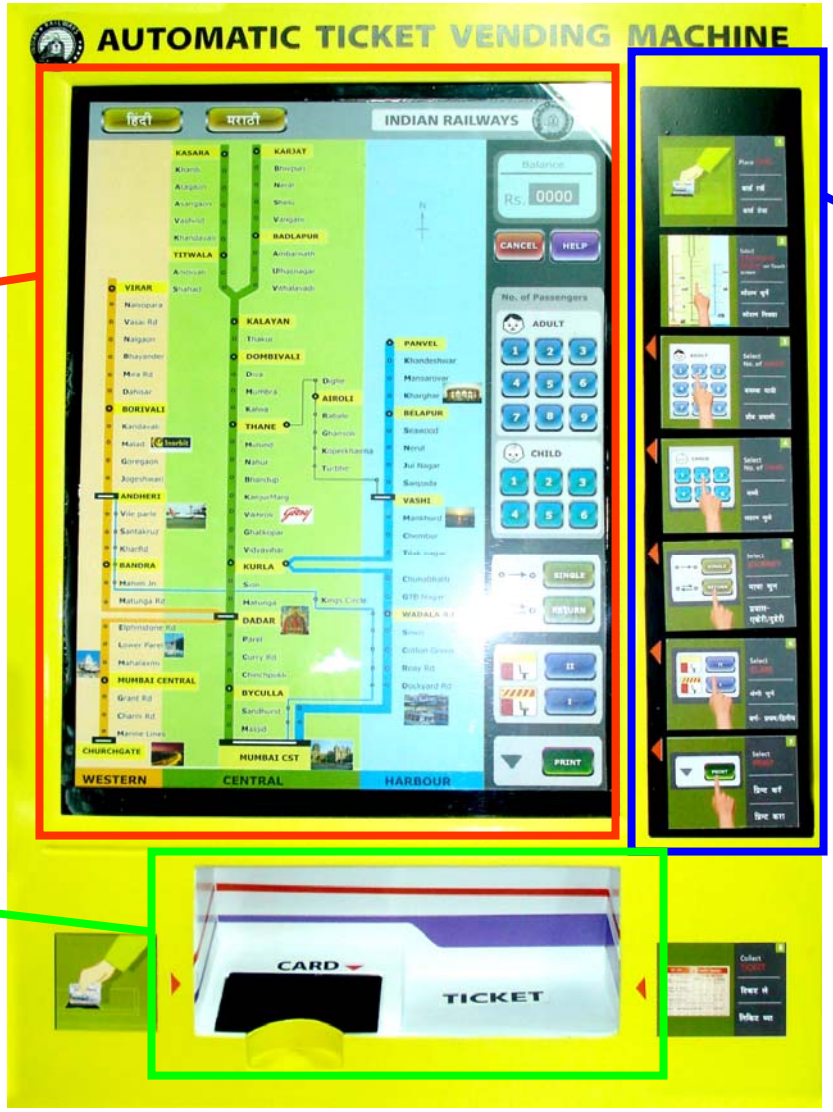
-Balance display shows the current balance and at the end after pressing print will show the remaining balance. If the balance goes below Rs.10 then the balance box flashes

-.

-Cancel button is to stop printing and help button if one faces problem with machine.

-Symbols are for each feature to help illiterate commuter.

Final Concept

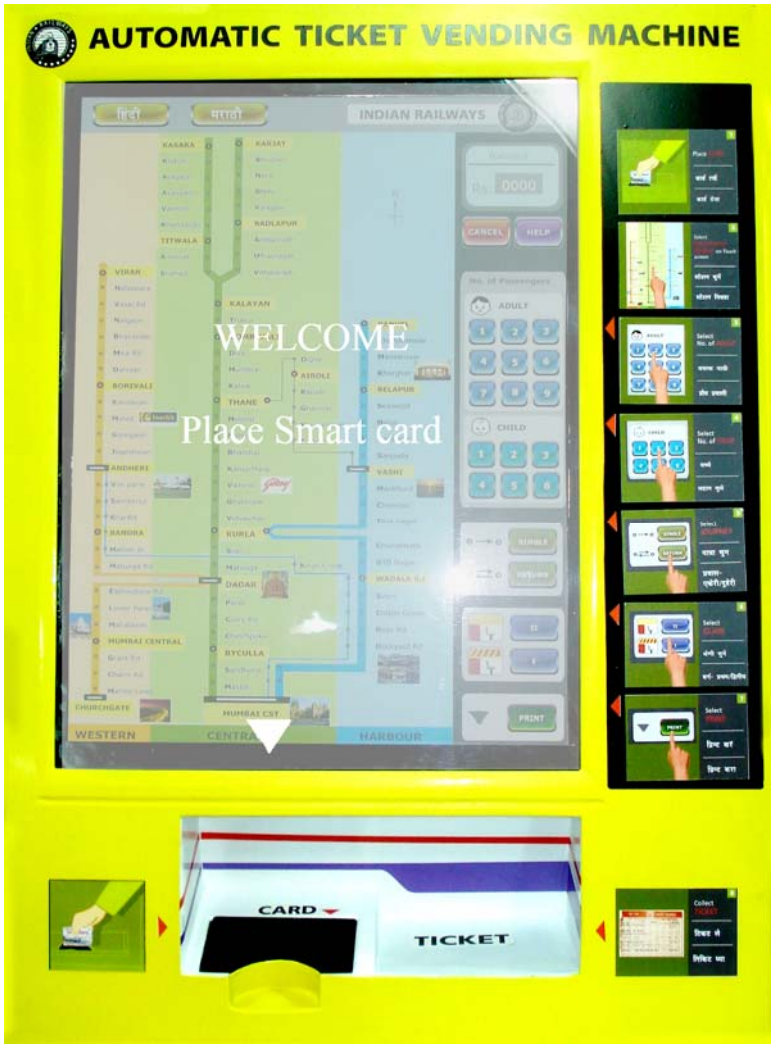


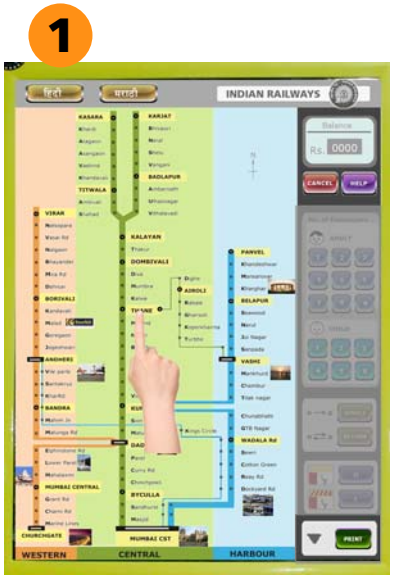
Display or touch screen space

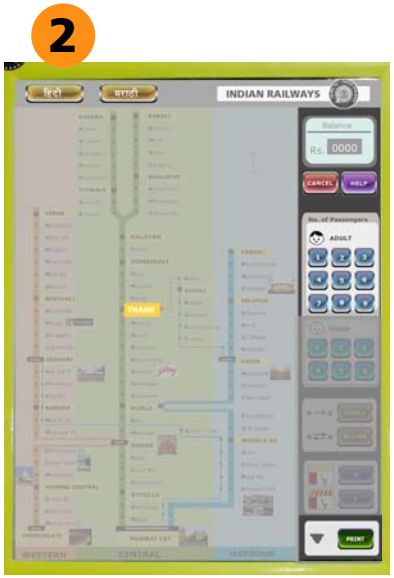
Instruction space

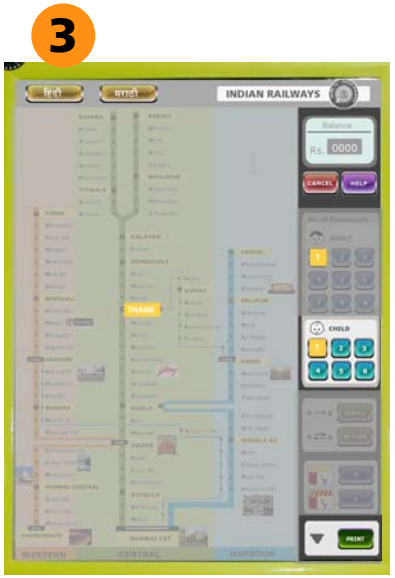
Card and ticket space

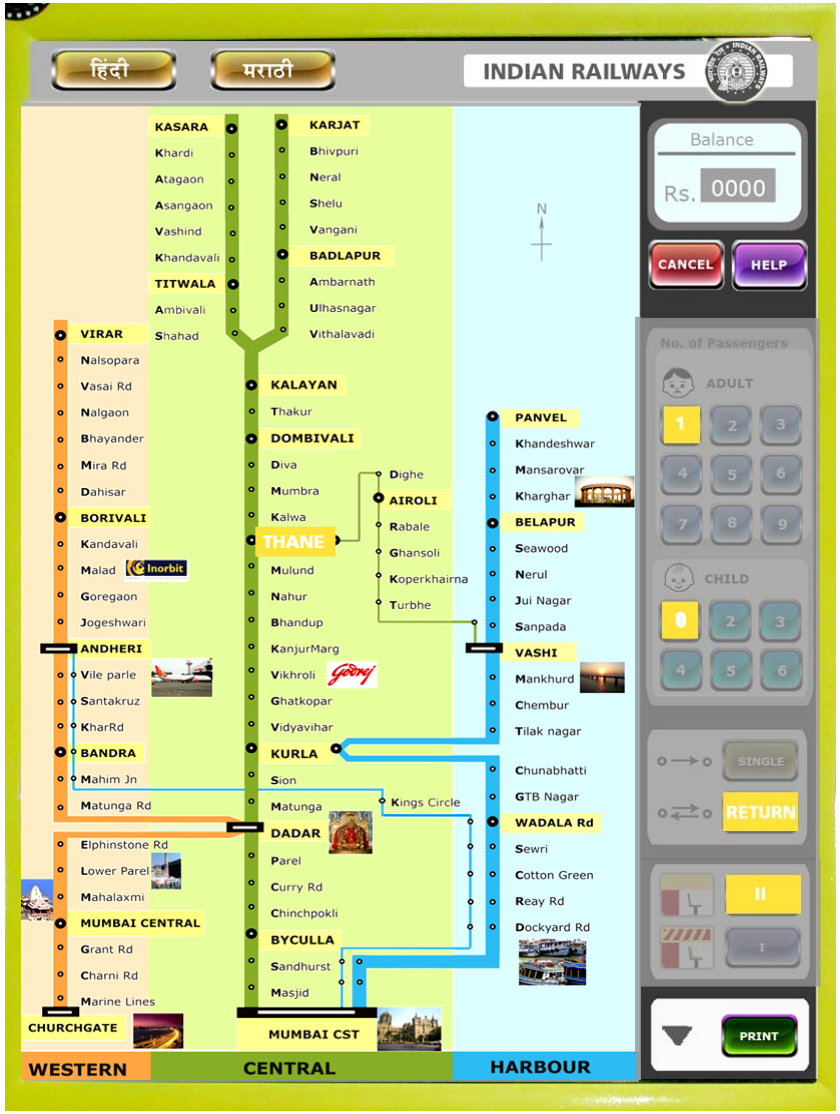
Flow diagram :











Default case :

In default case options like
No. of person - 1
No. of child – 0
Single journey, and
Second class
Are already highlighted.
So one just need to select the destination station and other options same as default then the commuter just need to press print button after selecting the station.

Final Concept

Final Concept

Smart Card with Map

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