

Summer Internship

TU Darmstadt,
Institute of Ergonomics,
Germany

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Acknowledgement

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We would also like to thank Lukas Bier for his help and support during our stay at the institute.

Last, but not the least, we thank our family and friends for their love and co-operation at every step.



Certificate of Internship

This is to certify that **Mr. Prem Lokesh**, born 4th September, 1985 in Jodhpur, India, worked in Germany at the Institute for Ergonomics, TU Darmstadt from 15th June, 2014 to 1st July, 2014. During this time he worked together with other Indian and German students on a project titled 'Design of vehicle entertainment console for the Indian and German users'.

His major tasks during the project included:

- Planning, organizing and managing the resources of the project
- Literature analysis
- User interviews of German and Indian users
- Developing detailed personas for design
- Developing design concepts
- Visualisation of the chosen concepts in different scenarios

The above mentioned aspects helped him understand and obtain a holistic view of the user centred design process while designing for different cultures.

The above activities were carried out in an intercultural interdisciplinary team consisting of German and Indian students from Engineering and Design backgrounds. His involvement in such an intercultural interdisciplinary team provided him with added perspective about design, design process and the associated evaluation methods.

Finally, Mr. Prem Lokesh has shown great capability for professional, interpersonal relationship with his colleagues and staff members of the Institute. We wish him all the best for his future endeavours.

Prof. Dr.-Ing. Ralph Bruder
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Completion certificate

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As the world becomes more global, products and technology used by different countries and cultures are often similar. We see the same products being used by people of various backgrounds even if it is not convenient to use due to several cultural differences. A design meant for Europeans is being used by the Asians as well. However, cultural interpretations are different which makes the use or the sale of such products in different countries a failure.

Example:

Kelloggs banked heavily on the quality of its crispy flakes when it entered the Indian market. But, however Kelloggs did not meet with the success it anticipated because of not taking cultural differences of Indian users into consideration. It was found that Indians always boiled their milk unlike in the West and consumed it warm or lukewarm but pouring hot milk on the flakes made them soggy. They also liked to add sugar to their milk. If the milk was cold, it didn't taste good since the sugar didn't dissolve. Kelloggs was not accepted by Indian consumers and till date fails to grab the market. [2]

This leads us to the importance of the User Centered Design (UCD) approach. It involves a very clear understanding of the user, his behaviour, cultural interpretation, conventions, his interaction with the product and its use. The main difference with other design philosophies is that UCD designs the product around how the users can, need or want to use the product instead of changing the user's behaviour to suit the design of the product.

As a part of an exchange programme, German students from TU Darmstadt and Indian students from Indian Institute of Technology Bombay were involved in a project based on User Centric Design. This is an inter-disciplinary project with two students pursuing their Masters in Mechanical and Process Engineering, one student pursuing Masters in Interaction design and a student pursuing Masters in Industrial Design. Our aim is to design two entertainment consoles for a German Kleinwagen and a B-segment Indian car based on the User Centered Design approach. The time frame of this project is 6 weeks. The goal of the project is to design the same product for the two countries by studying the cultural differences and reflect this in its design and features.

1.1 | Project Definition

The aim of the project is to design two vehicle entertainment consoles, one for a German Kleinwagen and one for an Indian B-segment car. The time frame for this project is 6 weeks and the process followed would be a User Centered Design (UCD) approach.

1.2 | Stakeholder Interview

Starting the project we were supposed to get a much more detailed brief about our project and expectations. For this purpose we had to conduct a stakeholder interview.

In our case the stakeholder is our advisor Pratap Kalenahalli Sudarshan. He stands on the top of the project and is in general responsible for the result we will create and evolve. The stakeholder knows important key data especially of the

Points covered

Project scenario

To design a stand-alone entertainment console that can be bought off the market by an independent user or by a car manufacturer to use in a particular model of their cars.

User segment

The target user segment is characterized by students. Students who use a car would often like to have good features. This includes a good entertainment system.

Use of the project for the stakeholder

The execution of this project by an intercultural group of students provides a new perspective on cultural relevance and its varied interpretation in design.

product, the user group, potential restrictions and methods of research.

Thus, a close collaboration of stakeholder and design group should be maintained.

We conducted a 20 minute long interview, where one person asked questions while the others observed and took down essential notes about the project.

Limitations

Features such as voice recognition, navigation system, climate control must not be added to this entertainment console design. There is no limitation on the kind of interface used for this console. The slot provided in the car for the entertainment console should be used to fix the music system but outer form of the console can have any shape. Any other constraints regarding the design must come from the persona. The scope of this project does not cover analysing the cost of the product or having a budget for the design. The entertainment console must have the four basic features of : Radio, CD, USB, MP3

Success / Failure of the project

The success or failure of this project would be defined by the connection of the design to the persona.

Deliverables

The following deliverables were agreed upon keeping the time frame of the project in consideration. An extensive report citing the motivation, research, process and output.

A Digital prototype of the design.

Brand philosophy

There is no specific brand to keep in mind while designing the car entertainment console. We must follow the process and the visual language must be based on persona. If the research strongly leads to a particular brand philosophy, we may use it.

The User Centered Design Process (UCD) (DIN ISO 9241-210) is used in varying degrees in the design and development of any product or service. One of the aspects of the UCD process is a strong understanding of the user, user's context and requirements before design.

This ADP focuses on the development of concept and prototype of the vehicle entertainment console for the target cultures of India and Germany based on the understanding and requirements of the target users.

The ADP would follow the below flow of activity and tasks.

Project Management: Understanding and allocation of tasks, time plan, roles

User Studies:

- Design and conducting user interviews with German and Indian users
- Developing German and Indian user profiles and personas

Concept and digital prototype of design for the German and Indian personas

1.4 | Team Roles

The entire project had to be divided into smaller tasks for the sake of better management and execution. These tasks were assigned to different group members. We assessed the strengths of every member of the team according to the task list to divide the work amongst the team-members. We also kept in mind every student's schedule while doing this and assigned achievable goals within the given time frame.

Skills	Prem	Sohini	Katha	Verena
Project Management				✓
Interviewing skills	✓			
Analysing data	✓	✓		
Concept generation	✓	✓	✓	✓
Evaluation methods				✓
3D modelling, rendering	✓	✓		
Prototyping	✓	✓		✓
Data handling	✓	✓	✓	✓
Academic documentation			✓	✓
Designing report	✓		✓	
Presentation slides	✓	✓	✓	✓
Presentation skills	✓	✓	✓	✓
Communication skills	✓	✓	✓	✓
Team leading experience	✓			✓

Table 1.1 : Competency Matrix

Tasks	Sub-divisions	Prem	Sohini	Katha	Verena
Project Management					✓
	Gantt Chart	✓	✓		
	Task division	✓	✓	✓	✓
	Roles				
Stakeholder Interview		✓	✓	✓	✓
Secondary Research	Literature Research	✓		✓	
	Questions draft		✓		✓
Primary Research :					
Questionnaire	Finalise questionnaire	✓			
Interviews	6 Germans	3		3	
	6 Indians	3		3	
Analyze data		✓	✓	✓	✓
Design Brief			✓		✓
Personas	German persona	✓		✓	
	Indian persona		✓		✓
Scenarios	Scenarios for German	✓		✓	
	Scenarios for Indian		✓		✓
Ideation		✓	✓	✓	✓
Concept generation	Minimum 2 each	✓	✓	✓	✓
Concept Evaluation	Methods	✓	✓	✓	✓
Freezing concept	Result of evaluation				
Concept Detailing		✓		✓	
Collating report			✓		✓
Renders		✓	✓		
Prototype				✓	✓
Report writing	Simultaneously	✓		✓	
Presentation slides			✓		✓

Table 1.2 : Task Division

1.5 | Time table

One of the important aspects of Project Management is the making of a time schedule listing the project's important milestones, tasks, deliverables and the amount of time allotted for each task.

We decided to make the time schedule in the form of a Gantt chart. We divided the work in 5 weeks and considered all public holidays, and events such as TU Meet and Move.

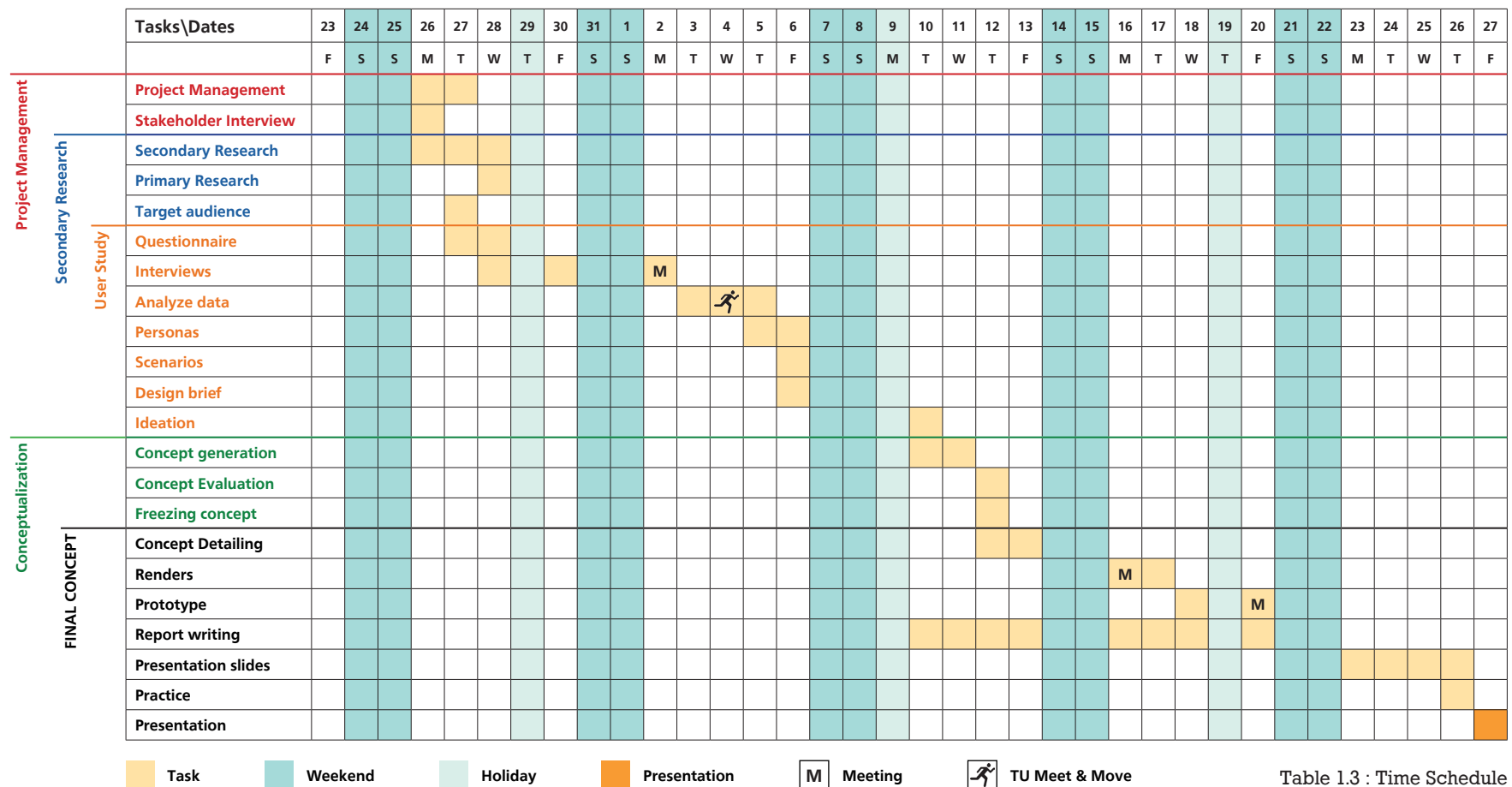


Table 1.3 : Time Schedule

Chapter 2 | Research

2.1 | Secondary Research

The execution of the design task has to be based on information fleshed out by research. Starting a design project besides primary research the developer has the assignment to find out how the market of the product is characterized.

In the process of secondary research our group has tried to get a lot of information about the car entertainment system in the B-segment.

The focus points are the standard entertainment system in new cars, the current market situation of purchasing entertainment systems especially the features and the design. The secondary research has been done for both, the Indian and the German markets whereas the results of both illustrate similarity. All facts are referred to the sources [3] and [4].

First of all we informed ourselves about the key data of a Kleinwagen in Germany and a B-segment car in India.

Kleinwagen in Germany

- a little, but fully-fedged car
- like VW Polo, Opel Corsa, Skoda Fabia or Ford Fiesta
- price 12,000 €- 18,000 €

B-segment car in India

- larger than a city car but smaller than a small family car
- like Santro, Wagon R, Zen, Alto and Indica
- price ₹ 400,000 - 800,000

What is a head unit?

The term head unit in a car stereo system used to refer to a 'tape deck' or a CD player but nowadays, it's as likely to be an MP3 player, a cell phone capable of MP3 playback or even a tablet computer.[5] The head unit is usually located in the center of the dashboard in the car. The head unit is basically the interface between the car's entertainment system and the user. It also forms an essential part of the car's aesthetics and are thus designed for different cars keeping in mind the visual language of the car.

Standard size

The most standard sizes for car audio head units and enclosures is DIN ISO 7736: Single (180x50 mm) in Europe, South America and Australia and Double (180x100 mm) in Japan, the UK and North America. [6]

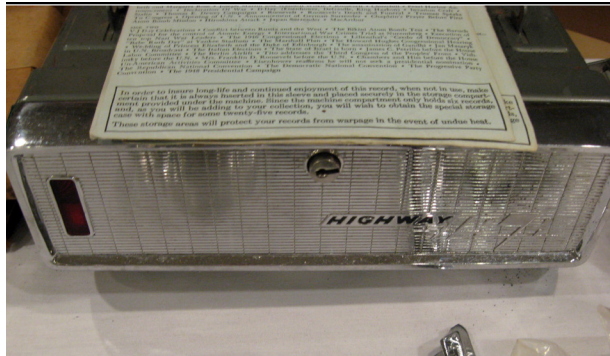


Fig. 2.1: Record player in 1955

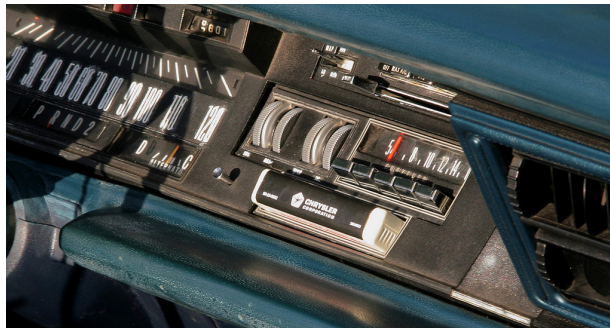


Fig. 2.2: Eight track player [1]



Fig. 2.3: Car Radio with CD in the 1990s later. [1]

History of car entertainment

The history of car entertainment, in this case known as a car radio, started in the 1930s. In this time radios were used but the aim was the integration of the radio in the car.

In the 1950s head units dropped in price and increased in quality over the intervening years being still only capable of receiving AM broadcasts. FM radio wasn't a popular medium in this time. Figure 2.1 shows a record player introduced by Chrysler in 1955 that used proprietary media format. An eight-track player from the 1960s is illustrated in Figure 2.2.

Every ten years, new features appeared on the car radio market, so in the 1970s the drivers had the chance to hear cassettes, in 1980s CD and in 1990s the market was full of head units with video function and in addition playing mp3-files.



Fig. 2.4: 2010: Kia's UVO infotainment system [1]

Figure 2.3 illustrates an example for a car radio in the 1990s with CD and radio function.

In the 2000s new features such as Bluetooth and Infotainment systems were brought to the market.

The further development in all technical aspects was also effective on car entertainment systems. During the first decade of the 21st century, head units gained the ability to interface with phones and other devices via Bluetooth. In automotive applications, the technology allowed for hands-free calling and created a situation where head units could automatically mute itself during a phone conversation.

The car system always has to be adapted to the general situation of entertainment aspects so that in 2011 the companies stopped offering cassette decks in new cars and there is the assumption that the CD will follow in the next years. Furthermore the development to bigger display especially touch display and an increasing number of features can be observed.

The most new feature in this time is the ability to connect with the internet, opening a lot of doors. Having an Android System and GUI, playing music from the cloud, the entertainment system merges more and more with the smartphone idea. Figure 2.4 shows a infotainment system from Kia of the year 2010 including a CD player, but the system is also capable of playing music from a built-in HDD or streaming it from internet. [7]

Available features of current car entertainment systems

- CD (variable number of cds/automatic change)
- Mp3, wma
- Radio (fm or am) > variable presets of radio channels
- Stations, automatic search of radio stations
- USB connection
- SD card
- Bluetooth
- Rds information (communications protocol standard for embedding
Small amounts of digital information in conventional fm radio
Broadcasts > e.G. Traffic information, time, alternative frequencies)
- Cell phone capability/connect with smartphone, tablet, notebook
- Head phones (AUX)
- Speaker options (bass, treble, loudness, mid)
- Mobile internet (option of music offers like spotify, internet radio)
- Extra remote control
- Display(b/w or coloured)
- Dvd options
- Data cd (pictures,documents)
- Share your phone display on the radio display
- Touch display
- Anti-theft protection (removable face)
- Automatic adaption of the loudness in according to the speed

In the following we have shown for each country two car radios representing the current market of car radios.

German market



Fig. 2.5: German Market example 1 [2]

JVC KD-R431E

- USB/CD-Receiver
 - Dual-Aux
 - available in different colours
- Price 60-70€ (amazon.de)



Fig. 2.6: German Market example 2 [3]

AEG Ar 4026

- DVD/CD
 - LCD Display with Touchscreen
 - SD/USB Slot
- Price 140-170€ (amazon.de)

Indian market



Fig. 2.7: Indian Market example 1 [4]

Pioneer MVH-X169UI

- Tuner
- USB,USB phone control
- AUX

Price Rs. 4,590

(<http://pioneer-india.in/shop/mvh-x169ui/>)



Fig. 2.8: Indian Market example 2 [5]

Pioneer AVH-X4690DVD

- Tuner
- USB/AUX
- AppRadio Mode for iPod/iPhone
- Bluetooth handsfree call
- CD
- wireless technology

Price Rs. 25,990

(<http://pioneer-india.in/shop/mvh-x169ui/>)

2.2 | Primary Research

Users of the product should be the main focus of the design group [Cooper et al., 2003]. They are the people who would use the product for the intended purpose. For redesigning existing products, it is necessary to speak to both current and potential users. This would help us to understand the habits and problems of current users and also the expectations of potential users.

2.2.1 | User Interviews and Analysis

One-to-one interviews with users is necessary for getting good insights into the user's needs. This leads us to the ethnographic interviewing technique called contextual enquiry.

We decided to conduct 6 German and 6 Indian interviews to get to know different kinds of user behaviour and then find patterns and trends. This would help us gain insights on user needs.

For the complete Recruitment Protocol refer to Appendix 1.

What we aim to learn from the users

Before deciding the questions/ discussion topics for the interview, it is necessary to know what sort of information we are looking for from the users for our design. We also need to study the background of existing products on the market and there problems. The following is a list of information we want to gain with the interview.

- Personal style
- Usage pattern of the car
- Likes and dislikes about driving
- A typical day in life
- Personality of the user
- Aesthetic choice
- What the user does for entertainment in the car
- Requirements in music
- Current stereo features and convenience of usage
- Preference of interface for the car stereo
- Need of information while driving
- Usage and adaptability to new technology
- Experience/Emotion that the user wants to draw from the car entertainment system
- Interaction with other devices

We divided ourselves into two groups for conducting the interviews. Due to time constraints, we divided the group into 2 German students and 2 Indian students. This made it easier for us to conduct the interviews at different times of the day according to the interviewer and interviewee's convenience.

Interviews

We decided to conduct 12 interviews in total, 6 Germans and 6 Indians. We divided ourselves into two groups. Each group conducted 6 interviews, 3 Indian users and 3 German users. By doing so, we hoped to get culturally different styles of interviewing, opinions and perspectives on the results of the interviews.

Our main aim to understand how the two groups of users are culturally and functionally different. We conducted the interviews over 4 days. All Indian interviews were performed via Skype. All German interviews were performed in person.

We made a list of topics for discussion and points of departure with the users. We also made a list of questions and possible sub-questions from the answers that we got from the user.

For the complete questionnaire, refer to the Appendix 2.

Main topics to discuss :

- Demographics
 - Name
 - Age, gender
 - Profession
 - Residence
- Hobbies
 - Music
 - Travel
 - Instruments
 - Sports
 - TV shows
- Day in the life
- Relaxation time
- Daily use of car
- Music
 - Soft rock, Hard rock, Classical etc
 - Sources (youtube / ipod / phone)
 - Radio (favourite station)
- Present music system- pros and cons
- Reasons for buying
 - Car
 - Phone
 - Choice
 - Use
- Other gadgets: handling and adaptability to car system
- Personal Style
- Aspirations/dreams

Analysis

Affinity Mapping

Affinity mapping is a tool used for analysing information by grouping and understanding it. This method is usually used when you have a lot of information and individual notes from interviews. Individual points and statements are written on strips of paper or post its. They are then put together depending on their similarity. Affinity mapping refers to placing related pieces of information together. After doing this, an insight can be found out from this cluster of information.

After the interviews, we listed out all the points that we got from every interview and then did an affinity mapping with all the information we had.

We did a separate affinity mapping for Indians and for Germans.
For complete list of insights from Affinity mapping, refer to Appendix 3.

Main insights we got from the affinity mapping:

German

- User is extroverted, adventurous, likes speed, casual style, and likes sports.
- Concerned about safety and security, does not want to multi-task.
- Uses the car on weekends for meeting with friends/family or going grocery shopping.
- Wants the experience to be of using a simple, clean interface which is hassle free.
- Likes to listen to rock music and has a specific taste in music.
- Stores music on his phone besides listening to the radio.
- User is tech savvy, and would pay a good price for the technology.
- User often uses navigation via his phone.

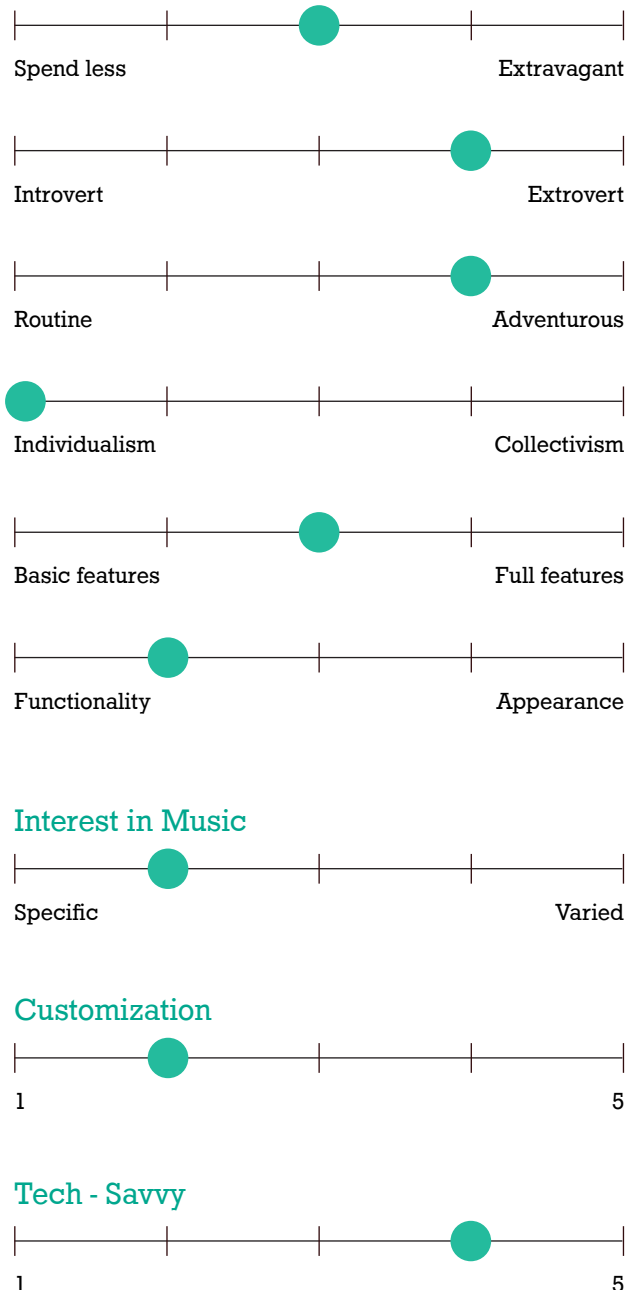
Indian

- User is extroverted, but safe natured.
- User uses his car most often with either friends or family.
- Family is important, collective nature for decision making.
- User is money-minded, and believes in efficient utilization.
- Brand is important for the user.
- User is tech-savvy and likes to use new technology.
- User likes to listen to Electronic Dance music, House music and sometimes listens to rock music. He also likes to listen to latest Bollywood songs.

Often people try to create a product for a large number of users trying to make the functionality as broad as possible. However, this concept backfires since so many features and functions often interfere with the user's satisfaction of using the product. The best way to successfully accommodate a variety of users is to design for specific type of individuals with specific needs. The main factor in this approach to designing a product is to find the right users to design for. These users must be people who best represent the needs of a larger section of people. After doing so, one must prioritize the more important needs so that they are met first. This would make sure that a larger set of users are satisfied.

A tool for designing for a specific user with specific needs is making a persona. A persona is a fictitious character who is used to define the kind of user that the product is being designed for, his wants, needs and problems. A persona can represent a user group who will use the product or service.

Data collected from interviews with users is used to make the persona. The variety of data is analysed, prioritised and then a persona is developed based on it. It is usually a 1-2 page description of the attitude, behaviour, skills, interests, environment, work, likes, dislikes of the person as well as his needs specific to the usage of the product or service. A persona also provides a check list for the design and helps in ending debates about what features to include or remove. [8]



Thomas Hoffmann

25 years old
Lives in Darmstadt on rent
Doing Masters in Mechanical Engg.
Parents live in Limburg
(100 km away from Darmstadt)

Interests

Thomas plays football with friends regularly. He likes to go running and swimming sometimes. Plays computer games such as car racing simulations. He likes to meet his friends, and meets them on weekends. He also goes out to party once or twice a month.

Mode of travel

Travels to college by bike if the weather is good otherwise he travels by bus. Drives his car on weekends to go out with friends, grocery shopping, visit parents. He drives a pre-owned Volkswagen Golf which he bought because it was comfortable and at a low cost.

Music

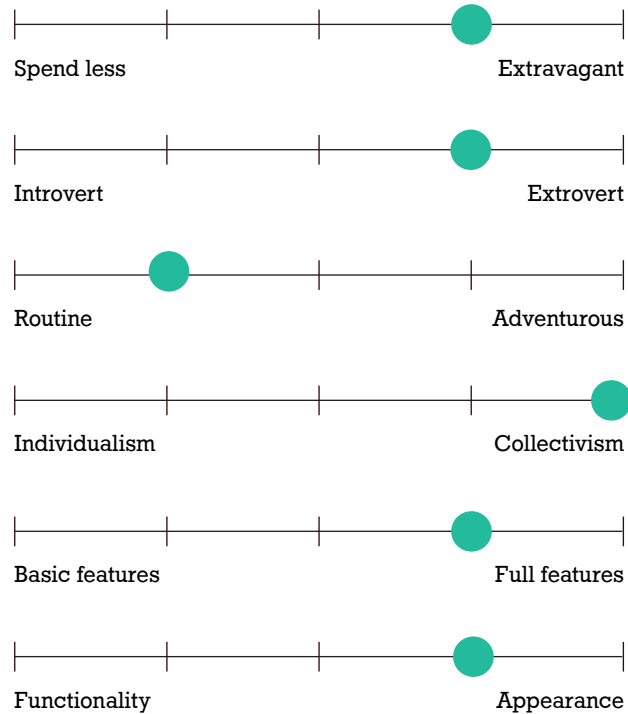
Likes to listen to rock music. Has 2-3 favourite radio channel and switches between them.

Life Goals

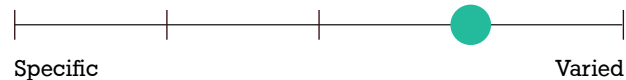
After Masters, he would like to do a Development based job in a company like Mercedes Benz. He would also like to buy a new car 5 to 6 years from now.

User Needs

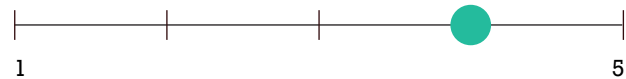
User wants a simple interface to select songs, listen to choice of music and get enough information from the display about the track/radio channel, time, source etc.
User should not get distracted from driving while using the product.
User would like to be able to connect phone with music system.
The connection should be clean, seamless and hassle free.
User should have the option to charge his phone
The system should provide easy access to favourite radio stations.
All type of smartphones should be able to connect to the system
Tactile feedback of buttons / controls.



Interest in Music



Customization



Tech - Savvy



Interests

Varun likes to play cricket sometimes on week-ends. He follows cricket matches on tv regularly. He likes watching comedy shows and Game of Thrones. He plays computer games like FIFA sometimes. He likes to meet his friends, and meets them in the evenings. He also goes out to party once in a week or two.

Mode of travel

He travels to college by Maruti Suzuki Swift which his father bought for him. In the evenings, he uses the car very often to go meet friends or go out for other purposes.

Music

Likes to listen to EDM, house, sometimes rock music. He also likes to listen to the latest songs from bollywood movies.

Life Goals :

After completing an MBA, he hopes to get a good job in MNC. He would also like to buy his own car a few years after starting to work.

User Needs

User should be able to connect his phone and other devices with music system seamlessly and hassle free. It should have the possibility of connecting more than one device at a time. Music system should be in sync with the look of the car. Presets must be available for various radio stations. The interface must be simple. The entertainment system should not distract the user from driving while using the product. Tactile feedback of buttons/controls is necessary. The user must feel in control of the system. Information like current of current track/FM channel, time etc. should be visually easy to comprehend. All type of smartphones should be able to connect to system. The product should make him feel happy and proud about owning it.

A scenario is a description of a person's interaction with a system. Scenarios help focus design efforts on the user's requirements.

For our project, we have defined generic scenarios for the two personas. This allows us to draw comparisons between the two designs and how it is used. We have tried to depict all kinds of features that the entertainment console can be used for. Through these scenarios we have worked out all the interactions for the entertainment consoles.

Scenario #1 :

Both personas using FM.

The user does manual setting of the radio channels, he then selects the frequency he wants and saves it in a preset. After this, he changes the source.

Scenario #2 :

Connecting devices such as phone, accepting/rejecting calls

User connects the phone via the dock/bluetooth. When he receives a call, he has the option of accepting or rejecting it.

Scenario #3 :

Changing audio/display settings from the menu

2.3 | Redefined Design brief

Based on the user personas, we came up with a requirement list for our design in order of priority for the Germans and Indians.

Entertainment console for the German Kleinwagen :

- The entertainment console should be designed for a college student who uses a car regularly.
- It should allow him to listen to the music of his choice from the devices he uses.
- The operation of this entertainment console should be hassle free
- It should allow for easy access
- It should have the features that the persona demands
- The entertainment console should have a sporty look.
- It should not distract him from driving

Entertainment console for the Indian B segment car :

- The entertainment console should be designed for a college student who uses a car regularly.
- It should allow him to listen to the music of his choice from the devices he uses.
- It should have the provision of attaching several kinds of devices.
- The operation of this entertainment console should be hassle free.
- The entertainment console should have a premium feel to it.
- It should have a vibrant design to reflect the user's personality.
- It should not distract him from driving.

Chapter 3

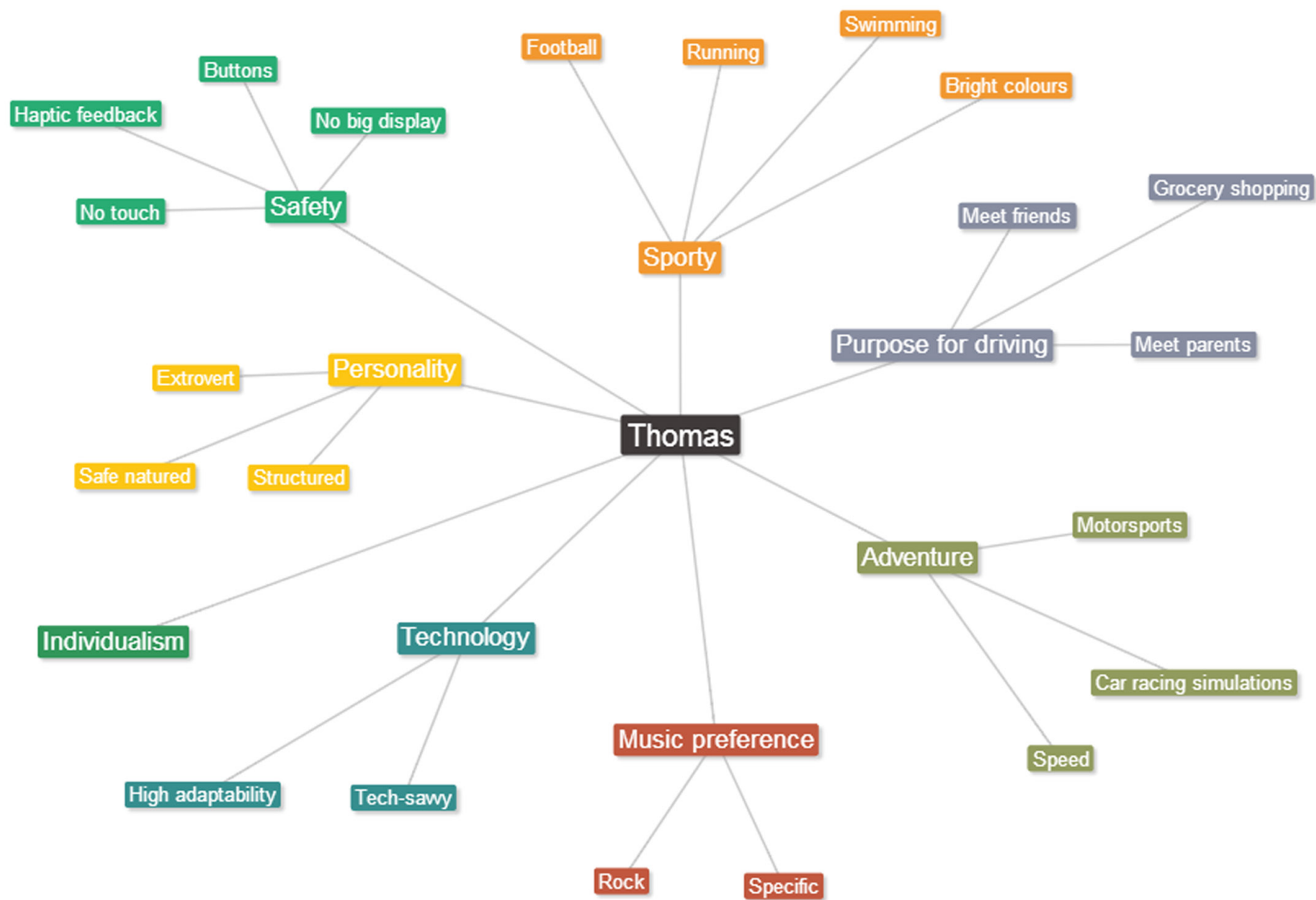
Conceptualization

After making the personas, we started ideation. Everyone in the team put forth various ideas regarding the form, features, settings of the stereo, interface as well as interaction.

3.1 Ideation and Concept generation

3.1.1 Mind Map

A mind map is used to visually arrange information in a way that it comes to your mind. It is usually around a central concept. In this case, it is around the personas. The various attributes of the personas, their likes and dislikes are arranged around the central name. The various additional points that branch out of them, insights etc. are also listed as further branches. This helps to visualise all the main points and information about the persona easily for the purpose of ideation.





3.1.2 | Comparison of Features

Feature / Button	Indian	German
On/off button	✓	✓
Source button	✓	✓
fm	✓	✓
aux	✓	
usb	✓	✓
cd	✓	✓
bluetooth	✓	✓
sd		
Volume +, -	✓	✓
Pause/play/<,>	✓	✓
Dock		✓
USB stick	✓	✓

Feature / Button	Indian	German
Radio	✓	✓
presets	✓ (6)	✓ (2-3)
auto tuning	✓	✓
manual tuning	✓	✓
Bluetooth	✓	✓
pairing	✓	✓
accept, reject call	✓	✓
Settings		
audio : bass, treble	✓	✓
speaker- front-back	✓	✓
Time	✓	✓
colour	✓	

Table 3.1 : Features Comparison

Interactive elements

The interaction of various kinds of buttons/controls that can be used in car entertainment console have been analysed in the following section.

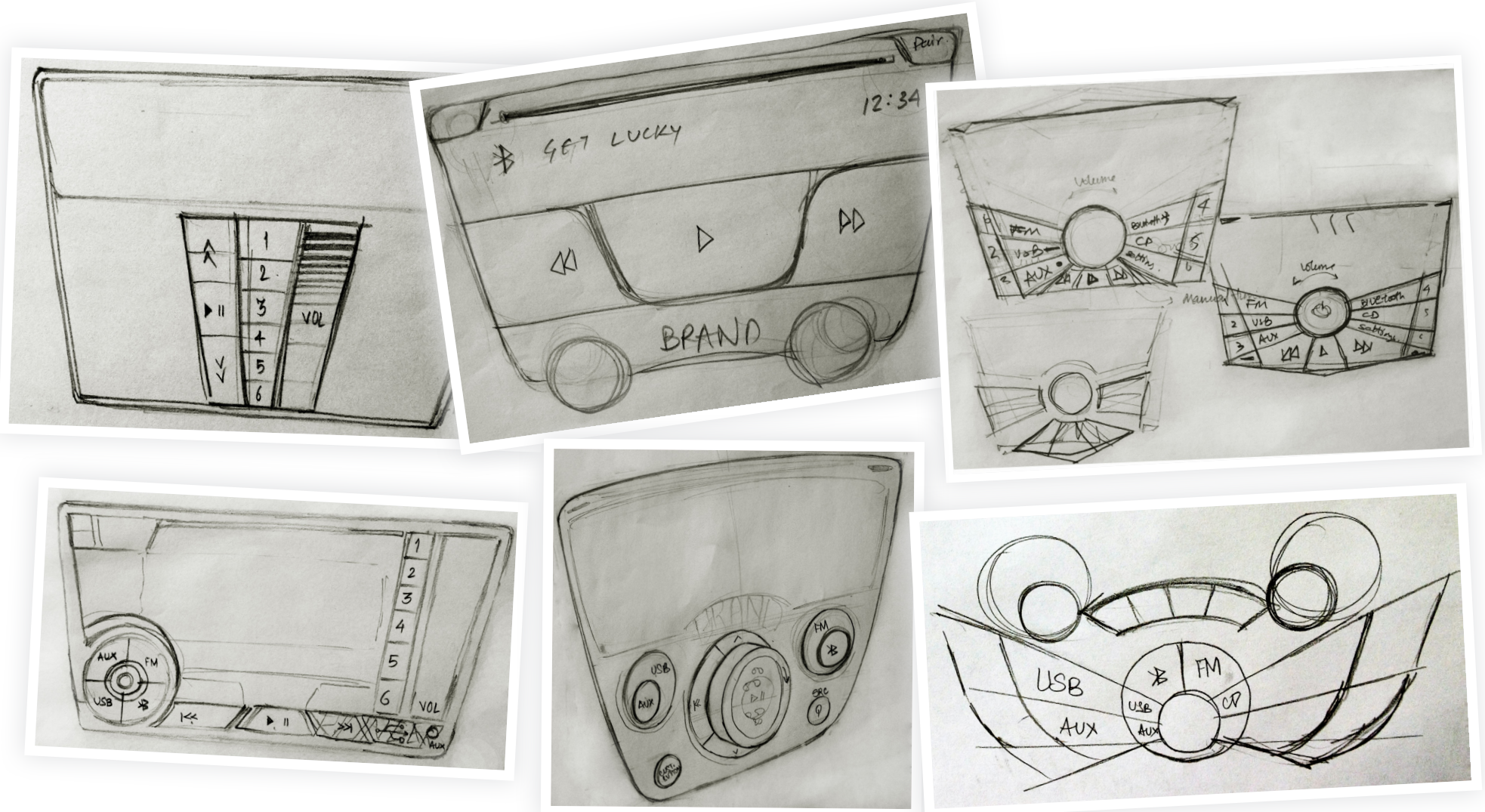
Description		Pros	Cons
 Dimmer knob to control volume and on/off control		multifunction button	to turn on the radio you have to increase the volume
		whenever you start, you start with low volume	limited movement
			difficult to search
 normal push button		dedicated button	need one more additional button
 toggle switch		visual feedback of status	looks old
 long press		multifunction button	learning curve
 turning wheel		clear affordance	too much space
		unlimited movement	it has to be round
		vertical and horizontal movement	

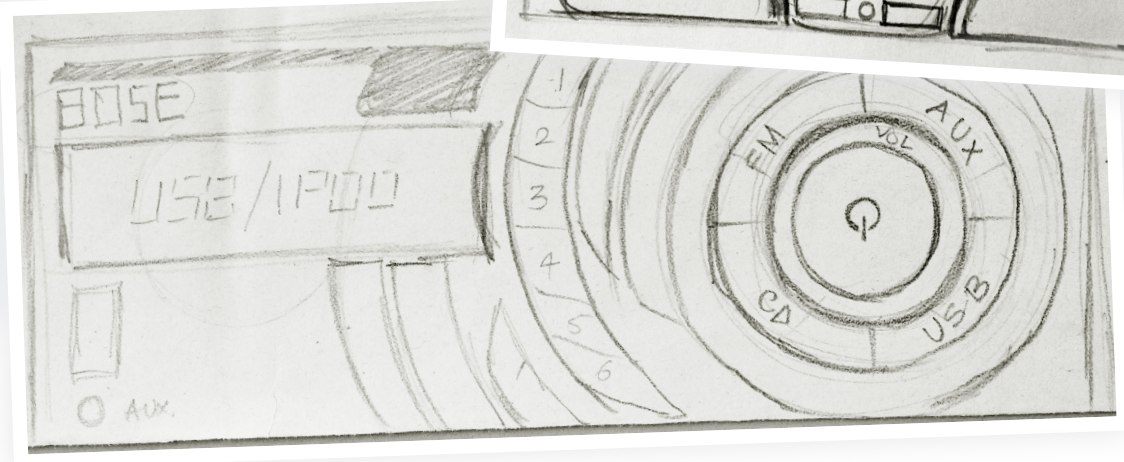
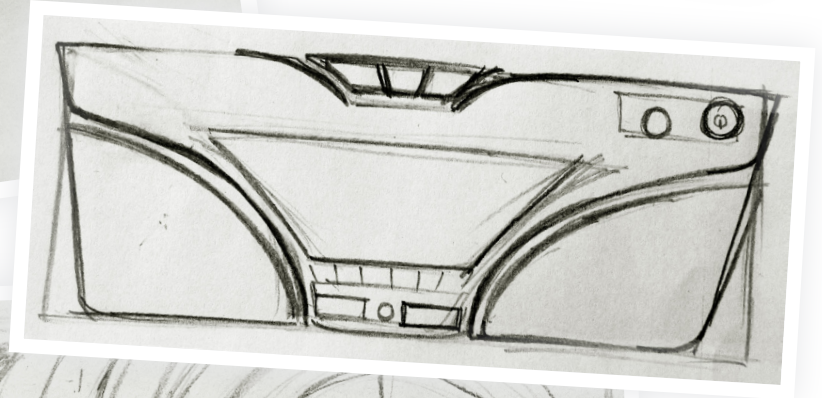
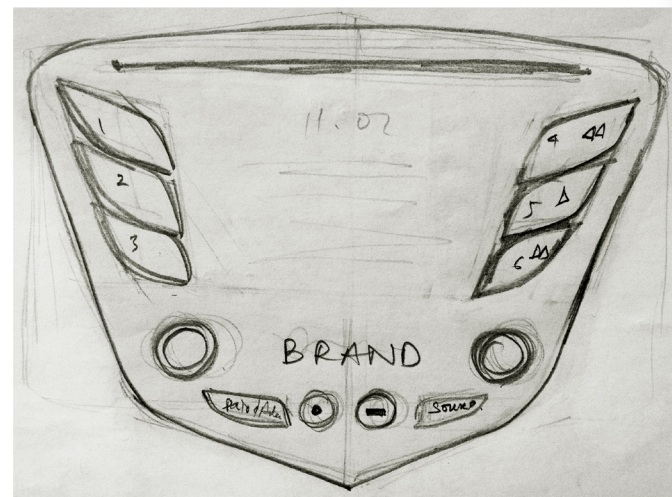
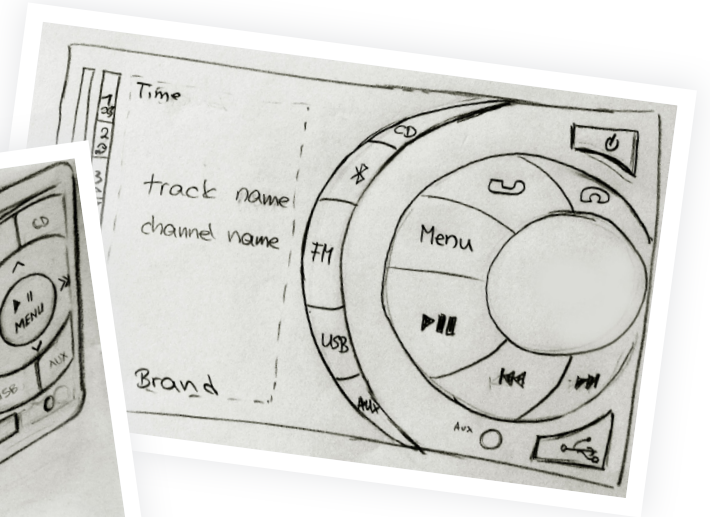
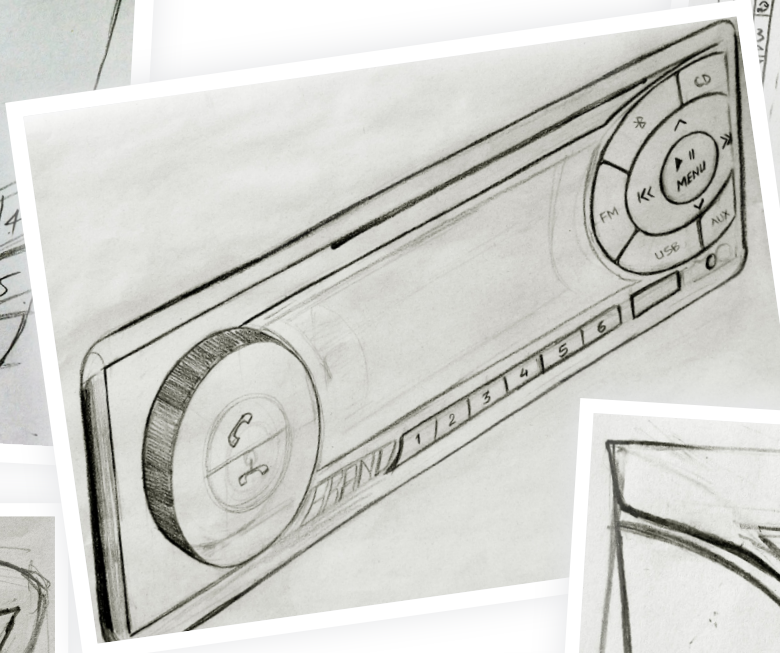
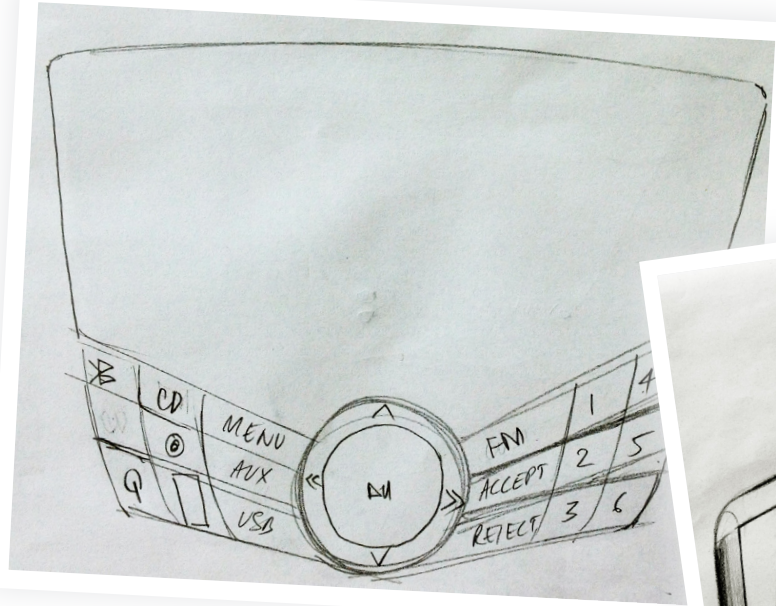
Description		Pros	Cons
	two ways button	two ways	more space
	seperate buttons for each source	direct mapping	takes much space and more buttons
		fast access	fixed number of options
	turning wheel with options	visual feedback of the current status	takes more space
		both vertical and horizontal affordance	fixed number of options
	dedicated push buttons	clear haptic feedback	slow movement
			vertical affordance
	touch/gesture button	new experience	not common
			no haptical feedback
	wheel	haptical feedback	vertical affordance
		clear affordance	to much space

Table 3.2 : Interactive elements

3.1.3 | Initial Sketches

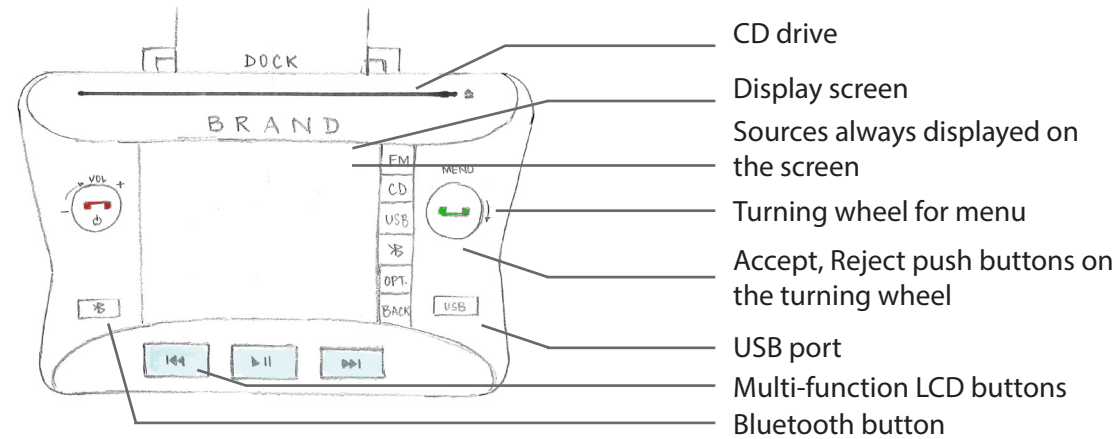
Based on the personas, we started exploring various forms, layouts and functionalities and came up with several exploration sketches.



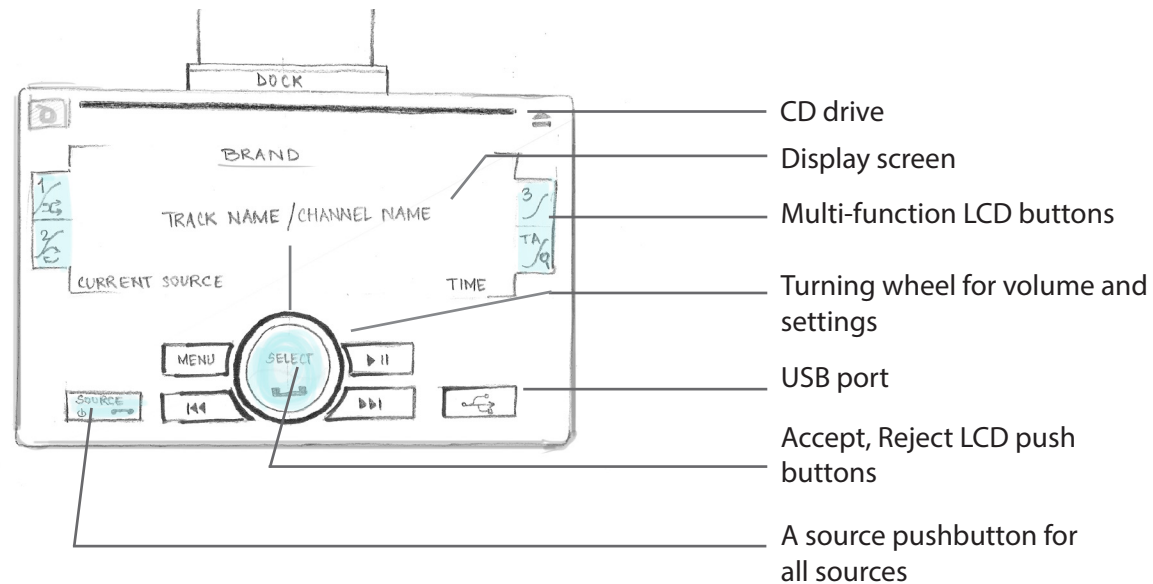


3.1.4 | Concepts for German persona

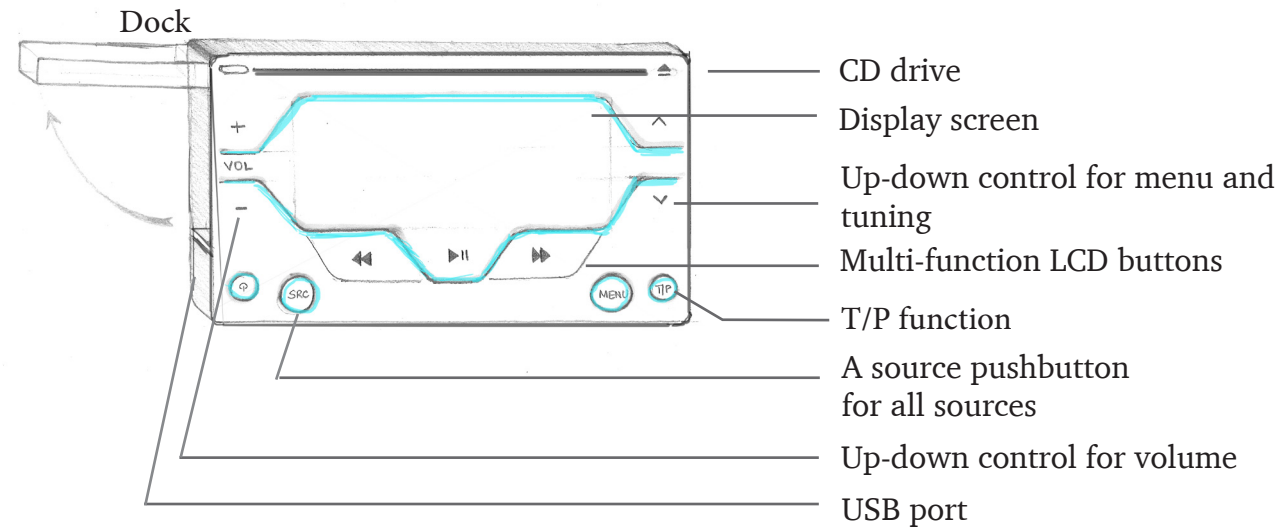
Concept 1



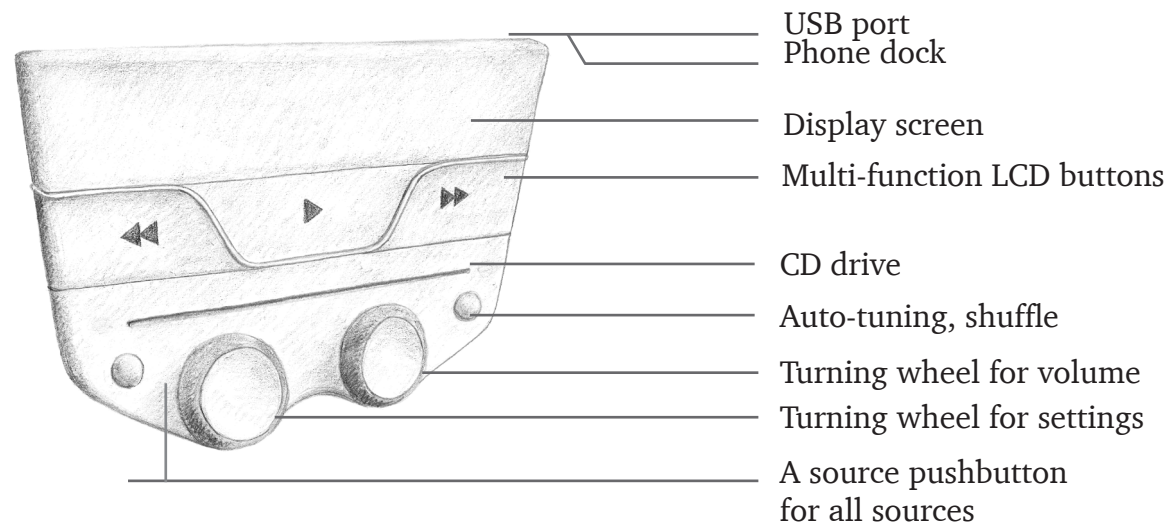
Concept 2



Concept 3

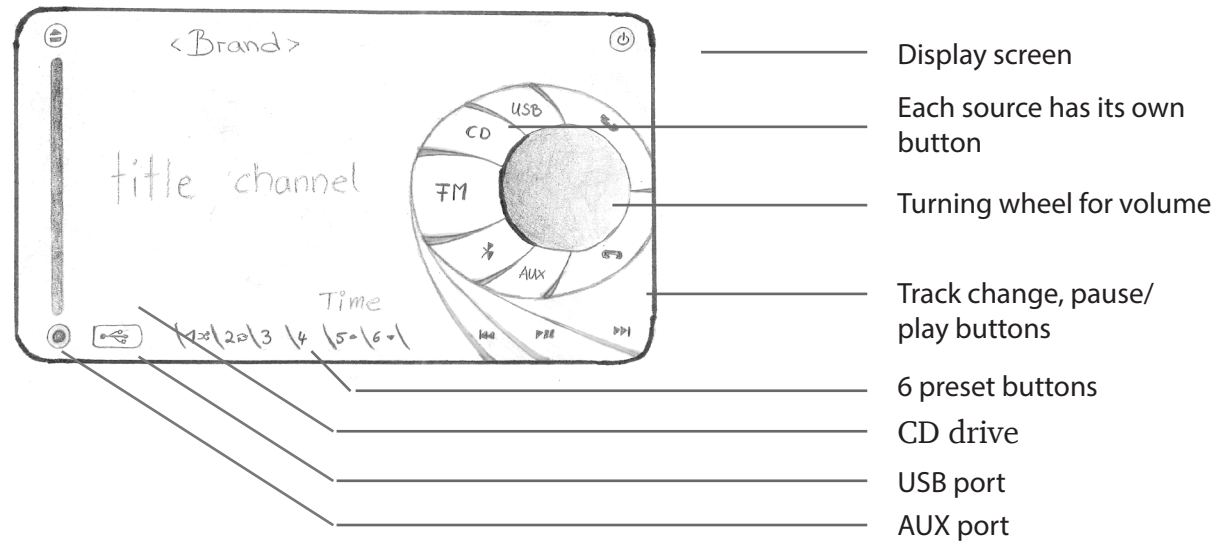


Concept 4

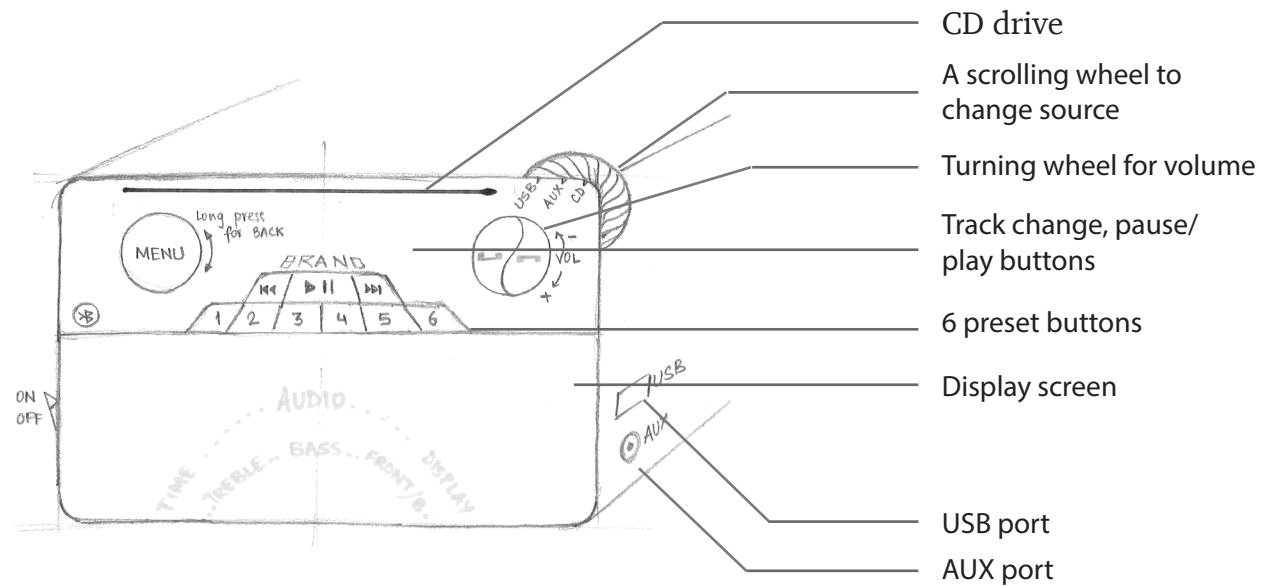


3.1.5 | Concepts for Indian persona

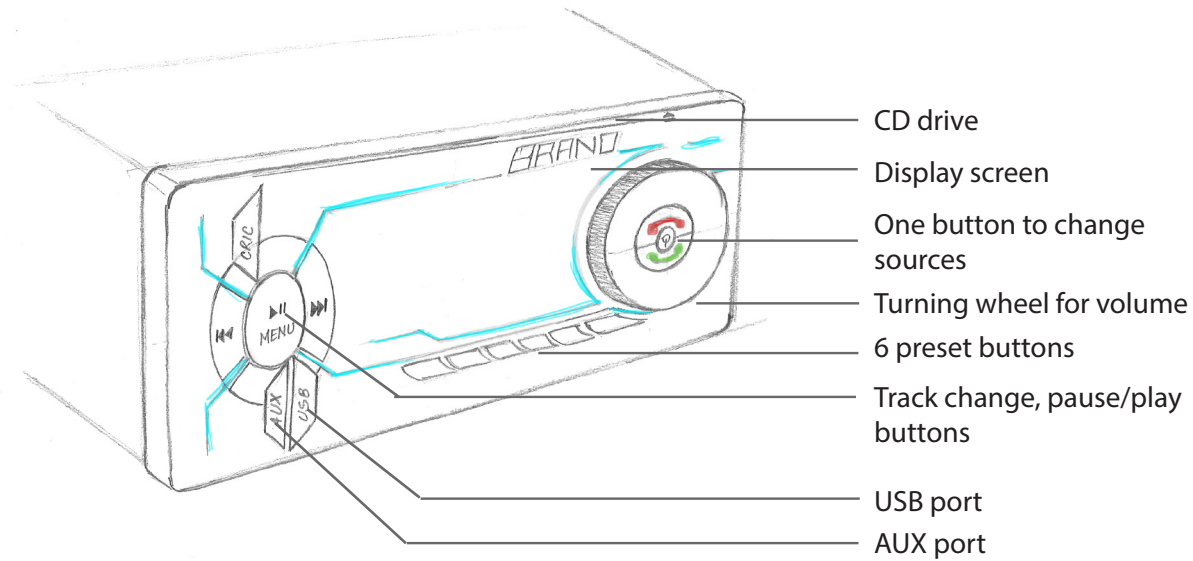
Concept 1



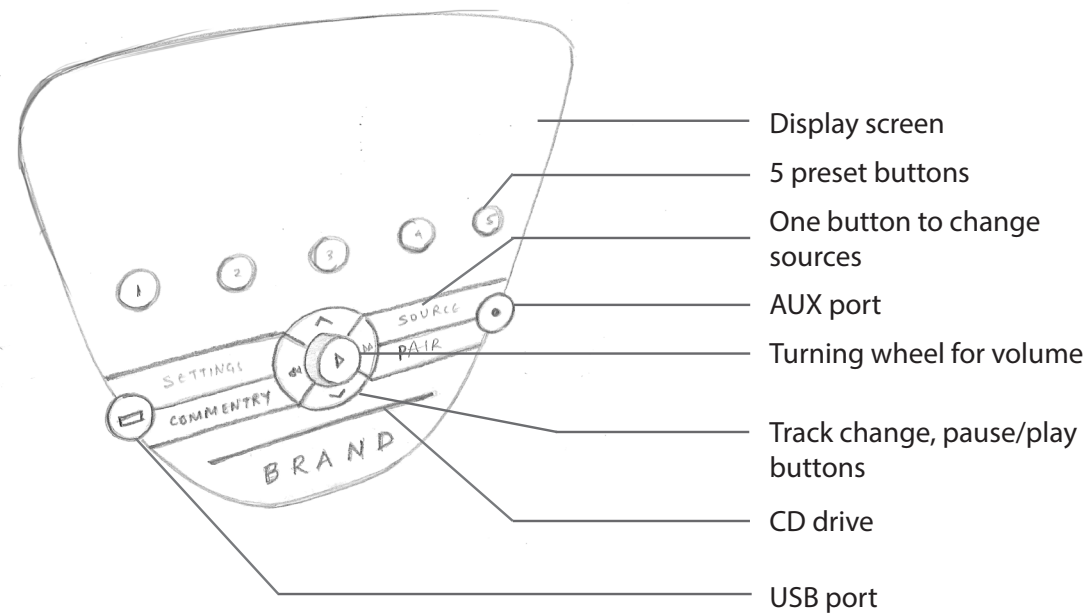
Concept 2



Concept 3



Concept 4



3.2 | Concept Evaluation

To select a favorite concept from the ones presented above, we used the discursive evaluation method. In the first step, we defined the criteria for the evaluation which were important to the German and Indian personas (Table 3.3). Furthermore, we chose a rating scale for the different criteria. The ideal value is 4 and if it is barely acceptable the value is 0. The following steps are the same for Germans and Indians only the result is different. Therefore the tables will be in section 3.2.1 and 3.2.2. To keep the tables clear we used shortcuts for the criteria.

After setting the criteria we made a pairwise comparison to determine the weighting factor of the different criteria (Table 3.4 and 3.7). This takes into account that not all the criteria are of the same importance. In the following step we assembled the solution properties of the concepts. We then discussed in the group which rating value from 0-4 each concept should get for the different criteria. In the last step we calculated the part and total value of the concepts (Table 3.6 and 3.9). For that purpose, we multiplied the rating value with the weighting factor in table 3.4/3.7 of the criteria. The normalised sum of these weighted rating results in the ranking of the concepts.

For Thomas the most important criteria for the vehicle entertainment console are the affordance of the buttons and controls, the functionality and a fast access (table 3.5).

The result of the rating and the following calculation is, that concept 4 is the winning concept. This concept stands out to the others, which is reflected in the differences between the priorities (Table 3.6). Only in the criteria of sportiness and functionality other concepts had better features compared to concept 4. Therefore we inserted these features in our chosen concept to improve it.

The criteria for the evaluation of the Indian concepts are nearly the same as the German concepts. Only sportiness and clean-look is replaced by appearance. This criteria is more fitting to the Indian persona, Varun. Furthermore, the weighting of the criteria is different. For Varun, the most important criteria are the affordance of the buttons and controls, fast access and that it is hassle free (Table 3.8). Besides branding is more important for Varun than for Thomas.

The result of the calculation wasn't as clear as it was with the German concepts. Concept 1 had the highest priority, but the margin between the concepts were not huge (Table 3.9). Furthermore all the concepts got a high rating

only in some of the criteria, therefore we weren't satisfied with choosing concept 1. Instead we choose from each concept the features Varun (persona) would like the most and designed an improved concept with that input.

Criteria		0 (-)	1 (0)	2 (+)	3 (++)	4 (+++)
A	Hassle free	More cognitive load, cluttered look, disconnected information display				Less Cognitive load, no clutter, proper flow of information
B	Affordance of buttons and controls	Perception is different from function of the button				Perception is the same as function of the button
C	Functionality	Does not fulfil the desired function				Fulfil the desired function
D	Branding	No brand identification				Clear Brand identification on the stereo
F	Customization	Not able to change anything according to personal choice				Able to change appearance or functionality
G	Fast Access	Takes more time to perform a function				Takes less time to perform a function
H	Premiumness	Inexpensive looking, no new technology				Looks expensive and some new technology use
I	Sportyness (German)	Not sporty (by material, colour, form)				Sporty looking (by material, colour, form)
J	Clean- look (German)	More number of elements				Less number of elements
K	Appearance (Indian)	No use of lights and generic				Good use of lights and edgy

Table. 3.3 : Defining the criteria

3.2.1 | German Concept Evaluation

		A	B	C	D	E	F	G	H	I
Hassle-free	A	1	1	0	2	2	1	0	0	0
Affordance of buttons and controls	B	1	1	1	2	0	0	0	0	0
Functionality	C	2	1	1	0	0	1	0	0	0
Branding	D	0	0	2	1	2	2	2	2	2
Customization	E	0	2	2	0	1	2	2	2	2
Fast Access	F	1	2	1	0	0	1	0	0	0
Premiumness	G	2	2	2	0	0	2	1	1	2
Sportyness	H	2	2	2	0	0	2	1	1	2
Clean- look	I	2	2	2	0	0	2	0	0	1
SUM		11	13	13	5	5	13	6	6	9
Weighing FACTOR		0.85	1.00	1.00	0.38	0.38	1.00	0.46	0.46	0.69

Table. 3.4 : Weighting factors for criteria for German

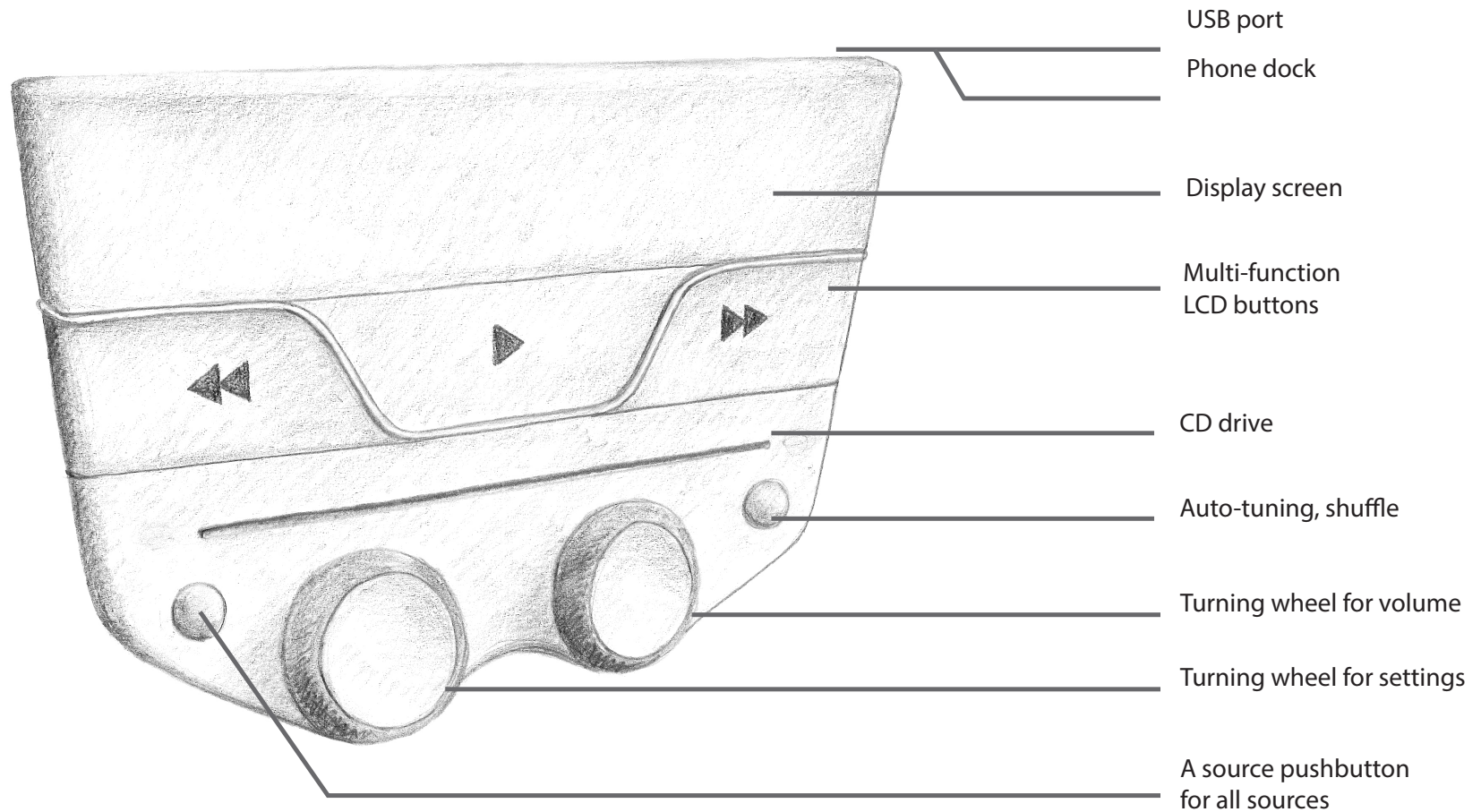
Criteria	Priority
Affordance of buttons and controls	1st
Functionality	
Fast Access	
Hassle-free	2nd
Clean- look	3rd
Premiumness	4th
Sportyness	
Branding	5th
Customization	

Table. 3.5 : Priority of criteria for German

Criteria	Weighting coefficient	concept 1		concept 2		concept 3		concept 4	
		Not weight-ed	Weighted	Not weight-ed	Weighted	Not weight-ed	Weighted	Not weight-ed	Weighted
A	0.85	1	0.85	2	1.7	3	2.55	3	2.55
B	1	3	3	2	2	3	3	3	3
C	1	3	3	4	4	3	3	3	3
D	0.38	3	1.14	3	1.14	3	1.14	3	1.14
E	0.38	3	1.14	3	1.14	3	1.14	3	1.14
F	1	2	2	2	2	3	3	4	4
G	0.46	1	0.46	2	0.92	3	1.38	4	1.84
H	0.46	4	1.84	2	0.92	2	0.92	3	1.38
I	0.69	2	1.38	3	2.07	3	2.07	4	2.76
SUM	6.22	22	14.81	23	15.89	26	18.2	30	20.81
priority	24.88	0.88	0.59	0.92	0.63	1.04	0.73	1.20	0.83
rank		4		3		2		1	

Table. 3.6 : Normalised solution of weighted ratings for German

Final German Concept



		A	B	C	D	E	F	G	H
Hassle-free	A	1	1	0	2	2	1	0	0
Affordance of buttons and controls	B	1	1	1	2	0	0	0	0
Functionality	C	2	1	1	0	0	1	1	1
Branding	D	0	0	2	1	1	2	2	1
Customization	E	0	2	2	1	1	2	2	2
Fast Access	F	1	2	1	0	0	1	0	0
Premiumness	G	2	2	1	0	0	2	1	1
Appearance	H	2	2	1	1	0	2	1	1
SUM		9	11	9	7	4	11	7	6
Weighting Factor		0.82	1.00	0.82	0.64	0.36	1.00	0.64	0.55

Table. 3.7 : Weighting factors for criteria for German

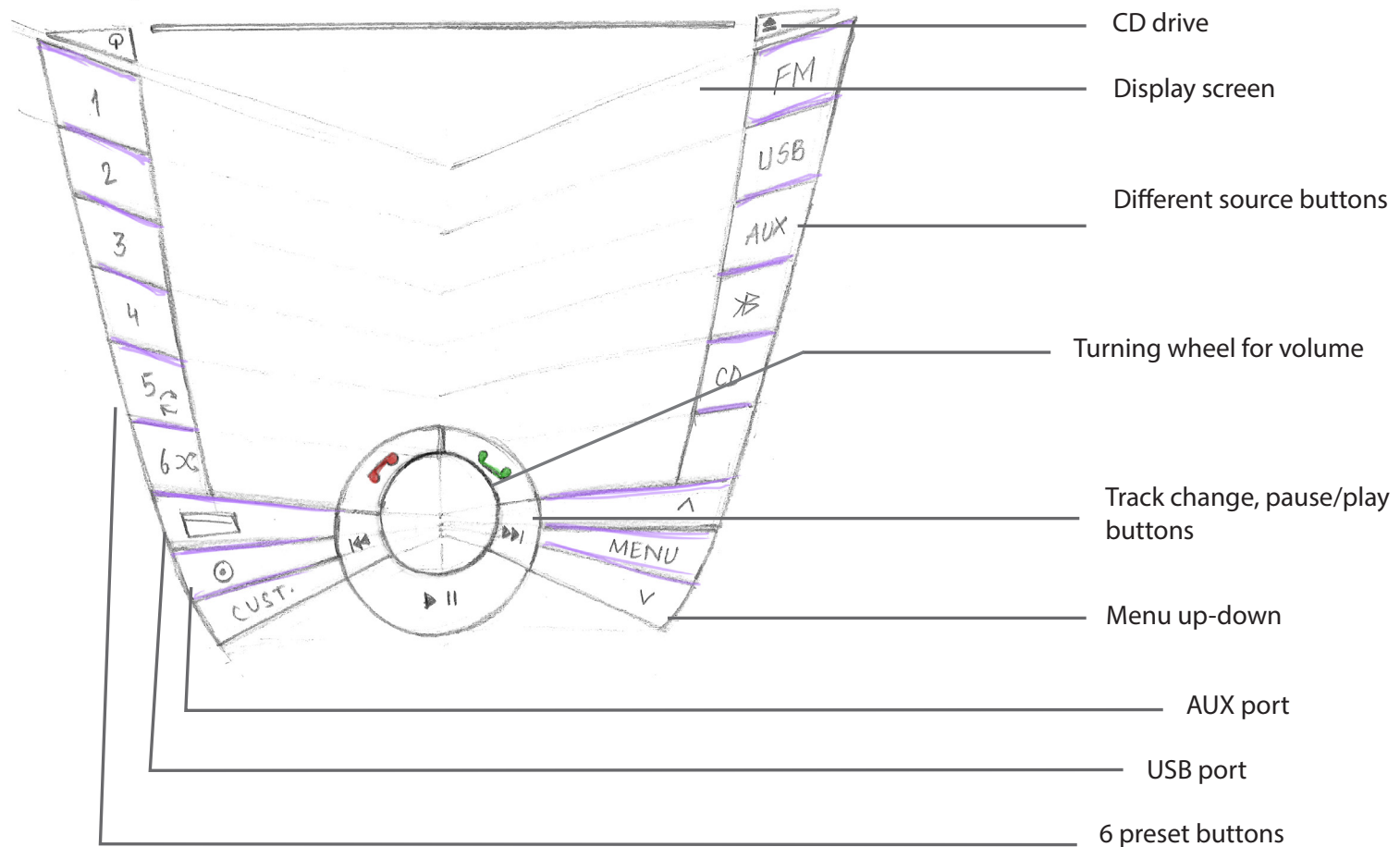
Criteria	Priority
Affordance of buttons and controls	1st 1st
Fast Access	
Hassel free	2nd 2nd
Functionality	
Branding	3rd 3rd
Premiumness	
Appearance	4th
Customization	5th

Table. 3.8 : Priority of criteria for German

Criteria	Weighting coefficient	concept 1		concept 2		concept 3		concept 4	
		Not weighted	Weighted	Not weighted	Weighted	Not weighted	Weighted	Not weighted	Weighted
A	0.82	3	2.46	2	1.64	1	0.82	3	2.46
B	1	3	3	3	3	2	2	3	3
C	0.82	3	2.46	3	2.46	4	3.28	4	3.28
D	0.64	4	2.56	4	2.56	4	2.56	4	2.56
E	0.36	4	1.44	3	1.08	4	1.44	3	1.08
F	1	3	3	2	2	2	2	3	3
G	0.64	4	2.56	2	1.28	4	2.56	3	1.92
H	0.55	3	1.65	1	0.55	3	1.65	2	1.1
SUM	5.83	27	19.13	20	14.57	24	16.31	25	18.4
priority	23.32	1.16	0.82	0.86	0.62	1.03	0.70	1.07	0.79
rank		1		4		3		2	

Table. 3.9 : Normalised solution of weighted ratings for German

Final Indian Concept



Chapter 4

Final Concepts

4.1 | German Concept

Display

Time, sources active are shown at all times.
The other details change with the source.
If pressed, the display ejects out to reveal the dock.

T/P function

Switches on traffic updates, switches off traffic updates

Source button

One way push button for changing source

Turning wheel for volume

The turning wheel is for changing volume.
FM, CD, USB : The push button in the center is used for switching on and switching off the radio. In case of a call : Call Accept

Multi-function LCD buttons

FM mode : 3 presets
CD mode : Previous track, play/pause, next track
Bluetooth mode : Previous track, play/pause, next track
USB mode : Previous track, play/pause, next track

CD eject button

Multi- function LCD button

FM mode : Auto scan button
CD, USB, ⌘: Shuffle button

Turning knob for settings

FM, CD, USB, ⌘: To scroll through the settings, turning wheel is used.
The push button in the center is used for selection. In case of a call : Call reject



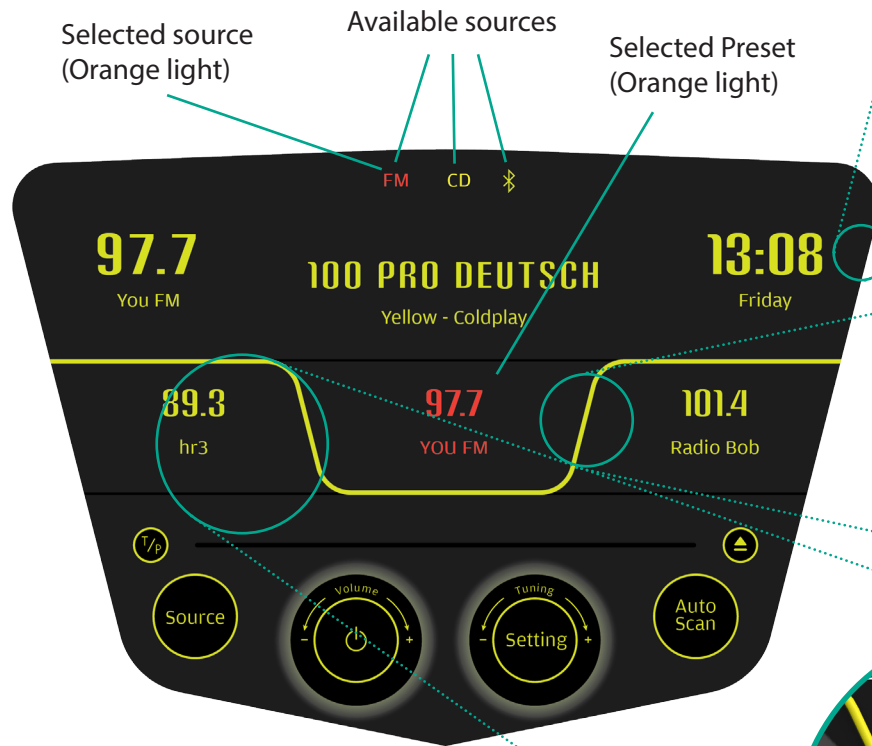
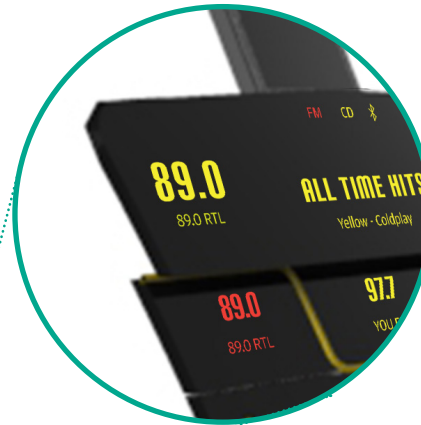


Fig. 4.2 : Visual feedback



Dock for phone is hidden behind the display panel so that it is not visible when not in use. This provides a clean look.



A rubber tubing running between the frequently used buttons. This feature not only provides a sporty look but also a tactile feedback to access the buttons blind.



There are LCD multi-function buttons which display a different function every time the source changes. This way, there is no confusion about the function of the button.

Fig. 4.3 : Open dock feature

Fig. 4.4 : LCD button

Fig. 4.5 : Bright rubber tubing

After evaluating the criteria for the German persona as well as the concepts, we found out that affordance of buttons, functionality and fast access was of primary importance for the German persona. Keeping this in mind, we selected the idea of having multi functional buttons with an LCD display which changed the display when the source changed thereby making the function of the button clear. This would also prevent more than one function written on the button which would make its usage simple and not confusing. The following law backs this feature :

Hicks law

Hick's Law states that the time required to make a decision is a function of the number of available options. It is used to estimate how long it will take for people to make a decision when presented with multiple choices. For example, when a pilot has to press a particular button in response to some event, such as an alarm, Hick's Law predicts that the greater the number of alternative buttons, the longer it will take to make the decision and select the correct one. Hick's Law has implications for the design of any system or process that requires simple decisions to be made based on multiple options.[9]

Another important feature of the German persona was the sportyness and love for adventure and speed. We decided to take this further and emphasize it in the design. The use of bright colours, silicone rubber tubing running through the design and also around the turning wheel, gives it a sporty look. The way the silicone tubing runs also looks like a racing track to reflect the interest in

speed and racing. We have selected a stylized font called Carbon which has slightly rounded edges, yet has a digital and sporty feel to it. The final form of the entertainment console is very trendy and young, yet it is kept simple and clean. A docking facility has been provided for a smartphone so that the phone can be conveniently docked for navigation and also be charged at the same time. This dock can be opened by pressing the display once. The display is ejected out and the dock is revealed. It can be closed in the same way.

The German concept has the following features :

LCD buttons : It uses LCD buttons as multi functional buttons. These buttons change function and display depending upon the source selected.

Source button : The source button is used as a one-way push button for source. The sources are active only if a device is connected to the system. Eg. The sources would show USB option only if a USB stick is connected to the stereo. The display is used to show the active source and also the next source in the line of sources so the user knows which source would be active next if he presses the source button.

Auto tuning/Shuffle button : The shuffle button also functions as a auto-tuning button for the radio. If the source is selected as FM, then the button switches to Auto-tuning option.

Turning wheel for volume : The turning wheel is meant for changing volume. It is not used for any other purpose, it has a dedicated function for vol-

ume. Turning wheel have been used for their clear affordance of changing volume.

Turning wheel for settings : This turning wheel can be used for manual tuning of the radio in FM mode. It is also used for changing settings from the menu. The settings can be selected by the push button on top, and then the turning wheel can be used for selecting from the menu. The display shows what is next in the menu and what is under each tab for better understanding and selection.

T/P function : This is a small push button which is meant for switching on and off the function of traffic updates.

Dock : A dock has been provided for a smart-phone so that navigation facility can be used conveniently. The dock can also be used to simply hold the phone and charge it. This is a feature often used by Germans, which is why this feature seemed very useful. The port can be purchased along with the stereo system.

USB port : A USB port has been provided at the same place as the docking port. It can be plugged in and then the display can be pushed back into place. People don't regularly remove their USB stick from the stereo system, thus plugging it in and leaving it there till you have to change the music on the USB stick is feasible.

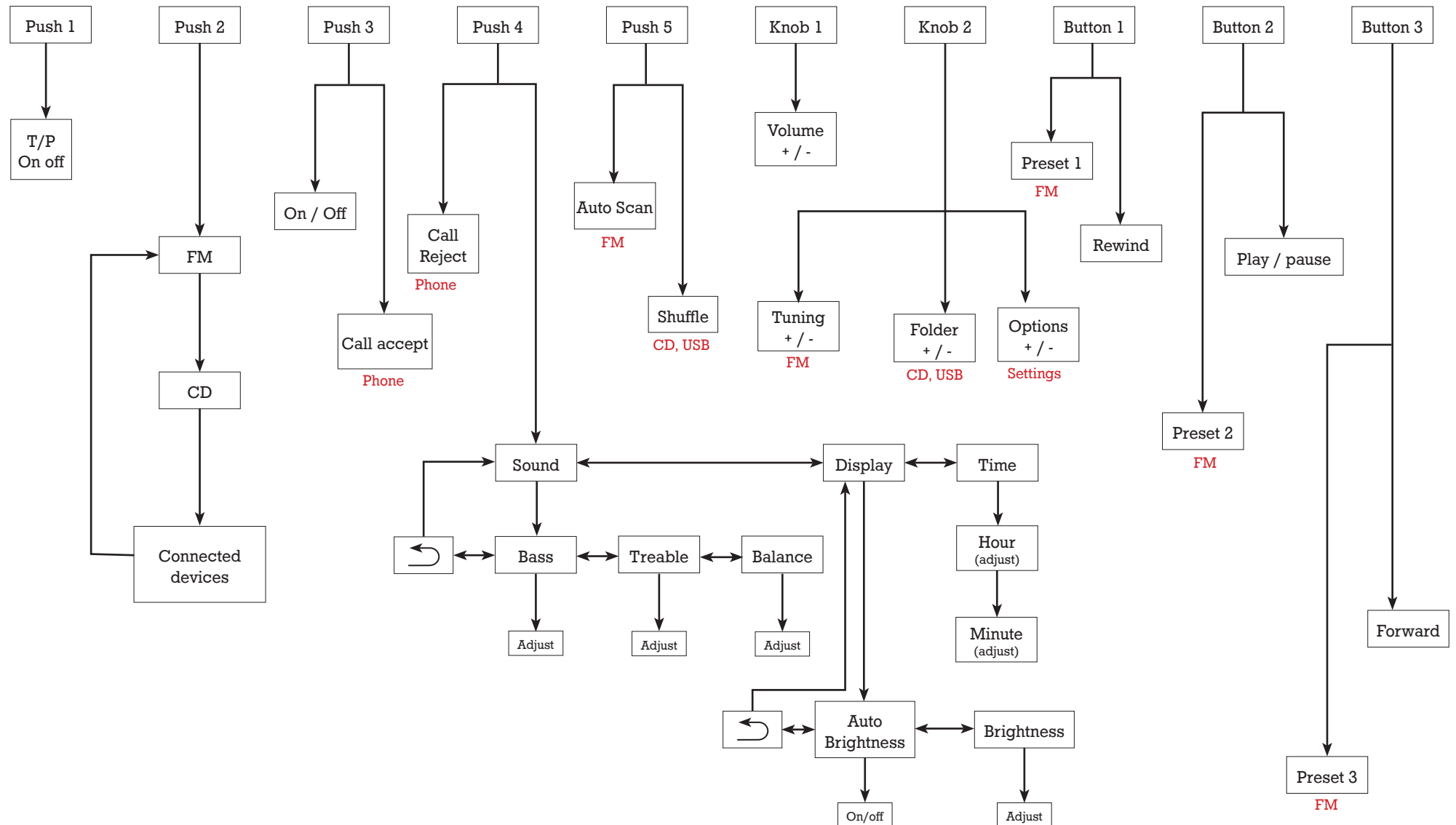
Bluetooth : Bluetooth feature has been provided for connecting the phone wirelessly.



Fig. 4.6 : German design on dashboard

Visualization of the entertainment console design on the dashboard of a German Kleinwagen

Information Architecture of German concept



Scenario #1

Thomas manually sets the radio channels, he selects the frequency he wants and saves it in a preset. After this, he changes the source.



Rotate knob to set frequency



Long press to save



Push to change source

Scenario #2

Thomas connects the phone via the dock. He receives a call while driving and receives the call via the entertainment console.



Phone icon pops up when connected



Switch to Phone mode by pressing
Source button 3 times



Press the button to attend call



Scenario #3

Change Bass level of the music played by the entertainment console.



Press setting to enter settings mode



Rotate knob scroll through the options to select sound



Rotate knob to scroll through the options to select sound



Press button to enter the selected menu

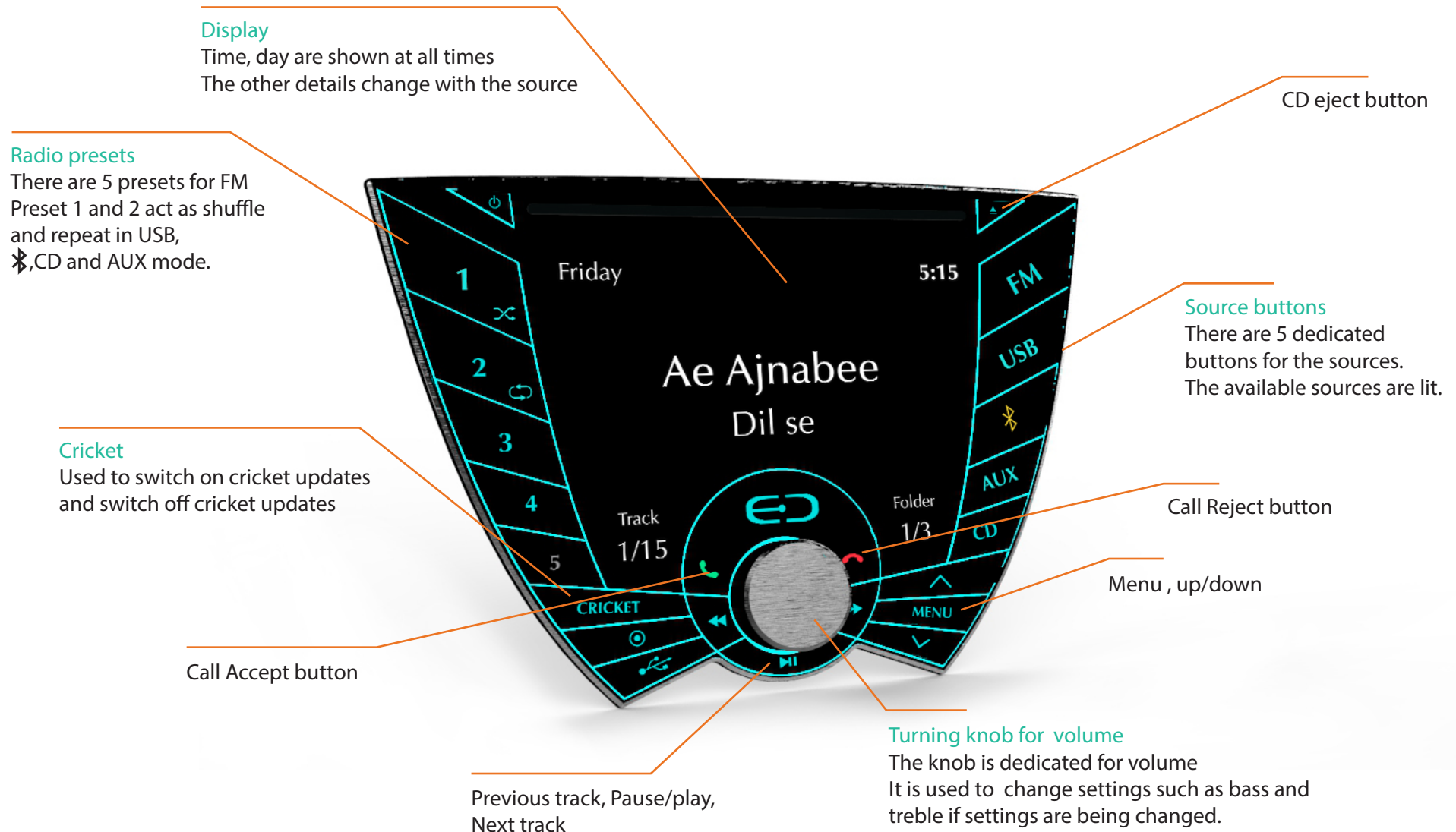


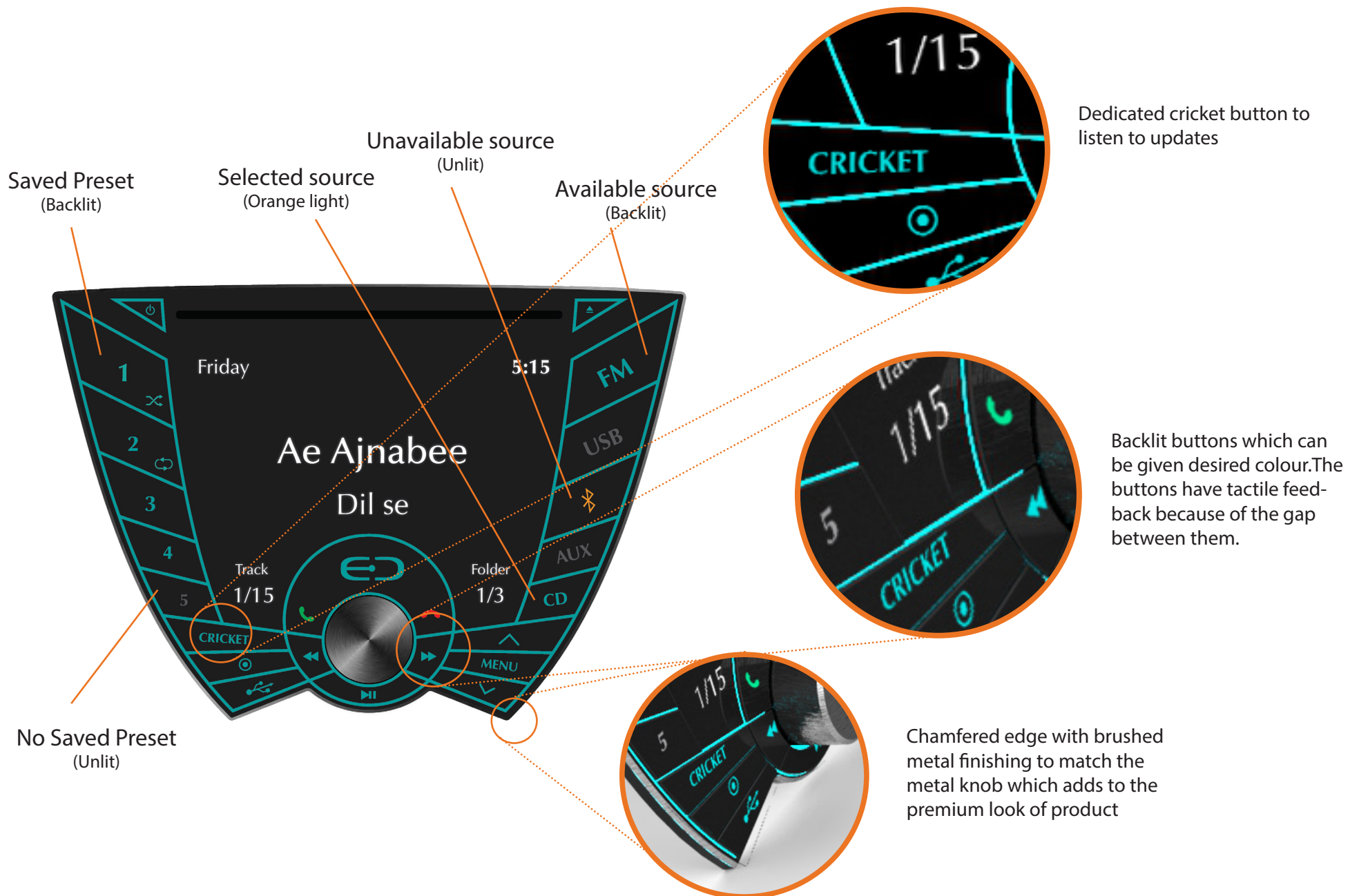
Rotate the knob to adjust Bass level.



Press button again to exit the menu.

4.2 | Indian Concept





After evaluating the criteria for the Indian concepts as well as the persona we found out that the affordance of buttons and fast access design was of highest priority for the Indian design. Keeping this in mind we made clear distinct buttons for the various sources. These buttons are kept big in size to make them easier to press. The following law explains the use of big buttons.

Fitts Law stated that the size of the target object along with its distance from the starting location could be directly measured, allowing him to model the ease at which a person could perform the same action with a different target object. [10] In simple words, the bigger an object and the closer it is to us, the easier it is to move to.

The theme of EDM and techno music was used as a theme for the Indian entertainment console. The Indian persona Varun likes EDM music and enjoys meeting with his friends and goes for parties often. Using bright blue light for the design, sharp edges, with oblique lines which seem to radiate out from the centre of the console behind the turning knob of the volume are used to bring across the theme. The font used for this display is Optima. It has very slight curves along its edges. It gives the display a classy look.

The Indian persona was rated high for customization. Thus a setting of changing the colour of the light has been added in menu under display settings. A button for listening to cricket updates has also been added. This can be used if a signal from the radio is available. However, if such a feature is not available, the button can be customized to favourite audio settings etc. The Indian user likes premiumness in his product. Thus we have kept a brushed steel knob in the design to give it a premium feel. The language of sharpness and premiumness is further continued in the chamfer around the edge of the entire entertainment console. This is also given a brushed steel finish.

The final form of the entertainment console is inspired from wings to reflect on the aspirational and ambitious nature of the young student.

The Indian concept has the following features :

Separate dedicated buttons for the different sources :

Five separate source buttons have been provided for the various sources that the entertainment console supports. It was observed and concluded that the Indian users like to have a lot of features in their entertainment system. Thus, all the sources were given separate buttons so that the multi-functionality of the console could clearly be communicated to the user.

Radio presets : Five radio presets have been provided in this entertainment console. These buttons are also kept big for easy access.

Turning wheel for volume : The turning wheel is meant for changing volume. It is not used for any other purpose, it has a dedicated function for volume.

Menu, up-down buttons : These buttons are used to change menu settings and move from one setting to another. The up-down buttons are also used to change the folder when a USB or CD is attached.

Cricket commentary button : This is a small push button which is meant for switching on the function of cricket updates and commentary.

AUX : An AUX port has been provided so that all kinds of phones can be connected to the system. Indians mostly travel with friends or family, thus an AUX port can come in handy.

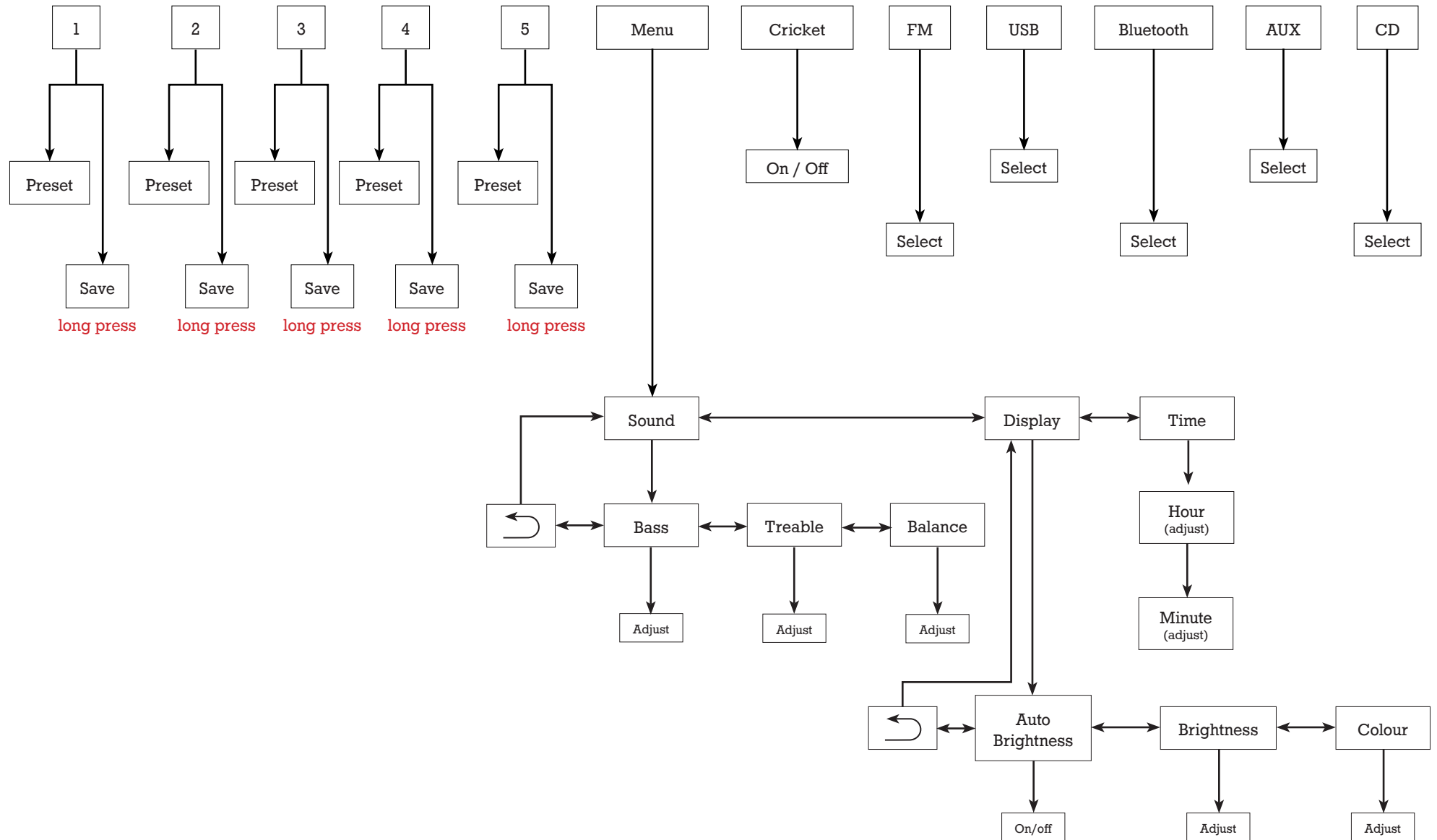
USB port : A USB port has been provided along with the AUX port to connect the phone or a USB stick.

Bluetooth : Bluetooth feature has been provided for connecting the phone wirelessly.



Fig. 4.26 : Indian design on dashboard

Visualization of the design on the dashboard of an Indian car



Scenario #1

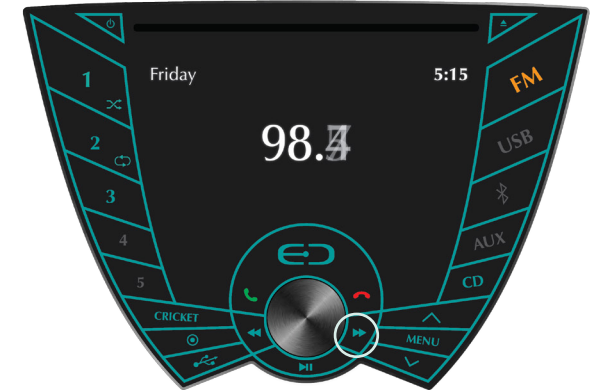
Varun manually sets the radio channels, he selects the frequency he wants and saves it in a preset. After this, he changes the source.



Press Forward button to change radio frequency by 0.1



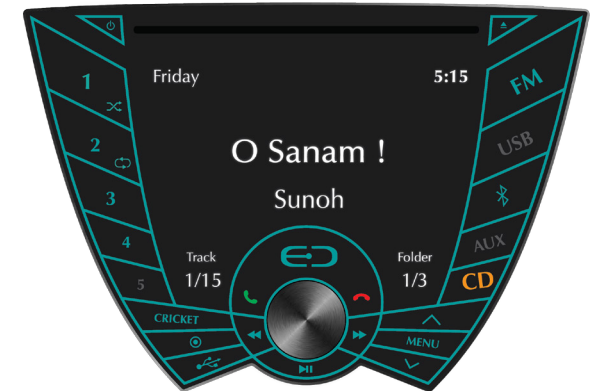
Long press to auto scan to next radio station



Long press to save radio station



Press CD button to change source to CD



Scenario #2

Varun connects the phone via bluetooth. He gets a call while driving and receives the call via the entertainment console.



Bluetooth icon lits up as soon as paired device comes in the range



Long press the button to pair with another device. Bluetooth icon starts blinking



Pairing completed



Screen display the name of device it is paired with

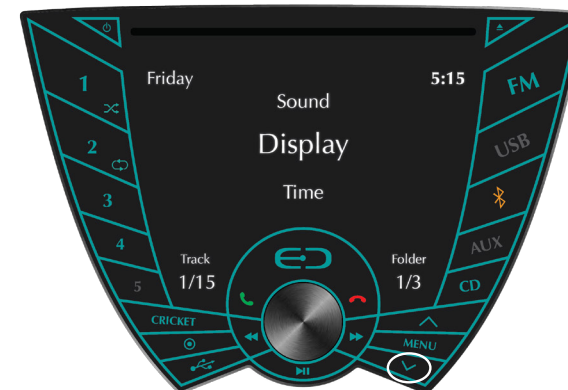


Press Call accept button to receive call

Change colour of the light of entertainment console.



Press MENU button to enter settings



Press down arrow to scroll through options



Press MENU button to enter display settings



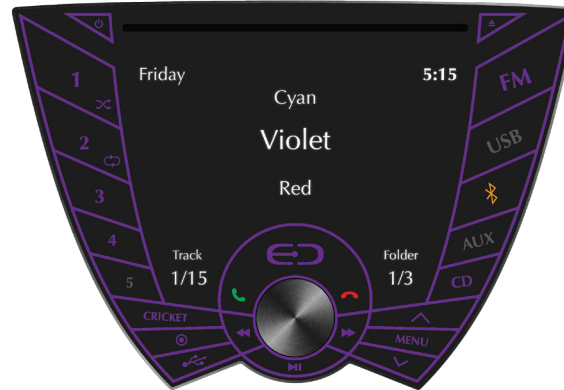
Press down arrow to scroll through options



Press MENU button to enter colour settings



Press down / up arrow to scroll through options



While scrolling through options, backlight changes to the respective colour



Press MENU to select the desired colour and exit



At the end of working on the design and details of the final concept, we use the persona as a reference to validate the design.

5.1 | Concept validation of German concept

Aspects of the persona that reflect in the German entertainment console

Affordance of buttons and controls : The frequency of usage of the buttons depicts the size of the buttons. The multi-function buttons for presets and track change are kept big since they are the most frequently used depending on the source. The volume and settings change is done by turning knobs. Knobs have a clear affordance of changing a feature through a wide range. The Eject and T/P buttons are the smallest since they are rarely used.

Hassle free : The multi-function buttons are made extremely hassle free by giving them a LCD display. The display changes according to the function of button in different modes.

Clean look : The LCD buttons reduce the clutter as they do not have all the functions written on them at all times. The dock and USB ports are hidden when not in use.

Functionality : The various features provided in the system are in accordance with the need of the user. Example : A dock has been provided for the



user to plug his phone in so that he can use the navigation feature. At the same time it can act as a holder for his phone and charge the phone.

Sporty appearance : The tubing running around the big buttons gives it a sporty look. Bright colours have been used for this purpose. This also gives the user a tactile feedback of the buttons.

Safety : All the controls are either push buttons or turning knobs. Thus, they have a permanent space and tactile feedback. The buttons are kept big for easy and fast access. This ensures the user does not need to visually locate the buttons and feels in control of the system.

5.2 | Concept validation of Indian concept



Aspects of the persona that reflect in the Indian entertainment console

Hassle free : Bluetooth connectivity has been provided for the phone thus not requiring the use of cables. However if there is a need for charging the phone along with listening to music, the USB port can be used.

Features : The console provides the user with various possibilities of connecting devices, radio presets. It also provides an additional button for cricket commentary and updates. (this feature is not yet provided by the radio channels).

Premiumness : The entertainment console has some small parts in chrome finish to make it look premium. There is also clear branding provided in the center since the user is brand-conscious.

EDM theme : The theme used to design this entertainment console is EDM and techno since the user likes to listen to EDM. Thus, bright blue light and straight, sharp lines are used. All the lines look like light radiating out from one source.

Customization : The Indian persona can multi-task and likes customization. The various sources are available on separate buttons. A button is provided for cricket commentary. There is also the option of changing the light colour for the console from the menu.

Safety : All the controls are either push buttons or turning knobs. Thus, they have a permanent space and tactile feedback. This ensures the user is used to them and feels in control of the system.

Impact of culture on design

The goal of the project was to design two entertainment consoles for Indian B segment cars and German Kleinwagen. Through this project we aimed to understand the importance of User Centered Design. We conducted a total of twelve user interviews to get insights into user needs. We also studied how culturally different the two kinds of users are. A workshop was conducted by our supervisor Pratap Kalenahalli Sudarshan on how to conduct Interviews. In this workshop, we were also shown examples of various interviewing techniques that can be used for different cultures. We studied the various insights we gained from the 6 German interviews and 6 Indian interviews. We found some differences in their behaviour and usage patterns. This is reflected in our design for the two entertainment consoles. There is a clear

difference in user needs and wants between the two cultures. Such differences must be studied while designing a product to suit it to the user instead of trying to make the user adapt to the product.

Adherence to time schedule

For most part of the project, we followed the time schedule that we made in the beginning of the project. Except for some days, we kept to the schedule.

During user study, the interviews had to be conducted when the potential users had the time to schedule it. We got delayed by two days since we could not foresee who our target users would be. We tried to make up for this time by dividing the interviews in a manner that they could be conducted simultaneously by two teammates at

a time and also worked a few hours extra for the rest of the week.

In the third week of the project, we began ideation and conceptualization. The German concepts were ready sooner than the Indian concepts. Thus, we started detailing the German concept and re-worked on the Indian concepts after that. We switched the tasks slightly to make sure we completed our work in time.

Team dynamics

The team comprised two Mechanical Engineers, one Interaction design student and one Industrial design student. It was an inter-cultural, inter-disciplinary team. The goal was to design two entertainment consoles for German Kleinwagen and Indian B segment cars. In the process, we had to understand how culture impacts design. We had to learn from each other and use our knowledge and understanding collectively for the execution of this project.

During the course of this project, Indian students learnt the task of Project Management from the German students. A time plan was made keeping in mind everyone's daily schedules, institute events, public holidays in between so that the output can be achieved in the given time frame. Task sheets and a competency matrix was also made for the division of work effectively. The Indian students also learnt evaluation methods for various concepts. As designers, often decisions are made between concepts by gut feeling or can fall prey to making assumptions. However, using defined evaluation methods and calculating weighting factors for criteria allows for

prioritization as well as a feature-wise evaluation with respect to each concept. Thus, every feature is analysed with respect to the concept and independently.

The German students learnt the task of conducting user interviews and affinity mapping from the design students. The aspect of empathy and keeping the user in the centre of the design process was emphasized on. It helped them to learn how to gain insights from the various statements and observations made from the user interviews. They also understood design terms such as affordance and its importance in design of products. The interaction of the user with the entertainment console in both cases was studied in detail. This was used to bridge the gap between the engineering of the product and the user. The German students also learnt how to translate the user's personality, likes and dislikes to the form of the product, interface preferences and aesthetic details that can be used in the design.

As a result of this inter-cultural and inter-disciplinary interaction between the teammates and other colleagues of the institute, each of us has gained a new perspective to look at our work and analyse it better. It has allowed us to be more critical as well as more empathetic in the execution of our project. The project was characterized by its intercultural aspects not only in the design process but also in our interactions with each other. We got along very well throughout the course of this project and spent time together outside of the work environment as well. As a result of this positive interaction, we executed our project well. We are looking forward to the collaboration in India in October 2014.

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Appendix

1. Recruitment Protocol

Age 20 - 30

Indian or German.

Should have driving experience of at least 6 months.

Own a car or willing to buy a car.

Available for interview before 3rd June 2014

For online interview

- Device to connect to internet and a camera and a mic.

- Internet connection.

2. Questionnaire

Introduction

Hello my name is and this are my college.... We are students from the IITB and from the TU Darmstadt. Currently we are working on a project together. Our goal is to design an entertainment system for the car. To do that we would like to know what the user is interested in and therefore we would like to interview you as a possible customer. Would it be ok for you if we record the interview?

Where do you live? Who do you live with?
What course are you doing? What is your profession?
Why have you chosen the course?

What do you like to do in your free time? (sports/reading/tv/travel/music/nothing much/ not free/ go out with friends)
When did you do it last?
How?what?when?why?

Can you tell us what a routine day in your life is like?

What kind of a car do you have ?
What did you look for when you bought it?
If you could buy a car now, then which one would you buy?
Why? What do you like about it?

What do you like to listen to on a regular basis?
Source of music- youtube/cds/laptop/phone/radio
What are you entertainment choices?
Do you play an instrument?

Do you listen to the radio?
Do you listen to a lot of channels or do you have one constant channel you listen to?
What do you listen to in your car?

When do you use your car on a regular basis?
Do you have an entertainment system in your car? (standard / customized)
When did you drive last?
What did you listen to?
Something(radio/cd)- process to operate? Nothing- why not?
Does your entertainment console have a display? Yes- what is on it?
What do you think about your current system? Is the handling difficult or easy? why?
Do you find it useful or look at it? Is there anything else you would like to see instead?

Do you think your current system is worth the money you paid? (Price-Performance... ?)
What do you miss in your car's entertainment system?
What all information do you access in your car right now? If yes- why?

Do you have an ipod/shuffle/mp3 player or any other portable device?
Do you use them in your car?
Yes- which? how- wires/bluetooth/docks?
No- why? Which devices do you not use? Would you like to use any in the car?

3. Affinity mapping

Indian interviews

Heading	Subheading
Demographics	demographics
Safety	no distraction/ one thing at a time
	safty is important
Existing Features, User Needs	existing features of car stereo
	user need
Cognitive	less effort
	simple design, easy interaction
	hassel free easy access
	easy and quick access
Influence	expert`s advice/ depends on advice
	peer pressure
	is internationally orientated
Money	economical thoughts, balance of price and performance
	efficient Utilization
	money minded
	returns for investments, time and energy
Pass Time	likes make- belive and simulations
	watches tv regularly, just for shows, person of habit
	stress buster
Family Oriented	family is important, social
	hierachy

Technology	aware about new features
	early adopter (technology)
	technologically aware
	not aware about new features or does not want to change
	outdated, useless
	wants info on display/ maybe bigger display
Buying Criteria	high quality justifies a high price
	brand loyalty
	not brand conscious
	practical nature, functionality
Need/ Want	not demanding/ I have enough
	demanding/ I want more
Music Preference	not particular about music
	listens to music only in the car for company
	specific taste in music
Personality	likes to party, fun loving
	extrovert
	casual approach
	calm and composed
	sensitiv person, sensitive to society and morals
	ambitious
	comfort is important
	traditional
Misc.	open minded / likes to explore
	updated, current affairs and info.
	doesn't like advertisement
	privacy
Appearance	drives every day
	show off/ brag
	sensitive to appearance

Adaptability	adaptable to change
	internet is important -> wireless, lot of features
	interested in technology
Customization	customization

German interviews

Heading	Subheading
Demographics	demographics
Money	ready to pay for quality
	concerned about cost/ cost effectiveness
Range	support every format
	Multitasking -> wants a lot of features
	only listen to the radio, do not connect phone or other portable devices
	does not like much change or try very new things
Nature Of The Person	is extrovertend
	socialize
	- peer pressure
	a family person
	relexing, calm / clean design
	i like sports/ fitness
	speed, adventure, likes loud music
	casual style
Frequenzy Of Driving	drives daily
	drives only on weekends
Usage Of Cd Player	uses CD player
	obsolete technology CD
Interface Experience	Experience of simple interface (ipone lovers)
	prefers visually clear display with touch and info

Safty/ Security	i want haptical buttons-> safty
	one task at a time
	follow protocol
	secure future / security
Access Connectivity	quick access
	hassle free, easy and fast connection
Appearance	neat and clean
	likes high design, should look expensive
	look matters
Phone Usage	uses navigation often via phone
	phone is important universal use for everything
Information	wants to be informed
	user likes to get new information and learn
	wants to see/hear current traffic news/ latest info
Technology	very fokused interestet in cars (technologie) / sensitive to car design ad performance
	technologie friendly
	immediate result, physical innolvement and practical
Car	has spacious car, space is important
	comfort in car is important
Personal Involvement	full control / know inside out
	likes personalisted design/ custamize
Buying Crieteria	not brand and technology specific
	functionality usability is more important
	brand loyalty
Music Preference	does not have any fixed taste in music
	has particular tast in music
Purpose Of Car Using Car	shopping
	going to meet family
	travelling with car
	going to work/ university daily