Jabra®

Jabra CC
Communicator / Process

INDUSTRIAL DESIGN MASTER THESIS PROJECT

AALBORG UNIVERSITY SPRING 2011

TITLE PAGE

10th semester - Industrial Design
Department of Architecture,
Design & Media Technology
Aalborg University

PROJECT TITLE
Jabra CC Communicator

THEME
Advanced Electronic Product Design

PROJECT PERIOD
31st of January - 31st of May.

PAGES
112

SUPERVISOR
Finn Schou, Associate Professor
Department of Architecture,
Design & Media Technology.

RESUME

Jabra CC Communicator is an industrial design project concerning the design of an intuitive, robust and innovative headset of tomorrow for contact centres.
This report takes the reader through the process and development of a headset design and documents user-findings, ideation and crucial considerations in relation to the final project result.

THREE CREATIVE MINDS - ONE CREATIVE DESIGN TEAM

Thomas Lænner | Steffen Mølgaard Larsen | Rasmus Trudslev Pedersen

READING GUIDANCE

This project is separated into two individual reports; A process report documenting the journey from the initial steps to the final product design - And presentation report communicating and visualizing the final product design and concept.

Pictures are referred to as (01. picture text). The source can be found in the list of illustrations. All other pictures, diagrams etc. without any numbering and are created by the design team or gathered from Jabra's internal material.

The appendix material consist of both printed and electronic documents. The printed appendixes can be found in the back of the book and is referred to as (app. xx). The electronic appendixes can be found on the enclosed DVD are referred to as (app. xx).

Furthermore the enclosed DVD contains PDF copies of the process and presentation book.

ACKNOWLEDGEMENT

On behalf of the design team we would like to express our appreciation for all the help and support we have recieved in this master thesis project by thanking following people:

Interaction Designer Henriette Sjøgreen for arranging the collaboration with Jabra and all other members of the Jabra Mechanical Concept & Design Department for technical support and hospitality.

Henrik Brodersen and Stefan Heise from Jabra CC&O.

Jabra Packaging Team for displaying and promoting the design teams design work and competencies.

Mechanical Designer, Frank Larsen for product prototyping.

Betinna Christoffersen and Nicolaj T. Jacobsen from LN Eurocom in Aalborg and Copenhagen and their support and caller teams.

Henrik Mølgaard from Telmore Copenhagen and their support team.

Brian Kristensen from SOS International Copenhagen and their crisis team.

TABLE OF CONTENT

LIST OF APPENDIX

APPROACH AND STRUCTURE

COLLABORATION WITH GN NETCOM

This 4th semester master thesis industrial design project is written in the period 31st of January to 31st of May at GN Netcom in Ballerup, Denmark.

An initial meeting is arranged by replying a e-mail application sent by Jabra. The meeting takes place in February 2010 where the expectation for the collaboration from the design team and GN Netcom point of view are reviewed. GN Netcom is very open to the assignment but accentuate that the most interesting area for GN is the design of a headset for the professional segment - contact centres and offices (CC&O). Furthermore the design team is offered a desk at GN Netcom and the opportunity of using their facilities and resources through out the project, which the design team accepts.

In November 2010 the design team and supervisor visits GN Netcom with the aim of setting up a final plan for collaboration and overall project focus before the team moves to GN Netcom's department in Ballerup. The project is then initiated late January 2011.

01. IDENTIFICATION / 31st of January
Defining Jabra, their product portfolio and competitors

02. RESEARCH / 14th of February
Conducting user studies, understanding the context and extracting potential areas of focus.

03. IDEATION / 28th of February
Ideation of concepts through technology research, workshop and user-feedback.

PIN UP ONE - 4th of March
WORKSHOP - 4th of March
PIN UP TWO - 24th of March

04. DEVELOPMENT / 4th of April
Generating product designs based on selected concept. Evaluation through online questionary and internal feedback from Jabra.

A&D SKYPE STATUS PRESENTATION - 7th of April
PIN UP THREE - 2nd of May

05. DETAILING / 3rd of May
Detailing of mechanical engineering / product architecture, material selection, moulding approach and interaction and interface design.

06. COMMUNICATION / 16th of May
Development of promotional material for selling the product.

MOTIVATION & AIM

In many years the user centred design approach has been the new and popular mind set when designing. By involving the user in the entire process and taking starting point in the users needs and wishes, innovative products with great impact are designed. However as an opposition to this, the former mind set of design driven innovation arises and questions the user centred approach by saying that it is the designers' job to design and not the users'. Somewhere in between these two mind sets the design sets its starting point for this master thesis project. By this meaning that not two design processes are the same and in order to create the best solutions the mind set also needs to adapt.

The aim with this master thesis project is to demonstrate abilities, as a close-knit design team, to design an advanced electronic product to an unknown user group. It has been important to design for an unknown target group of users in order to demonstrate the design team's ability to work problem orientated through user research. By combining the user centred approach with the design centred the team will demonstrate the ability to solve and implement acquired knowledge into strong and innovative design concepts. The teams' sense of aesthetics will be reflected in various design proposals through the process without compromising the usability and the overall objective. In the end the final result will reflect the ability to transfer strong concepts into a unique product design from early sketches to 3D models and renderings, mechanical engineering and branding.
Besides demonstrating the design teams abilities as industrial design engineers the aim is to identify and develop our roles in a bigger company as GN Netcom.

THE COMPANY

GN GRAND NORTH

GN - Greater Northern Telegraph Company - was founded in 1869 as a telegraph company. Today the company are recognized as a headset company, GN Netcom, and hearing instruments and audiological diagnostics equipment, GN ReSound. Furthermore the company also produces and sells for OEM (Original Equipment Manufacturer).

GN Netcom is world leading in innovative headset solutions which is marketed under the brand Jabra. The company has approximately 900 employees in Denmark and a total of 4100 employees world wide. GN Netcom is founded in 1987 and launches their first headset, Stetomike, under the organization GN Grand North. In the year of 2000 GN Netcom launches the first Bluetooth headset, Jabra BT100, in the world and marks the position as global innovator within personal communication. This is also the year where GN Netcom buys the American company Jabra, which was founded in 1993 and specialised in hands free communication.
In 2008 GN Netcom's Contact Centres and Office (CC&O) becomes a part of the Jabra brand. This is followed by a restructuring in 2008 where two division within Jabra are created; CC&O and Mobile. The two division are established in order to create greater focus on business to business and consumer markets.
Jabra has won various awards for their design and sound quality. In 2009 they won the Red Dot Best Product Design Award for the Jabra JX20 and the Frost & Sullivan Innovation Award for the Jabra Pro 9400 Series. Recently the 1st of April 2011 they received two more Red Dot Design Awards for Jabra Freeway and Jabra Wave.

Throughout the report GN Netcom will be referred to as Jabra.

PROCESS

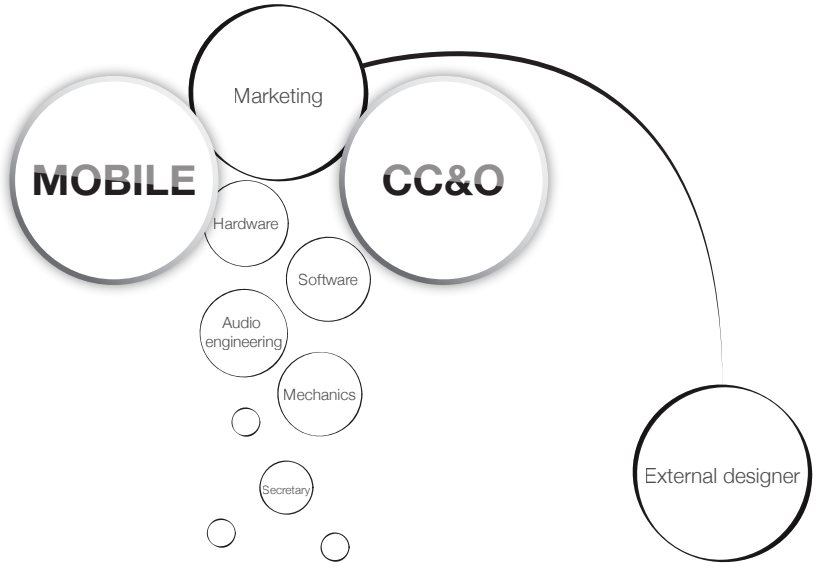
Jabra headquarters in Ballerup has several divisions contributing to developing new and innovative products. As mentioned the product development is divided in two divisions Mobile and CC&O. Within these two divisions there are several subdivisions such as marketing, mechanics, sales, hardware, software etc. The employees are only assigned to one division and hereby experts in either Mobile or CC&O. Despite this clear division there is still many subgroups that consists of employees across all types of divisions and subdivisions.

DESIGN PROCESS

In a normal product design process, Jabra uses external designers varying from project to project, however they tend to use a handful of the same designers as they have a better understanding of Jabra's requirements.
Jabra chooses to use the same designers for several reasons:

- Know-how about the process at Jabra
- Understanding of Jabra and the design language
- Knowledge of Jabra's production facilities
- Network - Well known in the company and perceived as a colleague

In a typical design process when Jabra want to launch a new product design the initial request is given by the marketing department. The design company receives a design brief carried out by the marketing department where the assignment is described. The design brief contains the deadline, prerequisites, demands and wishes for the solution and pictures of reference products can be attached along with simple sketches. When the project is delivered from the external designer the rest of the project is finished within Jabra's resources.



JABRA PORTFOLIO

The Jabra CC&O portfolio both consist of corded and cordless headsets solutions. In general the corded headsets are designed for contact centres in order to ensure unlimited talk time and a more durable headset with less fragile components. The cordless series consist of a cordless headset and a docking station, which together creates an integrated solution suited for offices.

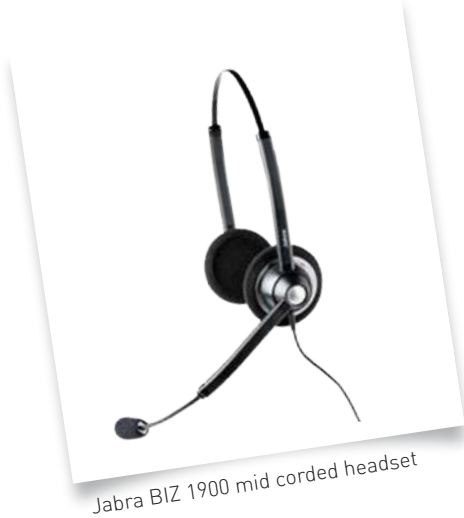
Within corded headsets Jabra has five different series and price points in order to cover the market. The low price headsets compromises with sound quality, noise reduction, comfort and robustness where as the more expensive headsets possess the latest technology and features.

In the cordless headsets category Jabra has four different series and price points. Again features as sound quality, noise reduction and comfort varies according to the price point, however these cordless headsets also differentiate in reach, dock functionality, connection possibilities and technologies. Regarding the connection technologies the cordless headsets from Jabra are mainly based on Digital Enhanced Cordless Telecommunications (DECT), which is a licensed band to ensure no disturbance of the signal. (Further described on page 28-29)

Jabra BIZ 2400 high end corded headset

Jabra 9120 cordless mid headset

Jabra Pro 9400 high end cordless headset



Jabra BIZ 1900 mid corded headset

PRODUCT ANALYSIS

In order to identify the DNA of Jabra headsets an analysis of the existing product portfolio is initiated. To locate the DNA the headsets are compared with competing headsets within the professional segment. The analysis is made in GN Netcom showroom where all the professional headsets are available. Headsets from Jabra's biggest competitors Sennheiser and Plantronics are printed and spread across the table. The analysis is based upon objective evaluations of the different headsets from a design related point of view.

While comparing Jabra, Sennheiser and Plantronics headsets, it quickly becomes clear that Jabra express a more Scandinavian design style. The simplicity, colourlessness and minimalistic design enhances the Scandinavian design expression but also make them appear slightly anonymous and boring. The headsets are not as expressive and radical different from the headset archetype as the competitive brands are. Furthermore the lines are in general strictly controlled. The thin and elegant band combined with the simple and light design makes Jabra headsets appear as a unisex headset. When looking at the BIZ 9400 and GN9210 the design seems only designed for mono headsets. When a duo versions of the headsets are docked they appear out of balance and do not appear as elegant and sculptural as when a mono version is docked.

A diagram with more headsets from the competing brands, and a mapping of them can be seen in (app. 04) Furthermore a video documenting the headset comparison can be seen in (app. 05)

01. Plantronics Supra Plus cordless headset

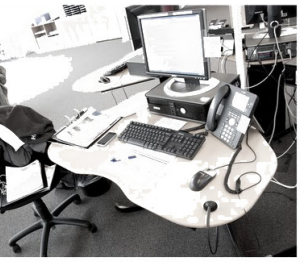
02. Plantronics Encore Pro corded headset

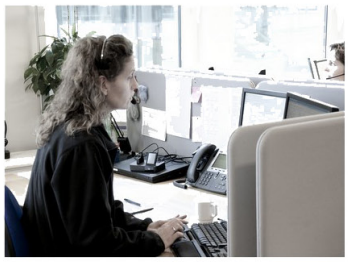
03. Sennheiser HME43K corded headset

04. Sennheiser DW Office cordless headset

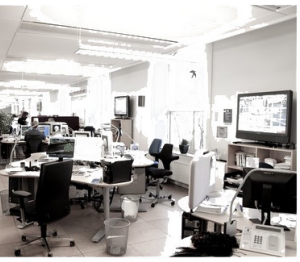




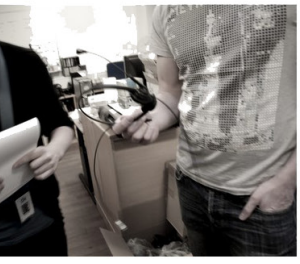


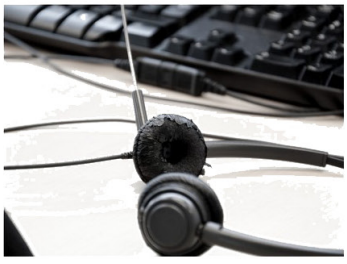


To accommodate Jabras interest in a product for the professional segment the design teams starts out by defining who the professional user groups are; contact centres and offices. As an initial user research the design team visits the Jabra customer support department where four employees support their business cliental by using cordless headsets. The research and interview provides the team with a quick insight into the office environment. Afterwards it is decided to aim the user research at contact centres which has more defined users and easier access to a large amount of them.

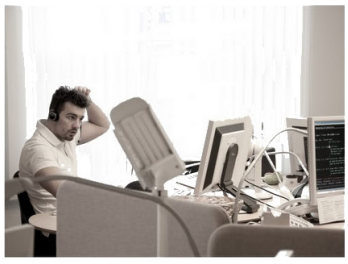
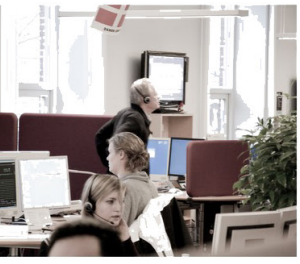


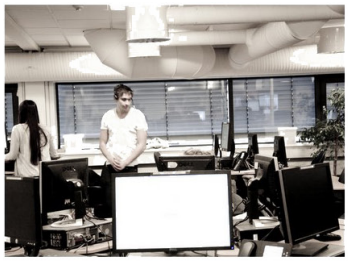











01. RESEARCH

USER RESEARCH

INTRODUCTION

A contact centre is basically an office which handles a large amount of request via in- and outbound telephone calls.
A contact centre is most commonly hired by an external company to administrate incoming support and inquiries from their customers or to manage canvass assignments (sales).
To get the best insight into what a contact centre is, it is important for the team to carry out user research representing both inbound and outbound services.

The user research is conducted at four different contact centres Telmore, SOS International, and LN Eurocom in Copenhagen and Aalborg which together represents both inbound and outbound, and usage of cordless and corded headsets.

The purpose of the research is to get familiar with the contact centres and sense the atmosphere, environment and context - Get insight into what the users wish for, hate, love and do not care about and from this extract potential problem / optimization areas regarding headset and the use of them.
As the user research is very subjective and related to emotional impressions it is hard to present it in black and white - However following sections together with (app. 01) documents the user research by presenting the collaborating contact centres followed by a refined summation of the most relevant findings from the user research.

RESEARCH EXECUTION

The execution of the research is carried out with focus on three basic research methods; observation (shadowing), show me how and situated interviewing.

The user research is a mix of observing and interviewing the users followed by clarifying question in relation to their use. The research material is documented by personal notes, photographs and video material. (app. 02) The contact centres are visited one at the time and at least for an hour and a half per centre. During the visits the team first interviews the purchasing agent at the place getting an presentation of the company. The users are first spectated without interfering in their work to observe their use in order to locate problems and find out which areas to ask in to. After the users are observed the most interesting users are pointed out and interviewed about their use of the headset.

RESEARCH SUMMATION

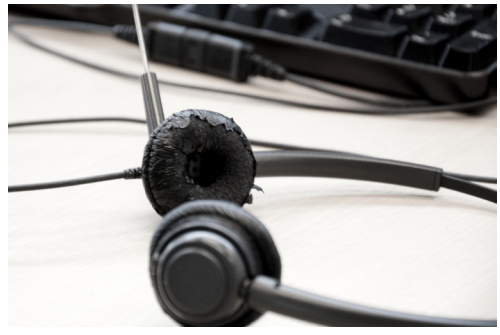
DOCKING & STORAGE

Whether the contact centres have corded or cordless headsets it is docked or stored during the day. For short breaks it often hangs around the neck, is placed randomly on the table or *hang on the edge of the desk*. In these cases the corded headsets often create problems as people sometimes trip in the cord or forget it hanging around the neck resulting in *ripping the cord apart when leaving the desk*.

Concerning the cordless headsets these come with a multifunctional dock used for charging, pairing headsets and providing the user with feedback from the headset. At SOS International the users tends to *forget to dock the headset* when not using it resulting in the battery running low and another headset is needed to continue working. Furthermore they also work in shifts at SOS International where they *share headsets* which in many cases results in a low battery because the headset only has approximately 7 hours of talk time. This is especially one of the main differences between contact centres and offices where the amount of talk time is not as extensive as at contact centres.

The docking station is very useful providing feedback from the headset. Unfortunately the primary function of charging the headsets actually limits the use as it is not possible, to use the headset while it charges.

In relation to the Jabra 9400 series which is the newest cordless headset from Jabra, it has some issues concerning the dock. The users finds it difficult to dock the duo headset and when it is securely docked they often experience the *cleaning personal knocking it out the dock* when cleaning the desk, resulting in low battery when arriving at work the day after. Concerning having objects on the desk the user in general enjoy a clean and tidy desk which is free of cables.



SHARING HEADSETS

The varying assignments at the contact centres results in the centres works in shifts throughout the entire day. At LN Eurocom they have support and business to business canvass during the daytime and consumer canvass in the evening. In relation to this the headsets are often social products which is shared between a lot of different people.

At all the contact centres the employees have a personal box containing notes, pen, time sheets etc. At SOS International the users also have personal ear cushions in their personal box as the headsets are shared with other. Places without personal ear cushions or headsets solves this by using cleaning tissues to disinfect the headset, especially the ear cushions.

LISTEN MODE

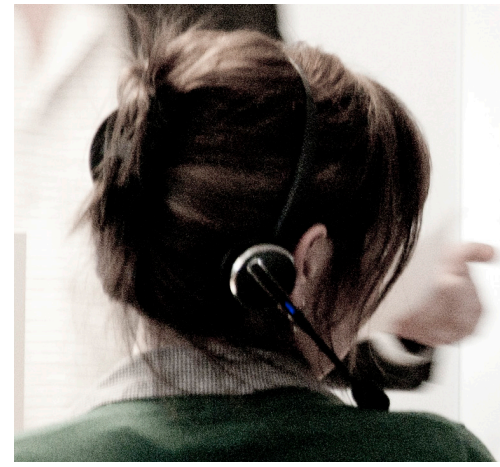
At all of the contact centres "listen mode" is a very important feature as it is used for coaching new employees. Both the corded and cordless headset has this function, however it is more convenient to use with the cordless headsets. For the corded headsets a splitter cord is used which is a cord that enables two headsets to be connected but it easily gets tangled up, lost or even breaks.

The cordless headsets is more simple to use, as "listen mode" is activated by docking the external headset in the dock you want to enter listen mode on and accepting on the primary headset. However this also creates some problems as it is only possible to pair three-four headsets depending on the brand - and even though, it should be possible to pair four headsets the users often experience an instability where one of them looses connection. At SOS International they also have problems with accidental disconnecting because the secondary headsets disconnects when pressing the mute button - and the mute button is located in the middle between the volume adjustment on the headset.

Although it is possible with four attending one call it is a common wish to be able to connect up to 15 people in connection when coaching large teams.

TOUCH FEEDBACK

The new BIZ 9400 Jabra headset is based on the touch interface technology which creates a very discreet and clean expression. However the touch buttons has not as good tactile feedback as physical buttons. When interviewing the users they did not prefer the touch as the feedback was not clear enough which led to confusion whether the touch button was pushed or not. Furthermore they also found it too sensitive which sometimes resulted in unintentional muting the headset.



WISHES

During the interviews with different employees it is possible to involve them in the design process and hereby make them come up with features which could be convenient having in a headset.

A common feature which will improve the quality of the contact centres is being able to *join others conversations* without having to dock the headset in their docking base. It will then be possible to get inspiration from one another during the day to improve the way of handling a call. In line with this it is also a wish being able to record ones own calls in order to coach themselves.

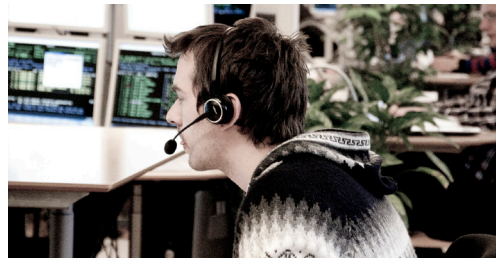
Another wish is the ability to set ones *status on the headset*. This will help the inbound user to set whether they are available or unavailable by using a simple command on the headset - It will then be possible to set ones status when being away from the desk.

MUTE FUNCTION

At outbound calls the mute button is not use as extensive compared to support calls, where the customer is put on hold in connection with finding the right information or getting support from a colleague.

The research shows it is clear that the mute function has to be quick, intuitive and easy accessible. A common problem regarding the mute function on the headset is that it is difficult to locate and navigate while it is placed on the side of the user's head - And with the touch it gets more difficult as there is no tactical feedback. With corded headsets the mute button on the desk phone is used, which is the preferred location.

Another issue related to the mute function is the indication of whether it is on or off. The feedback for this is provided through a sound in the headset, which limits the information only to the one wearing the headset. It is therefore not possible for others to see if the person is muted or not which can results in unintentional interruptions.



APPEARANCE

When it comes to the appearance of the headsets a common denominator is professionalism. Most companies want to *appear professional* for which reason there are dress coats and rules regarding behaviour at work. Therefore the appearance of the headsets has to represent professionalism - The headset shall as a part of a unified appearance impress visitor of the company.

Some frequent design wishes provided by the employees are having a headset that *appears and feels light*, however it must not look too fragile as it can create insecureness when handling it. On the surface the visual design is not that important but when asking employees they still have a personal opinion on what they visually preferred.

BUYING HEADSETS

When asking the purchasing agent at the contact centres, the price of the headset is a vital factor. The aim is to get a reasonable quantity discount. Besides the price the *sound quality, noise reduction functionality, and durability* in general is features which are of great importance.

To ensure that the headsets are popular among the employees for having a comfortable but secure fit, new models are always tested internal in the company. The feedback from the employees are included when deciding which headset to buy.

When buying new headsets it is also essential that they are compatible with and can be used for all types of inbound and outbound tasks. For instance listen mode is a function which can not be left out if a headset should be competitive.

Overall a good headset needs to be pure simple, intuitive and feel and appear like a headset of good quality both when wearing and handling it.

SUMMARY

In general the user research provides the design team with at good insight into what a contact centres is, who the users are and how the headsets are being used. A lot of problems are found in the user research but it is difficult to point out a specific problem area because the problems are smaller incoherent areas on features, interaction and lack of above mentioned. However design parameters as professionalism, light and robust design are found and has to be taken in to consideration when designing.

RESEARCH REFINEMENT

As the results of user-research is fragments of problems in various areas a persona is created to represent the average call centre employee.

This is Christina, she is 22 years old and has worked at a couple of contact centres both carrying out inbound and outbound tasks.
Currently she works at support. A normal workday for her is from 9-16 where she has a couple of short breaks and a lunch break.

She is currently using a corded headset, which she does not know the brand of. When she first got the headset she was not offered any other wearing styles than the regular headband wearing style - However she did not even think about another wearing style being available.
At her former workplace she had a cordless headset which makes the cord on her current headset a annoying part of her work day. The cord often get tangled up with her keyboard and mouse cord and in general limits her mobility. Christina likes to have a clean desk where cords from mouse, keyboard, telephone and headset not are tangled together. She believes a cordless headset would make her workflow much more efficient and comfortable.
Christina likes as much sound isolation as possible when taking to her customers, and therefore prefers a duo headsets. If the background noise becomes to extensive she plugs in ear bud headphones in one or her ears listening to music instead of background noise.

She believes that it is nice to have the desk phone in sight and of reach in order to use it as a control panel for controlling the headset, when muting, adjusting volume and answering and ending calls compared to when she used a cordless headset where all of the control button were placed on the headset.
Christina has a bad habit as many of her colleges when being on the phone. She either tap, clicks or pulls something, it could be clicking a pen or rolling the headset cable etc. This is a bad habit she cannot disclaim.

Christina now only answers inbound calls and uses the computer a lot to look up customer and type in information regarding the customer. During the day she sometimes has to ask her team leader questions regarding specific cases. She mutes the headset on the desk phone, leaves the headset on the table and walks over to her team leader to ask the question before returning to the customer.

Christina shares her headsets with the part time employees checking in after she gets off. She thinks it is a bit unpleasant to think about other are using the same ear cushions as her, and she normally cleans them with cleansing tissues before wearing it.
When leaving work she logs out of the system and normally either hang the headset on the monitor or leaves it randomly on the desk and empty it for all of her papers and personal belongings. All the papers are stored in her personal box which she moves to the shelves before leaving.

When it comes to the appearance and design of the headset Christina does not have that strong opinions. She sees it as a tool for carrying out her work. The most important factors for her is the comfort and the audio however she still would not prefer wearing a headset that did not have any traces of aesthetic qualities and a headset that might make her look silly.

A diagram illustrating a typical work flow for a in- and outbound-user can be seen in (app. 03)

PIN UP ONE

With all the findings from the user research conducted at the contact centres the design team arranges the first out of three pin ups with a selection of people from Jabra.
At PIN UP ONE the most relevant results from the user-research are presented in order to create the foundation for a following arranged workshop.

The main topics from the user-research that are presented consist of following:

- The headset is not docked resulting in low battery.
- No indication of status.
- Touch is not a preferred interaction technology.
- Difficult to interact with the button on the headset when wearing it.
- Possibility to be log onto others conversations to be inspired.
- Headset cords often get tangled up with the mouse and keyboard cord.
- Headset is insecure in the dock.

WORKSHOP PREPARATIONS

In order to discuss the findings from the research a workshop is held in continuation of the pin up. The aim is to generate as many ideas as possible and find out which areas Jabra already has explored and which they believe are the most interesting. To get the best result of the workshop ideation, the participants are divided into three teams consisting of people representing various departments; packaging, usability and comfort, and Mobile and CC&O product management. A design team member is assigned to each group to facilitate the discussion and to present already generated ideas. Through the user research the design team generates ideas and conceptual solutions for how to accommodate the findings. These ideas are visualized and embedded in the envelope that each team receives. The envelopes contains three specific problems representing the listed user research observations. Furthermore it contains inspirational pictures of various functional products which could inspire to solutions or help in facilitate the discussion for those who can not draw or have trouble explaining their ideas. The enclosed envelope material can be seen in (app. 06).

WORKSHOP EXECUTION

Each person from the design team represents one of the three workshop groups and furthermore acts as the facilitator in the group. The envelopes are opened and the enclosed material used to initiate the discussions. The premade solutions are left out in the beginning but introduced later on to get feedback. The inspirational pictures are used active in relation to solving the listed problems and to describe possible solutions to the problems. At the end of the workshop the design team member from each group presents the ideas in plenum and the ideas are commented. It is carried out as an open ideation session where the participants are pending on each others ideas and together developing concepts. Video material documenting the presentation and ideation can be seen in (app. 07)

WORKSHOP OUTCOME

Some of the ideas generated in the workshop groups are identical to the solutions made by the design team prior to the workshop - this only confirms the validity of the concepts.
Especially two concepts are discussed among all the groups which also is an idea the design teams have come up with before the workshop:

1. Charger-cable instead of docking charger station so the headset can be used while charging. A well known principle from mobile phones where the phone can be charged while still being able to use the phone. This idea gets a lot of positive feedback and seems reasonable in solving the talk time issue at the contact centres.

2. Rotate boom arm (microphone arm) to mute headset microphone, meaning that the headset automatically mutes when the boom arm is rotated to upright position. An idea that supports an intuitive use and has great signal value by showing the surroundings when the headset is muted. Also an idea that receives a lot of positive feedback and an already known principle from a Logitech consumer headset - Logitech ClearChat PC Wireless.

Furthermore the workshop results in following relevant ideas/solutions:

- Lead charger cord underneath desk to prevent cable jamming.
- Extra headset batteries implemented into the personal cushions to prevent low battery scenarios.
- Induction charging plate for quick charging headset.
- Alarm sound when the headset is docked wrong or is knocked out the dock.
- Cable management ball as accessory which connect charger cable from hub to headset.
- Registration of headset is worn if not it goes into standby, in order to safe battery.
- Dock which can be mounted on table edge.
- Dock with automatic cord roll up for the charger cable known from vacuum cleaners.
- Play feature accessory to avoid the employees repeatedly playing with headset cable and hereby damaging it.

Further ideas and material is documented in (app. 08)

OVERVIEW

Besides coming up with various solutions to the observed problems from the user research, the workshop also results in a more refined focus area. After presenting the ideas a discussion is initiated about the scope of the design team's project and next steps. In the discussion it is clear to the design team that current Jabra cordless headsets only pay regard to office use but still is used in contact centres. However the user research indicates that there are some crucial differences between usage in offices and contact centres in for example the charger issue where the headset has to be docked to be charged and demands to durability and social usage.
It is therefore clear that a potential aim of the project is to design a cordless headset aimed for contact centre appliance, which is a new product both for Jabra and competing brands. It is a fact that more and more products are made cordless and the user research showed that increasingly more cordless headsets are used at the contact centres.

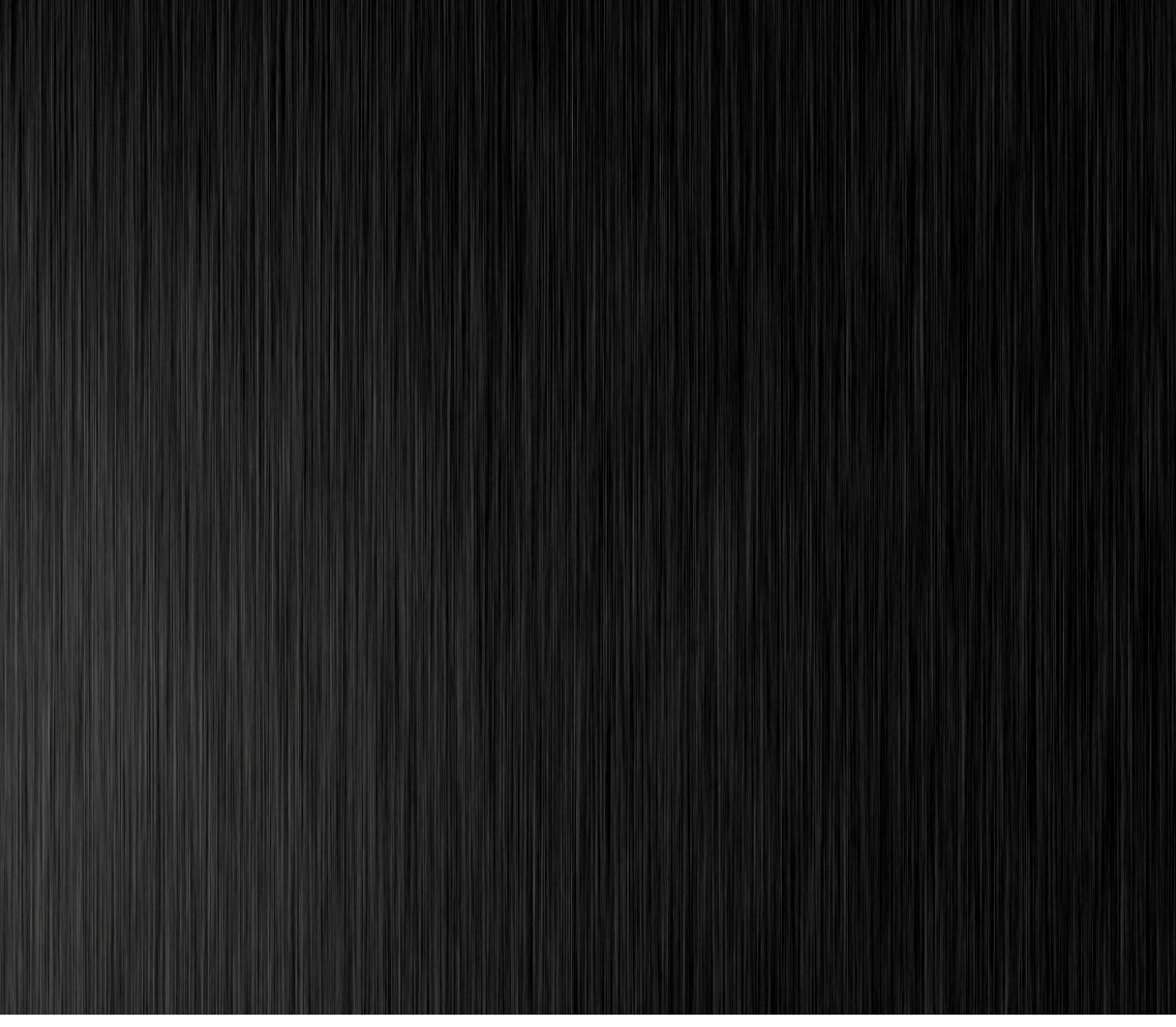

lyreco
STICKY NOTES
100
Jabra
3 problems within 3 problem areas..
Orange team

FOCUS AREA

Current Jabra's CC&O products are based on both corded and cordless technologies, where the corded headsets are intended to contact centres and cordless headsets for office use. However as the cordless technology has developed and decreased significant in price, the cordless headsets are adopted by the contact centres and contributing to a more flexible and free environment plus a more efficient workflow.

Despite the contact centres are adopting cordless headsets, they are still from the design team's point of view designed for office use where it is a fact that contact centres' demands differs on several areas from offices'. The focus area of the project is to design a cordless headset purely intended for contact centres. The headsets will pay regard to the transition from corded to cordless headsets by implementing the core values from the corded headsets.

The design will enhance the users experience through a more intuitive use and no-bullshit functionality and end up with a qualified design proposal for tomorrows cordless contact centre headset.



Before initiating the ideation it is important to understand the elements of a headset and the connection technologies applied in Jabra headsets. Furthermore it is also important for the design team to understand the fundamental terms of comfort and how it will affect the design process. These areas are looked into in order to promote the ideation.

CORDLESS TECHNOLOGIES

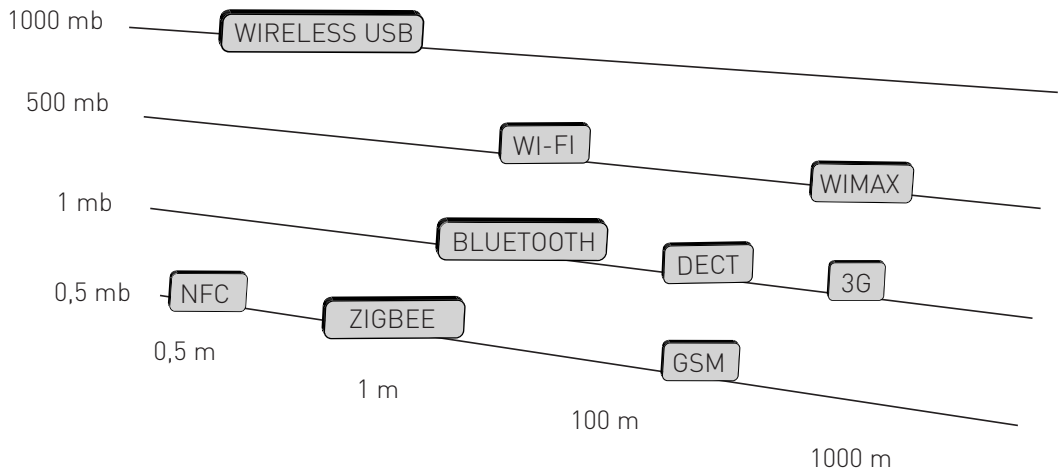
Jabra always uses one of two cordless technologies in their products. With the focus area defined it is essential to define which technology to implement in the project.
Following section is based on a meeting with Senior Hardware Engineer Rene Elbæk Jensen. Audio recording can be found in
(⊘ app. 10)
It shortly runs through the different wireless technology standards used by Jabra and list their advantages and disadvantages in order to find the most appropriate technology for the cordless headset for contact centres.

BLUETOOTH

The Bluetooth technology is used in a range of Jabra's cordless products and is the preferred standard within mobile products - However some Jabra office products also uses Bluetooth, such as Jabra GO 6400.
Bluetooth is a cordless standard running on the 2,4 GHz band also referred to as the "junk band" implying that Bluetooth shares its band with a range of other products and standards, such as microwave ovens and Wi-Fi. The transmit and receive range is estimated to 100 meters.
Within this band Bluetooth operates in a certain number of channels. In these channels packages are send and received between the two Bluetooth based products. When a package is received it is extracted, but in some cases these packages can be damaged or simply empty due to interference. This affects the sound quality by making gaps in the conversation. Bluetooth is more tough compared to DECT as it "accepts" more empty packages before it loses the connection. One of the main advantages is Bluetooth uses less power compared to many other cordless technologies.

DECT (DIGITAL ENHANCED CORDLESS TECHNOLOGY)

DECT is a cordless technology standard used in most of Jabra's Pro Office headsets as it delivers good range (300-450 meters) and sound quality.
It runs on the 1,9 GHz band which is a protected band by the DECT Forum association. This means only certified DECT products are allowed to use the 1,9 GHz band which gives a lot less interference compared to other cordless standards. As mentioned the different GHz bands consist of channels which sends and receives packages. With DECT the 1,9 GHz does not accepts as many empty packages which means it easier loses connection if there is interference. However this also means that there is no bad sound quality but it just disconnects if there is any interference.
Due to the long DECT range the power consumption is also large but it is possible to have a lower power consumption if the range is lowered.



CHOOSING THE TECHNOLOGY

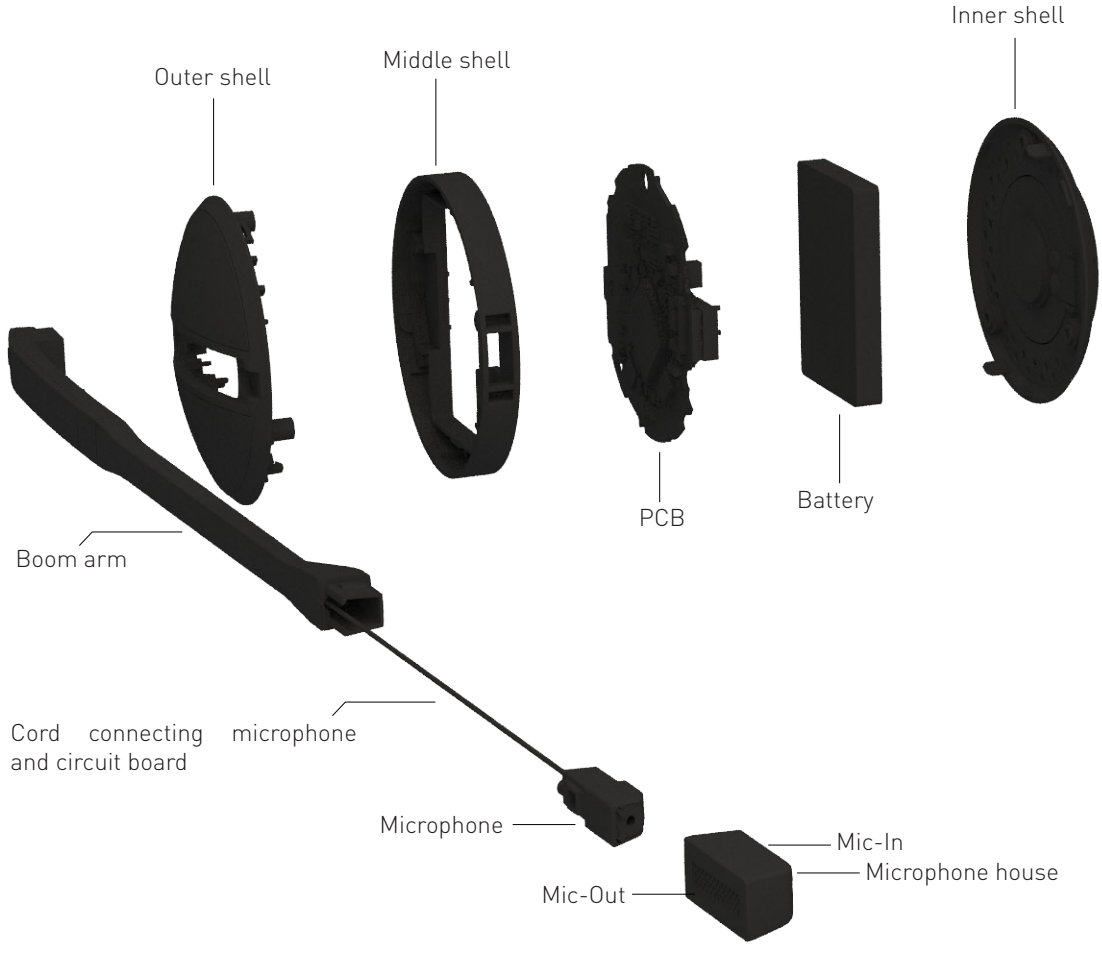
When it comes to battery life DECT is a super consumer compared to Bluetooth. In general a DECT product has a three times larger battery than a Bluetooth product. This is related to the DECT power consumption where DECT has an average standby time of 36 hours and Bluetooth has an average standby time of 10 days with a three time smaller battery. However DECT also supports more than twice the range compared to Bluetooth which adds more freedom to the use.

In general there is a large understanding of that Bluetooth technology is for consumer products while DECT is for the professional use. As it is right now, Jabra solves the talk time issue with DECT by using a bigger battery and the long range seems to be a unique selling point for the DECT solutions. Jabra also has a lot of patents on solutions that ensures a good density performance for the DECT solutions which means that it is possible to have approximately 80 headsets in the same area on the same time where Bluetooth headsets are more limited.

Based on these differences it is decided to choose DECT as the cordless technology for the cordless headset for contact centres.

PRODUCT ARCHITECTURE

With the focus area defined and the chosen cordless DECT technology, an analysis of Jabra's newest cordless headset Jabra Pro 9400 is conducted. In this section the parts are described and the inner parts pointed out to find out which elements to implement in the future design of a cordless headset for contact centres.
The most relevant parts are further descriped in (app. 09)




Headband clip
Headband
Outer headband house
Inner headband house
Headband house pin
Headband house
Ear cushion
Speaker house ring
Speaker house

HEADSET **COMFORT**

As a headset is a product the users wear it is essential to pay regard to the ergonomic aspect at Jabra named "comfort". Jabra has a specific comfort group to ensure the headsets are as comfortable as possible. Following section is based on a meeting with Interaction Designer Henriette Sjögreen Kristensen at Jabra.

The Jabra comfort team has build up a database of experience representing the different areas and factor to focus on when designing a comfortable headsets.
The comfort team test, evaluates and improves the comfort ability though user tests. The comfort testing is a time demanding and extensive research process as it is carried out by making as many test people as possible wear a prototype of the headset and afterwards evaluate it. The evaluation is either made through an interview or longer tests where the user is asked to wear the headset for one and a half hour the user has to rate the comfort ability and secure fit.
As the comfort testing of a headset is dependent on testing the actual prototype, the design team only have a few comfort terms to pay regard to. The ability to adjust the headset by making the length of the headband adjustable and rotatable speaker houses are some key demands for ensuring comfort.

The basis for the comfort will therefore take use of knowledge within existing Jabra products. Such as thickness of ear cushions and wearing styles etc.
When it comes to wearing styles there are three different main styles provided by Jabra.
As the user-research showed none of the employees have the possibility of choosing between different wearing styles the new headset design will focus on applying a regular headband wearing style.

Jabra BIZ 2400 with neckband

Jabra BIZ 2400 with ear hook

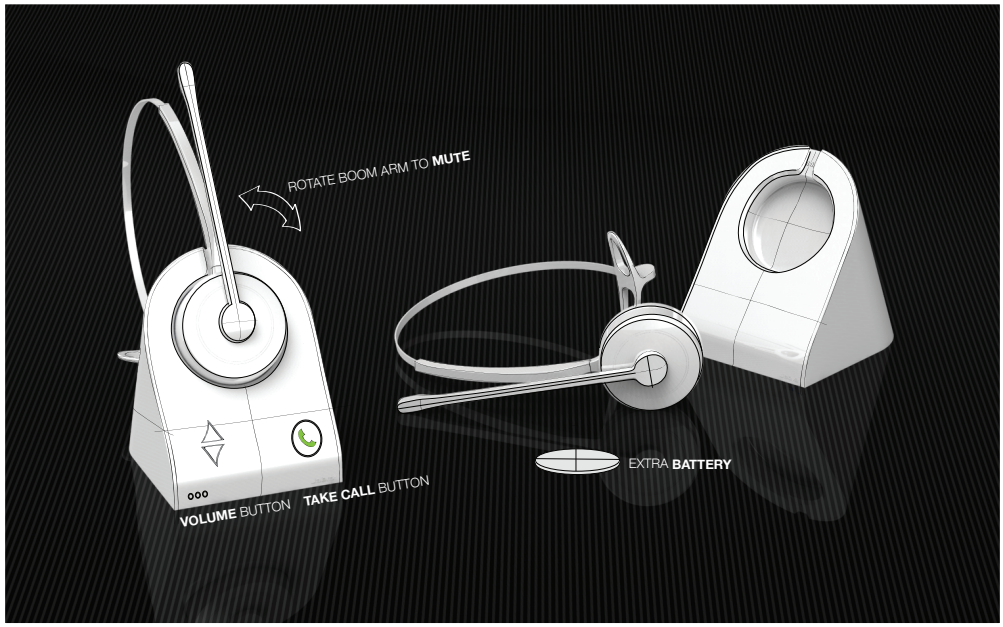
Jabra BIZ 2400 with headband

Based on the phase of research the concept ideation can be initiated. The aim is to generate concepts for a new cordless CC headset design - Which will be presented at PIN UP TWO, and for CC employees at LN Eurocom Aalborg. The provided feedback will together state the concept for further development and refinement.

02. **IDEATION**

FIVE CONCEPTS

The fragmented concepts extracted from the PIN UP ONE workshop is the main starting point for the ideation. The aim is to develop a minimum of three concepts within the focus area that pay regard to the findings from the user research. The generated concept are to be presented at PIN UP TWO which is held approximately three weeks after PIN UP ONE. By visualizing the concepts sketchy it is notified that none of the concepts are final and can be combined in both design and features.



REGULAR DOCK CONCEPT

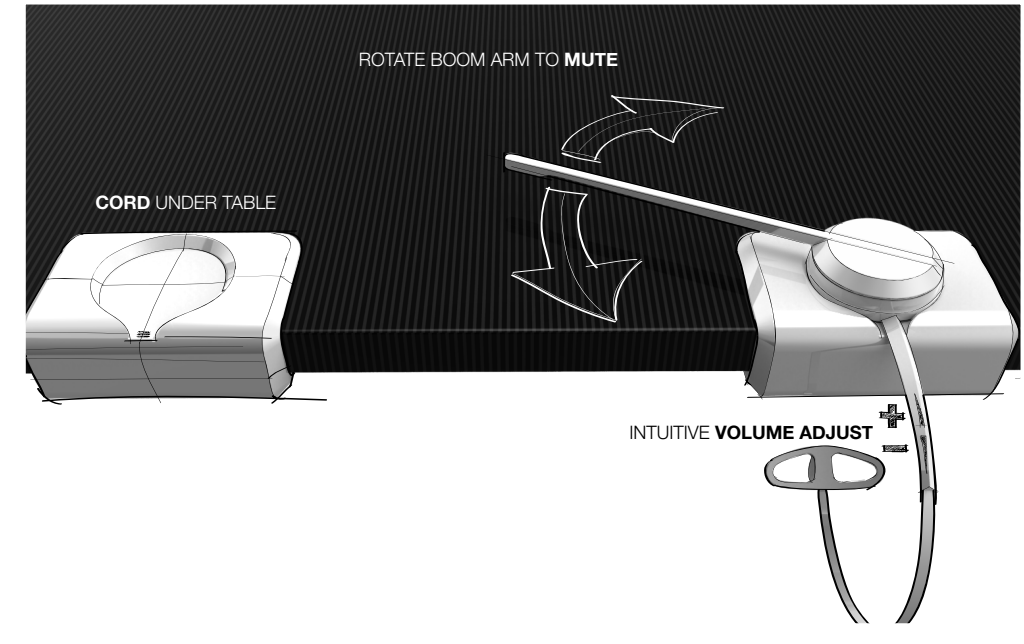
The "rotate-to-mute" function is a principle that is considered in all the concepts and is a convenient and easy feature to implement in a contact centre headsets. One of the ideas from the workshops is to implement an extra battery, which could be implemented in the replaceable ear cushions. The overall idea complies with the user research in several ways but the problem in implementing the batteries into the ear cushions is that they will follow the users and not the headset. The users then has to have extra ear cushions in case of low battery and need a place to charge them when leaving work and furthermore it would create some very expensive ear cushions. The feature in implementing changeable batteries in the headset however is something Jabra earlier have tried. No one really knows why the feature no longer is in use but the team decides to try and implement this feature in one of the concepts in order to get feedback on it from the users.

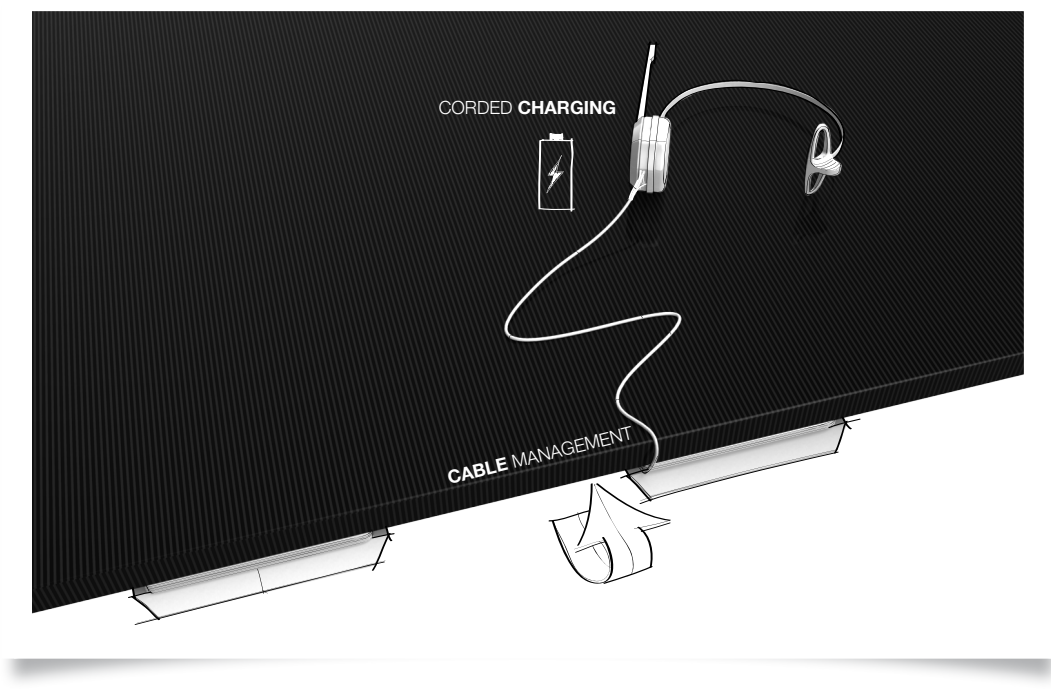
The concept has a regular dock as seen in existing products. To keep the headset as intuitive as possible the operation of the headset is kept on the dock so the only operation the headset has is mute by rotating the boom arm.

TABLE EDGE CONCEPT

Based on the user research showing that the users place their headsets around the table edge when not in use, this concept is developed. The wish for a more intuitive headset and better, easier and quicker docking is the primary focus of this concept. By reusing the users already existing habits the concepts tries to invite to a more often docking of the headset. When a headset is docked in todays docks it is only done when the user is done using it, which is when they leave work. The user research supports this perception because it shows that people tend to place the headset all sorts of places except for in the dock. Furthermore the users likes a "cord less desktop" meaning they always tries to have a clean desk. By placing the dock on the edge of the table the cord can be guided on the surface under the table.

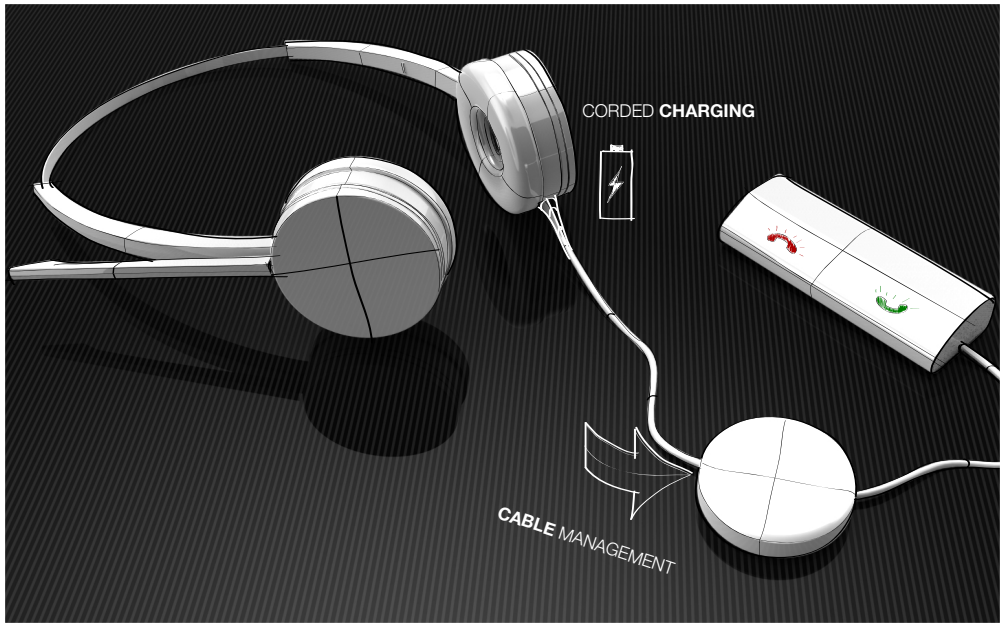
The volume control is implemented in the headset in a more intuitive way by placing the adjustment as tactile button on the headband house. In existing headsets, with volume adjustment on the speaker house, there is a lack of intuitive use as the users can choose to have the boom arm in either left or right side. This means the positions of the two buttons are switched. By placing the volume buttons on the headband house the position remains the same no matter if it left or right eared. Then volume up will be up and volume down will be down - simple and intuitive as that.





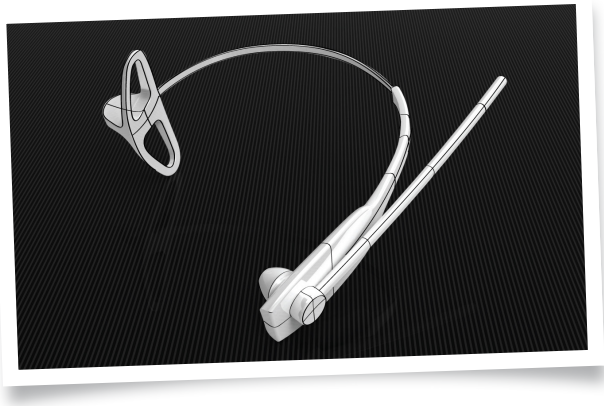
INVISIBLE HUB CONCEPT

Based on the "table edge dock" concept the "invisible hub" concept emerges. The term hub is used as there is no docking procedure and only a wireless transmission to the headsets.
Based on the idea of having a cordless headset that is charged with a cable which is a known principle from mobile phones this charging concept is generated. As the "cable edge dock" this concept deals with the cord issue by having all the cables hidden under the table but with a more discrete hub. Some sort of cable management is considered implemented in the dock so the charger cable easily can be stored and pulled out.



CONTROL PANEL CONCEPT

From the "invisible hub" concept the "control panel" concept emerges. In this concept the headset is also charged through a cable however the hub is placed on the table in order to function as a control panel for the headset. Only the most relevant function as rotate-to-mute is thought into this concept and all other operation such as volume adjust, answering and ending calls is on the control panel. Opposite the invisible hub concept the cable management is implemented as an independent product. When charging the headset it is simply left on the table, hung on the table edge, around the monitor or where ever the user normally store a corded headset.



EAR GEL CONCEPT

The observations of the CC employees listening to music while wearing their personal ear bud headphones generates this concept of a headset based on ear gels. The ear gels will ensure efficient noise reduction for the user because the ear gels blocks out a lot of background noise. The concept also challenges the archetype of a professional headset and complies with the wish for a light headset. The concept is a more a form concept that can be combined with all the mentioned concepts.

VIDEO SKETCHING

As the concepts are build upon many fragments it is easier to understand and differ the concepts when illustrating them through scenarios. Video sketching is a fast and informative method for presenting concepts in this level of detail. The method is used to stage a user scenario on an overall level. Since the concepts are not given any specified design yet the teams use simple mock ups as in these cases are modified headsets and docks supported with simple video editing in form of text and icons.
The "ear gel" concept is not video sketched as it as mentioned is more a form concept. The video sketches are used for presenting the concepts at PIN UP TWO and for user-feedback at LN Eurocom in Aalborg.

All of the video sketches can be seen in
(↗ app. 11)


13
14
15
16
Volume adjustment on headband
Easy quick docking

PIN UP TWO

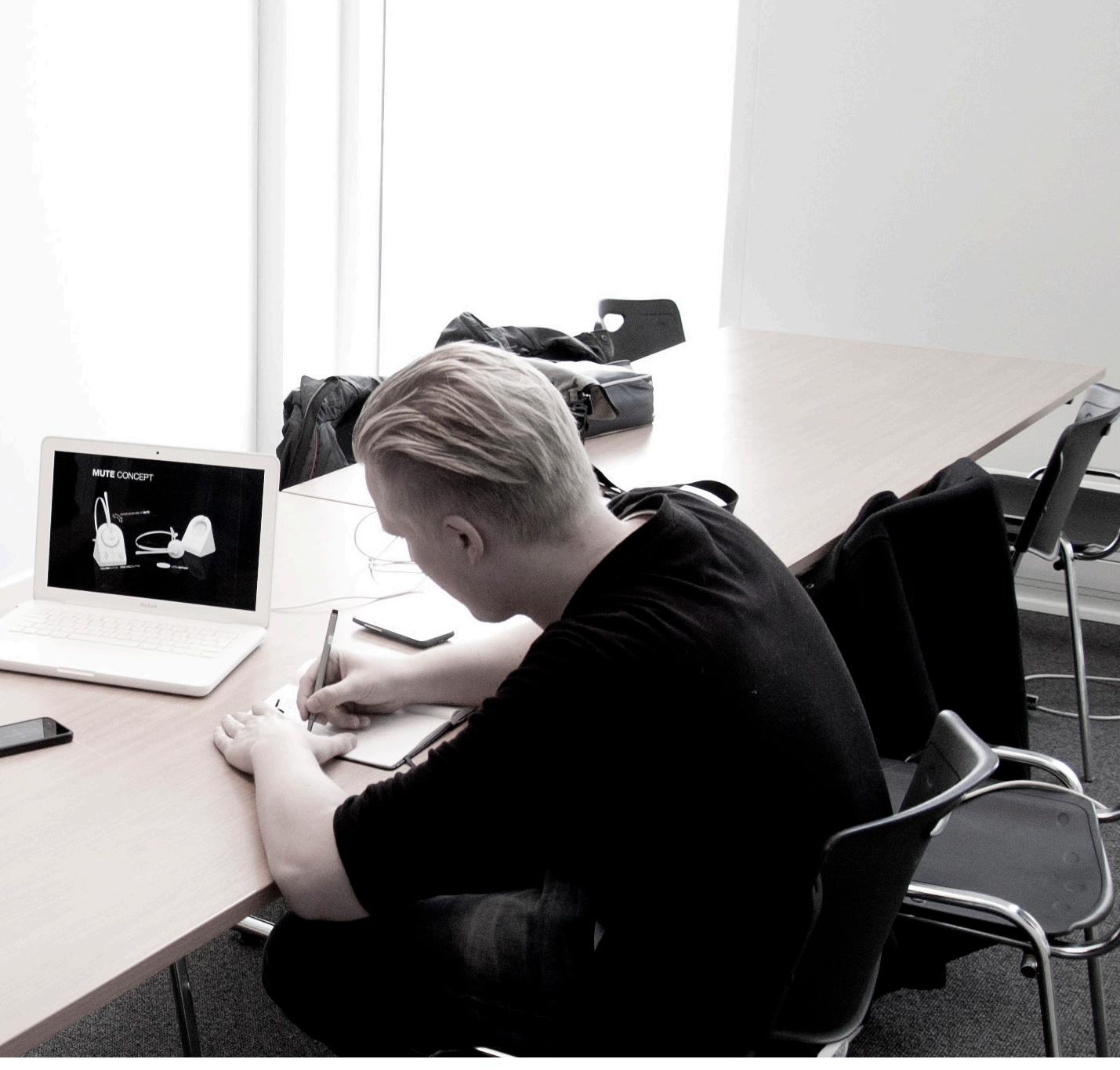
The four generated concepts with the video sketches are presented internally for Jabra at PIN UP TWO, where the participants are asked to indicate which concept they think have potential to develop further on.

In general the participants, appreciates the video sketching, and find the concepts easier to understand.
In general Jabra thinks that the concepts based upon the table edge are doubtful due to that this type of solutions would demand more to the installation and existing equipment. This is not comprehensive as contact centres have many employees and the tables can differ a lot.
The "Regular Dock" concept is discussed as the safe choice because it does not differ that much from already existing solutions within Jabra's product portfolio. This is also why the participants do not find it as interesting as the other concepts.

The majority of the participants believe in the "Control Panel" and "Ear Gel" concept. They believe the "Control Panel" concept reflects the user-research the best by solving the issue of the headset charging and having rotate to mute. The "Ear Gel" concept is found interesting as it is something totally new within Jabra's product portfolio. However it is stated that there might be some comfort related issues with the concept, but they still find it interesting to hear the users' opinion.

LN **USER FEEDBACK**

The same material presented at PIN UP TWO is presented to four users at LN Eurocom in Aalborg. They are shortly taken through the different concepts and asked which one they prefer in relation to their daily work routine.
The overall positive comments from the users concerns the charger cable. They find it pleasant to be able to charge while still wearing the headset and not having to take it off to dock it or change batteries. They are not worried about the cord while charging since this not differs from how they use their corded headset now. Furthermore there is excitement concerning the rotate-to-mute feature since it already is a gesture they tend to do when muting. However one user found the principle too "technical" and would rather have a psychical and visible mute button on the desk



as currently on their desk phones.
The "Table Edge" is also a concept that receives positive feedback as both the hub and the cables are located underneath the table. However some concerns of unfortunately knocking out the headset from the dock are mentioned. All four users know that some users are hanging their headset around the table, as observed from the user research, however none of the four do it.
The Ear Gel concept is surprisingly fast rejected as the users personally do not like the principle of having ear gels inside their ears for such a long period of time. Even though it would be more sound isolating it would perhaps also be too isolating as it can be annoying to listen to your own voice when having totally closed ear canals. A user also mentioned his concerns about this because it would make him speak even louder than he already does.

THE CONCEPT

CHOOSING THE CONCEPT

With the feedback from Jabra and the users there is one common defined direction: The "Control Panel" concept.

It is clear to the design team that this is the direction to take since the concept pay regard to the feedback given from both the users and Jabra.

Implementing charging with a cable in the headset is also one of the early ideas the team had and is considered as a comprehensive solution that solves the issue with the talk time. The concept also supports the idea of making the headset more intuitive by adding a control panel for the headset and only keeping the essential features on the headset. However it is important for the concept to have an easy and smart cable management solution to comply with the users' wish for clean tables with no tangles cords. As mentioned in the focus area the aim is to design a cordless headset that will pay regard to the transition between corded and cordless headset. This is represented in the control panel concept as the headset will be a "corded" cordless headset. It is therefore clear that this is the direction to pursue.

REFINING THE CONCEPT

The prerequisites for the focus area is that we are moving towards a cordless society. Within telecommunication the society is also in a turning point where the old telephone line gradually is being replaced by IP telephony. At LN Eurcom in Aalborg all their telephones are at the moment (Spring 2011) being replaced with IP telephony meaning that the headset is connected directly to the computer via USB. The user research showed that the telephone functions as the users' "control panel" and it is therefore interesting to design a proposal for "tomorrow" where the telephones are replaced by the new cordless CC headset. By this the control panel concept will therefore be based on IP telephony.

CONTROL PANEL

To transmit the wireless signal to the headset and control the features of the headset a control panel is connected to the computer via USB.

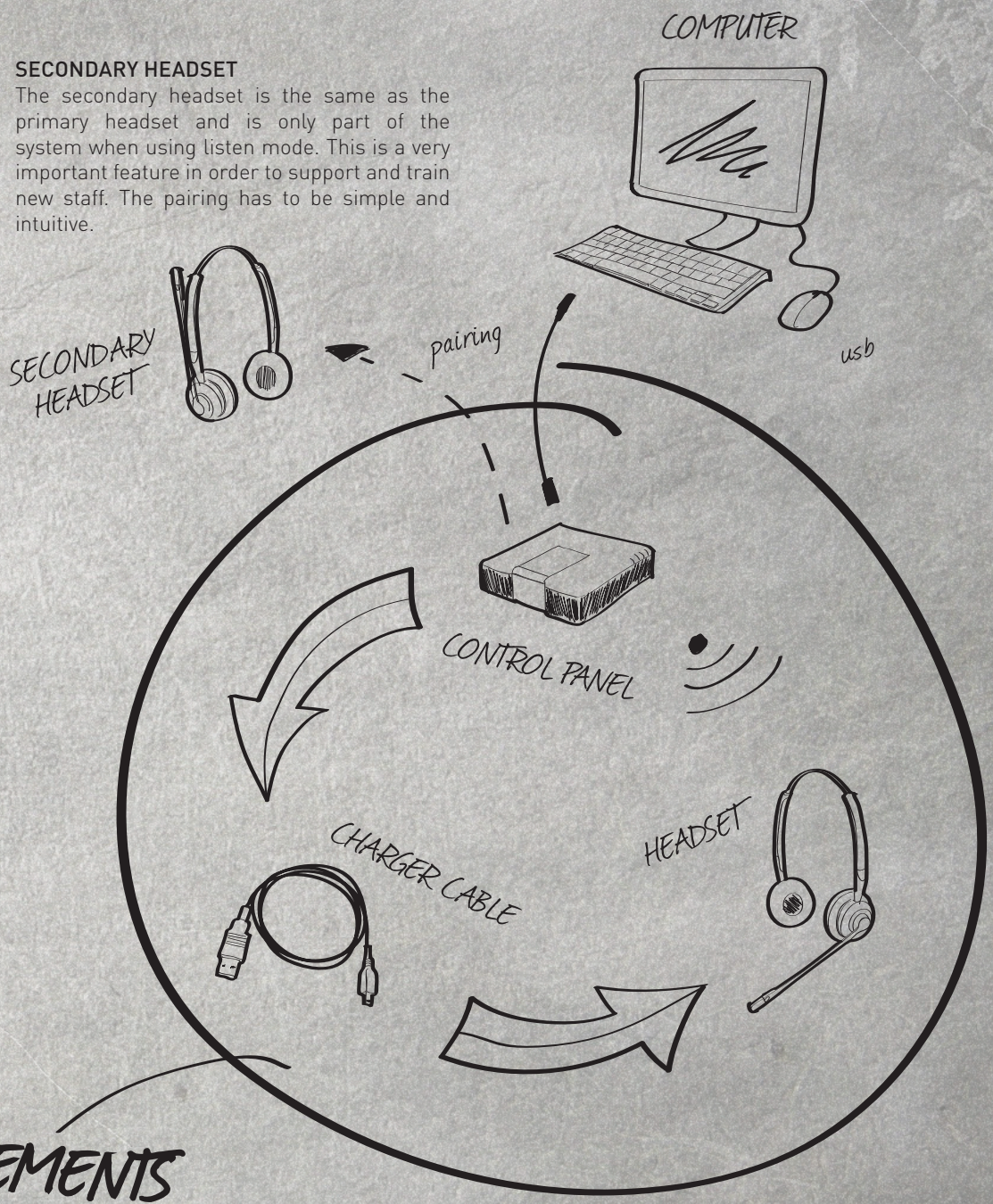
CHARGER CABLE

In order to have unlimited talk time when using the headset the charger cable connects the headset to the hub for power.

To avoid the cable form getting in the way a cable management solution has to be implemented.

COMPUTER
All in- and outbound calls are made through the COMPUTER using a dedicated software.

SECONDARY HEADSET
The secondary headset is the same as the primary headset and is only part of the system when using listen mode. This is a very important feature in order to support and train new staff. The pairing has to be simple and intuitive.



ELEMENTS TO DESIGN

PRIMARY HEADSET
The primary headset is the contact centre users most important tool and is therefore used many hours a day. The headset has to focus on a more intuitive use, for which reason the mute function will be enabled when rotating the boom arm.

With the concept and its elements defined it is time to develop and design different headsets, control panels and cable management solutions. The aim is to end up with various designs to present at PIN UP THREE. At Jabra there is a general excitement for the users' opinion which is a newly born but strong approach in the company at the moment. This results in the design team planning an online survey to use as support for the selection of two directions. The two directions will be refined and detailed further and presented at a "walk-around-session" at Jabra before choosing the final direction.

The primary product in the system is considered to be the headset for which reason this is where the design team takes its starting point. It is important to notice that this development phase is a highly iterative process. The headset, cable management and control panel is not designed simultaneously but in smaller sessions in between each other. In order to ease the understanding each element is explained separately.

03. DEVELOPMENT

DESIGN PARAMETERS

HEADSET **DESIGN**

ROBUST DESIGN LANGUAGE WHICH STILL APPEARS LIGHT
EXPRESS PROFESSIONALISM AND QUALITY
REFLECT JABRA DESIGN LANGUAGE (AS DEFINED ON PAGE 11)

HEADSET **IMPROVEMENTS**

IMPROVE TALK TIME
MORE OFTEN AND QUICKER CHARGING
SIMPLE AND INTUITIVE USE AND FUNCTIONALITY
INDICATION OF STATUS
EASY ACCESS TO "LISTENING MODE"

CONCEPT **FOCUSES**

FOCUS ON HEADBAND AS THE PRIMARY WEARING STYLE
PRICE TARGET POINT IN THE HIGH END OF CORDED HEADSETS AND LOW END OF CORDLESS HEADSETS.
PAY REGARD TO THE TRANSITION FROM CORDED TO CORDLESS
FOCUS ON MUTE AS AN IMPORTANT FEATURE
FOCUS ON THE HEADSET BEING A SOCIAL PRODUCT

TECHNICAL SPECIFICATIONS

USE DECT
CONNECT VIA USB
360 DEGREE SPIN OF BOOM ARM.
FLEXIBLE/ADJUSTABLE BOOM ARM
35MM ADJUSTABLE HEADBAND IN EACH SIDE.
COMPATIBLE TO LEFT- AND RIGHT EARED - SYMMETRIC
ROTATABLE SPEAKER HOUSES.
ACOUSTIC/VENTILATION HOLES IN SPEAKER HOUSE

HEADSET DESIGN

The ideation process begins with a brainstorm based on the design parameters.
The research showed that the contact centres overall strive for robust and light headset design. A light weight headset is however difficult to design as most headsets already are minimized and reduced in weight. It is therefore considered as an important aspect to design a headset that appears light but at the same time also robust.

PICTURE SHARING METHOD

Three design styles are defined to initiate the design development phase; Robustness, Feminine and Young & Fresh. These three directions will be the starting point for the further development in order to design expressive headsets. The design team is aware of that it is important to design something expressive in order to get the most feedback, later on it is then important to tone them down again.
To create a common understanding of the three direction among the design team each member finds three inspirational pictures representing each style. The team member working with the assigned style then receives six images and has to pay regard to these pictures when designing the headsets. Approximately each hour the team gathers to view and evaluate the designs and hereby influence them throughout the entire process.

The result of this session are ten varying headset designs which will be presented in the following pages.

05. *Picture for the picture sharing method based upon Robustness, Feminine and Young & Fresh*

AMY

AMY is a design addressing the *female* audience. Therefore the inspiration for this headset has been a women's watch from Calvin Klein, In order to transfer the smooth and elegant curvature into a light weight unified headset.

The unified speaker house is divided in three parts with a green circle to break up the shape and make the unified part seem lighter and more interesting.

The ear cushions are divided with lines to brace the round shape and create a connection to the white speaker house. The headset is designed in white to make the headset seem more pure and clean.

RAIL

RAIL pays regard to Jabra's Scandinavian design language by having simple and well defined surfaces and shapes kept in neutral colours. The inspiration is smooth natural grinded stones which is transferred to the outer shell of the speaker house and creates a simple and smooth look. In an attempt to combine the two speaker houses a metal rail runs along the side of the headband which leaves an expression of quality and *robustness*.

The design language is close to Jabra's existing products which very likely makes it one of the more save choices.

PIPE

PIPE arises from taking inspiration in how a globus is attached to its stand making it possible to spin it. By adding this principle combined with elements based on the globe shape the headset gets a updated retro and *young* look.

To maintain a light weight design with a touch of robustness the pipes are used for creating the headband. This furthermore creates a broader headband which is covered with leather to ensure a comfortable fit.

PLEXI

PLEXI plays with the idea of combining see through and solid materials in an attempt to create a solid build headset with a light and *fresh* expression.

The inspiration is a mass-produced pen, which is epitomised for its purpose by removing all minor features. This is transferred to the headset in order to achieve a higher degree of simplicity. Despite the simplicity technical elements as wiring and microphone is solved by having the black solid line which in the boom arm is used for a sound tube and in the headband to carry the cord. When worn only the black lines will be visible making it appear incredibly light.

TROOPER

TROOPER takes *robustness* to the extreme as this is one of the key findings from the user research. Inspired from a Dewalt drilling machine this headset is supplied with four rubber bumpers, screws and a thick outer shell. Rubber grooves is added where the headband is adjusted and provides a greater tactile feedback.

The overall design has a soft expression with a minimum of shape edges to improve the impact strength.

HOOK

HOOK aims to address the *female* audience by being inspired from a Chanel bag. Here elements as the texture and the Chanel logo is interpreted and transferred to the headset. By adding an exclusive appearing texture the headset moves from a "normal" design towards becoming more as a jewellery. The slim headband and boom arm design supports the feminine and light expression.

EMBRACE

EMBRACE strives to create an elegant connection between the different headset elements by letting them embrace the speaker house. It is inspired from a pair of Tom Ford sunglasses where the frame embraces the glasses and the joints seems invisible. This adds a lighter expression to the headset because of the small gaps in between certain areas of the headset. Small stitches are added to decorate and embrace the ear cushion. This also gives a softer look by breaking the cushion up.

WOOFER

WOOFER is as the name imply inspired by a speaker unit which adds the impression of good sound quality to the headset. The design has a robust expression as the metal ring is screwed into the speaker house holding the parts together. This combined with the dimensions leaves no doubt it will stand up to the rough environment in a contact centre.

To break down this partly solid design the headband is divided into two parts creating a lighter structure. Details as the mesh in the speaker house and the metal plate at the microphone contributes to the overall design expression creating a more unified design.

SQUARE

SQUARE differs from the rest of the headsets by taking distance from the traditionally round speaker houses. It challenges the archetype of a headset in a subtle way and makes the headset seem robust with its slightly over dimensioned parts. The white colour on the outside gives the headset a clean look and differs from other typical headsets at a contact centre. While the black colour on the inside is added to break the inside from the outside parts and avoid discoloured headband from hair products.

SUNNY

SUNNY is inspired by sunglasses where the headband is interpreted as the frame. The boom arm is half merged with the speaker house and creates an area for the employee to place a name tag. Both the end of the speaker house and microphone house has a mesh structure to make the plane surfaces more interesting and make room for ventilating the speaker unit.

HEADSET SURVEY

The end users at the contact centres can vary a lot and be all types of people regarding gender, age, style and attitude. With ten different headset design it can be misleading to evaluate them from a few users' feedback. Therefore it is decided to set up an online survey to get feedback on the ten designs and to have en indication of which headsets that addresses the most people.

The users are asked to rate the headset designs on a scale from 1-5 where 1 is dislike and 5 is like and additionally give comments. Furthermore they have to type in gender, age and if they have worked or currently are working at a contact centre or similar.

The survey was online for four days, and resulted in 321 replies from 55% men and 45% women, in the age group 18-62, where 22% had relations to a contact centre.

Individual comments are given on almost every headset design, providing feedback on shape, build, colour, comfort and technical restrictions etc. All comments and the rating are afterwards reviewed to provide the design team with an overview of which design to pursue.

Even though the headset survey provides essential information of which design to pursue it is important to distinguish between the opinions of the users and the ones actually responsible for buying the headsets.
The feedback is mainly minded on the aesthetics of the headset where a buyer also would be minded on build, audio, comfort and price.

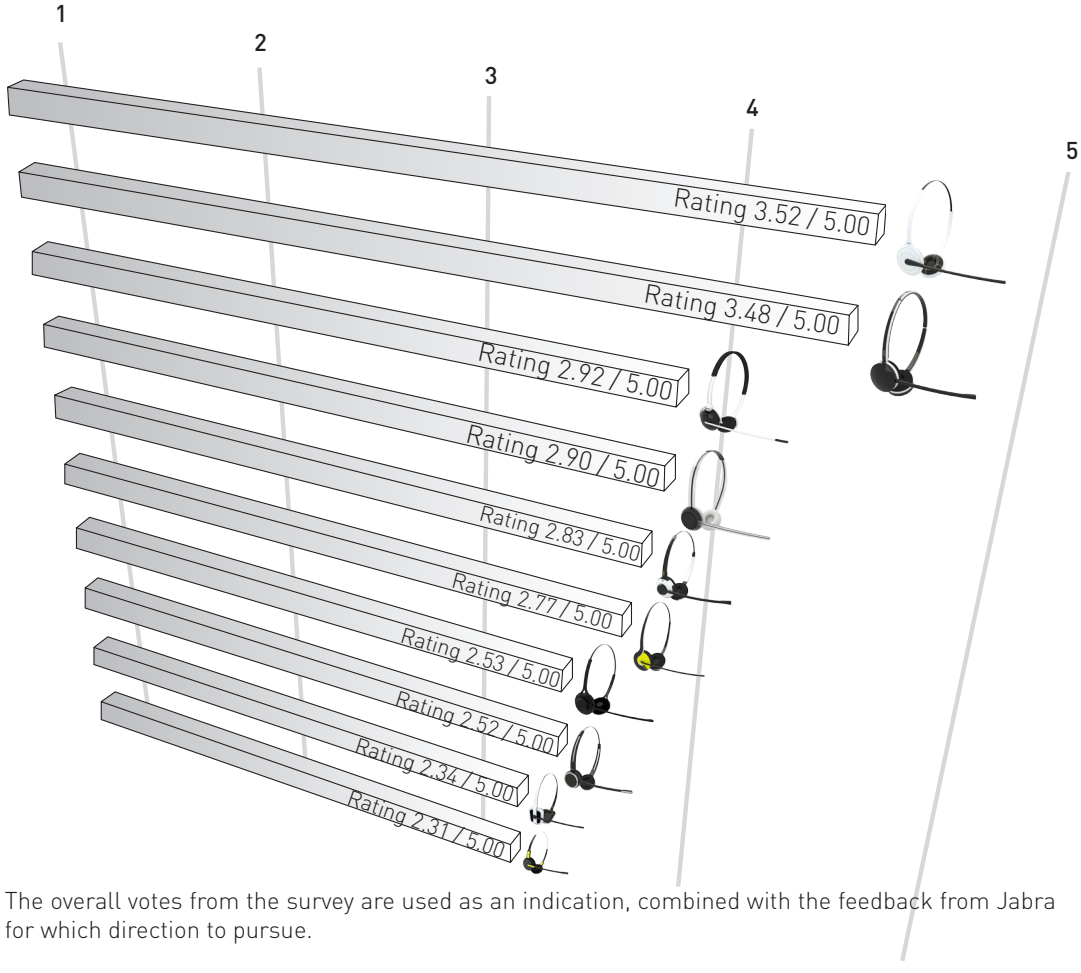
Following presents the most relevant survey data and extracts of the comments given in the survey. In (↗ app. 12) more specific survey data can be found, containing comments on the headsets and percentage distribution of the votes from 1-5.

AMY SURVEY COMMENTS
Positive: Simple, light, clean, female.
Negative: Cold, fragile.

PIPE SURVEY COMMENTS
Positive: Classy, Robust, Light, Comfortable
Negative: Cheap, Masculine, Seen before

RAIL SURVEY COMMENTS
Positive: Stylish, Timeless, Quality
Negative: Heavy, Seen before, Boring

PLEXI SURVEY COMMENTS
Positive: Light, Comfortable, Robust, New age
Negative: Plastic, Cheap, Sensitive



The overall votes from the survey are used as an indication, combined with the feedback from Jabra for which direction to pursue.

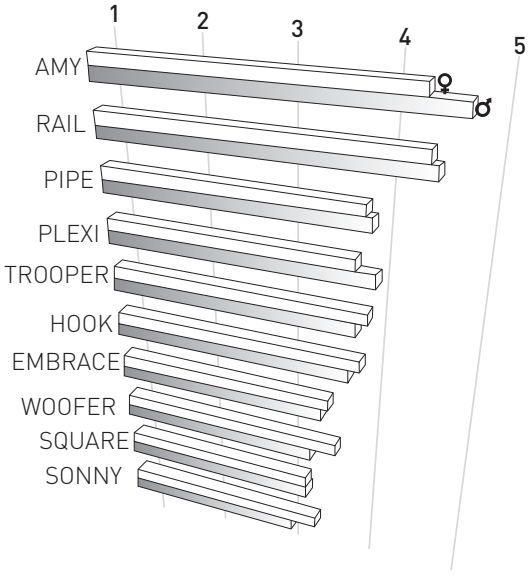


Chart of headset ratings based upon gender. Showing that more women than men votes for for AMY.

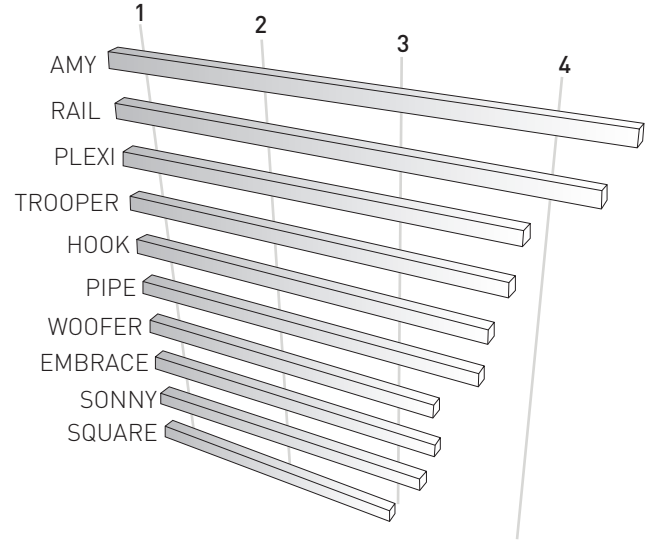


Chart of headset ratings only from CC employees. Overall the same ratings except for TROOPER that enters the top 4 and PIPE that drops.

CONTROL PANEL & CABLE MANAGEMENT

In-between the ideation and development of the headset designs, the development of cable management and control panel is initiated.

Despite some of the cable management and control panel designs are developed before the survey is launched, these are not included in the online survey as the design team estimates that this will require a deeper insight into the content of the project and an understanding of the product system in general. This combined with the amount of material would result in a too extensive survey minimizing the reply rate.

In order to design a smart cable management solution the focus lies within finding the best principle for managing the cord. There is already several hundred solutions on the market only with a little variation (↗ app. 13). In order to design a successful cable management solution the result has to have a certain degree of innovation. Therefore more than one brainstorm session is carried out with inspiration from Jabra's existing products and research on the internet. It is from the beginning decided that the cable management has to be a low-tech solution.

The design of the control panel does not have the same restrictions as the headsets and the cable management. A fast meeting with an electronic engineer shows the technology can be compressed to a USB dongle. This allows the usability and aesthetics to dictate the design instead of having strict technical regulations.

Some of the control panels and cable management solutions are designed independently from each other. Despite these do not compliment each other in a proper way, they are paired in sets to minimized the amount of individual material for PIN UP THREE. However some of the most low-tech cable management solutions are presented alone as they appear more as accessories.

On the next page four sets are presented together with two of the low tech cable management solutions.

Cablme management sketches

HUBTIMIST

This cable management and control panel is inspired by the Danish design icon "Hoptimisten". The cable management has a build-in spring making it possible to press it down and hereby prevent the cord from unwinding. This is furthermore designed as a play feature by pushing it up and down or spinning in order to avoid the callers from damaging the cord.
The design language follows the classic Scandinavian design line with its clean geometries, simplicity and few colours. Both the control panel and cable management has the same shape and a slanted cut top surface, which automatically gives them affinity and orients the interface towards the user.

CANDYBAR & CLEO

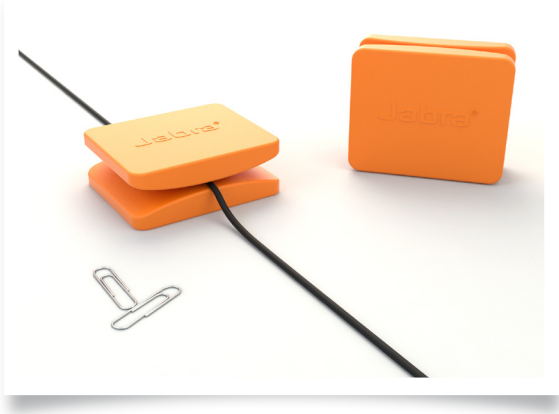
This control panel and cable management design explores the possibility of combining to different basic geometries and instead creating the affinity by using the same materials and colours. The cable management is kept circular as this is considered as the best way of winding the cord to limit the stress of it. The cord is therefore simply rolled around the circle placed in a position where the cord is not in the way when working.
The control panel takes it starting point in designing a panel which when placed can fit to existing elements on the desk as the keyboard and monitor. The buttons are placed on a straight line with a small slope for better overview.

FLIP FLOP

This control panel BOX and cable management FLIP FLOP combines two basic geometries, however the shapes are close to each other as the squared control panel has large rounded corners. The colours and materials are kept in the same style combined with a divided up interaction area by adding a new material. On the cable management the a rubber band divides the circular shape, which also is used to turn the inside out of the rubber shell when the cord is winded.

ROLL

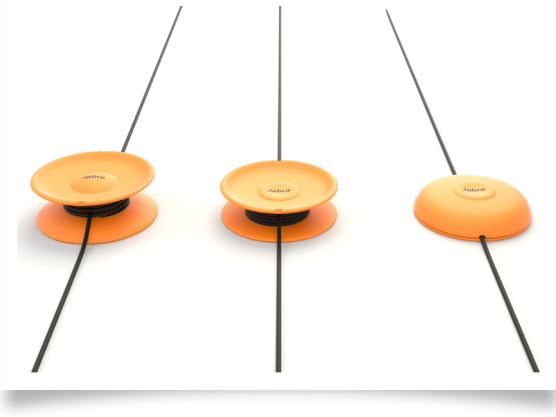
In this set the interaction with the control panel has created the foundation for the design. The volume is adjusted by turning the metal ring while a small line of light indicates the level. The buttons are divided in a layout that fulfil the circular shape and this combined with a slope on the top, provides a great viewing angle.
The cable management is again based on a simple roll up principle, however a suction cup is added both to secure it when rolling in the cord but also provide it with a more secure fit. It is also imagined that it can be placed under the table and hereby totally avoid the cord, which was part of the early concept "invisible hub". (page 38)



When designing and brainstorming on cable management solutions it has always been the intention that they shall be low-tech, however after designing the previous solution it is clear that it is possible to move a level down and make them even more low in relation to production costs. Therefore two ultra low-tech rubber cable management solution are designed.

CLIP

The first ultra low solution is based on a squared shape with a variation in the material thickness in order to create two fixing points for the cord.



PUSH

The second solution is based on some of the ideas from earlier cable management solution. By combining the inverse shell principle with a suction cup this new design arises. To make it more interesting a vacuum pump is added to create a play feature and furthermore improve the sucking power.

PIN UP THREE

For pin up number three all of the headset design, control panels and cable management solutions are printed and posted on the wall to provide an overview of the designs and to be used for facilitating the evaluation. Simple mock-ups of the cable management and control panels are also brought to the pin up. (app. 14)

Before carrying on to this a presentation is given where each design is described according to the user-research and the design teams individual thoughts. Furthermore the execution of the online survey and the aim of it is described. The result is not presented but hidden behind post-its on the printed posters. This is done as it is wished to get the participants reviews before reviling the results in order not to influence their stance. Each participant are giving a marker and asked to choose three headsets they believe has the most potential of becoming a contact centre headset.

THE HEADSET DESIGNS

The top 4 headsets based on number of votes is first WOOFER, as the participants believes it expresses quality and robustness. This is followed by a tie between EMBRACE & RAIL where they like the simple and elegant joint between the speaker- and headband house. Last but not least is AMY where comments on the clean surfaces, light weight and colour is given.

Besides getting a ranking of the headsets a lot of comments are given on how to improve the headsets by combining different elements from the various headsets but also which headset that has challenges regarding production and mechanical aspects.

CONTROL PANEL & CABLE MANAGEMENT

The feedback given on the control panels are in general that a simple design and intuitive interface is the right direction to go. Jabra therefore prefer the CANDY BAR and

BOX control panel, as these have clear and simple buttons and a overall simple shape. Furthermore it is discussed whether the control panel and cable management must have the same shape in order to have a more unified expression.
The interface on the ROLL concept they believe is too complex for a contact centre and better fitted for an office / consumer market.
Regarding cable management they believe that all of the design presented in sets are too complicated and looks expensive to produce taking the actual function of the product into consideration. They believe that the ultra low designs, PUSH and CLIP have more potential as they can be designed as small commercial products, and an accessories that is easy and cheap to manufacture and produced in large quantities. However PUSH is the one they preferred as it has this extra value in form of the play feature and it is seen upon as "ready for production".

CHOOSING THE DIRECTIONS

Based on the feedback two headsets are chosen to develop further; AMY and WOOFER. AMY scores high in the online survey and there is a common enthusiasm from Jabra's point of view, as it possesses a new an interesting design language not seen in Jabra's current product portfolio and has a very light expression which is valued high.
WOOFER is chosen as it is the one possessing the most potential as a CC headset according to Jabra. It has the required robust expression, a direct indication of good sound quality in the speaker house design and it can be seen as part of Jabra's existing product portfolio.

Regarding cable management it is decided to continue with both of the ultra low solution. Despite PUSH is preferred by Jabra the design team still see potential in CLIP. As to the control panels both CANDY BAR and BOX is chosen to develop further.

HEADSET **MERGING**

In collaboration with the PIN UP 3 participants, individual elements of the ten headset are evaluated with focus on transferring some of the most significant qualities from the various headsets to AMY and WOOFER.

AMY is mostly liked by the female participants. It appears light and comfortable to wear, however there are some doubts about the dimensions of the headset. Overall AMY has to become more robust and still maintain the light expression to become better fitted for a contact centre.

PIPE is described as comfortable looking with its wide headband covered with leather. The combination of creating a light headband with a solid expression that generates comfort related values is something Jabra likes. An expression like this will be interesting to combine with WOOFER in order to add more lightness and comfort.

PLEXI is in general acknowledge for its new and interesting approach with transparent materials, however Jabra also find it cheap as the inspiration picture is low-end pens. Despite this they like the chamfered speaker house which make it appear smaller. This expression can also be transferred to WOOFER in order to make the speaker house appear smaller.

RAIL is the headset that gets second most votes. However it is the headset which recieves most negative comments. Jabra think it looks heavy, has a too large gap between the headband and headband house and the speaker houses are very plane which will make them look like Mickey Mouse ears. Furthermore they describe it as the boring/ seen before but save choice.

TROOPER is perceived as an extreme suggestion for a robust design. Jabra believes is looks like a Star Wars Stormtrooper but still thinks it is interesting with the screws and the bumpers in the speaker house which will ensure protection for the house when dropped. In order to make AMY more robust a suggestion for combining the speaker house from Trooper is suggested.

The headband detail at EMBRACE is popular. Jabra think it is an interesting and elegant way of making a joint, however they all agree that there will be some construction related issues regarding wiring. Furthermore they think the speaker house without the boom arm looks like a stethoscope.

WOOFER gets most votes as it is believed it will fit best in a contact centre context. However there are some issue with the adjustment of the headband and the heavy expression of the headband.

SUNNY's design as in the online survey does not appeal to anyone, however Jabra believe the boom arm has a lot of potential and could be transferred to WOOFER. Furthermore they also like the idea of somehow adding a nametag to the headset which is a request Jabra currently have from marketing.

Based on the comments from PIN UP THREE the qualities from the different headsets are merged into two new designs; AMY and WOOFER version 2.0. In general the headsets are brought closer to a realistic product. The inner components (page 30) are used to shape the 3D modelling around to ensure the a more realistic volume of the headsets.
The two new headsets are printed as posters used for a "walk-around-session" at Jabra where 68 random employees are asked to choose between the two headsets based on their first intuition.

AMY VERSION 2.0
AMY now has more realistic dimensions which gives it a more robust expression while still maintaining the light expression. A dividing line is made in the headband and speaker house where the surfaces facing the head are black in order to avoid the white material getting dirty over time. As for the ear cushions small stitches are added the leather to emphasize the curvature of the cushion making it appear softer. Furthermore bumpers from TROOPER is added which also contributes to the robust expression of the headset. When adding the bumpers to AMY a new idea of making the bumpers changeable together with the ear cushions arises. The idea is developed and the ear cushions are made personal with space for a name tag label. The ear cushions could come in customized colours and be sold as an extra accessory for the headset.

WALK AROUND FEEDBACK
The comments given on AMY is overall focused on the white colour which is found appealing to a lot of the asked people - However they do not believe that the white colour will function in a contact centre environment. It would be better at offices as a dentist or doctors house. Some comments of changing the headset to a darker colour is also suggested. Furthermore the aesthetics of the headset is mentioned as appealing and looks light while still durable.
The idea of the changeable ear cushions with name-tag is an idea perceived with very much enthusiasm and something that should be pursued.

AMY SCORED 30 OF 68 VOTES.

AMY & WOOFER VERISION 2

To encounter the comment on WOOFERs the headband composition and expression is transferred from Pipe. The headband houses are shortened and the headband is widened in order to improve the comfort and create a smooth transition to the leather cover on the top. The speaker house is chamfered with inspiration from the speaker house on PLEXI which decreases the diameter of the metal decoration ring. The metal ring is not as before emphasising the edge of the speaker house, which makes it appear smaller.
Sunny's boom arm is transferred to WOOFER in form of the grid and edgy end.

WALK AROUND FEEDBACK
WOOFER generated a lot of positive feedback on comfort and durability, which is demanded of a contact centre headset. However the people asked at Jabra also believed it appeared slightly heavier, which is the issue between robustness and light weight design. Furthermore they find the headband comfortable looking and find this could be the next Jabra CC Headset. Therefore WOOFER is seen as the safe direction business wise to take.

WOOFER SCORED 38 OF 68 VOTES.

FAMILY PICTURE

FAMILY PICTURES

With the two headsets combined and refined, the cable managements and control panels chosen at PIN UP THREE are added to create a family picture. The headsets are seen as the dictating element for the design language and the cable management and control panel have to adapt to them.

AMY

Amy represents the round, soft and clean design expression and is therefore combined with cable management PUSH and the CANDY BAR control panel. The black and white colour from Amy is transferred to CANDY BAR to create a more direct connection between the two products. As mentioned earlier Jabra liked the oblong expression from candy bar and the simple and intuitive operation of it. This is why the overall shape of it is kept and the link between it and AMY is achieved through the colouring. The buttons are made more robust and added a tactile feedback instead of touch by adding an interaction plate on top of it with the buttons "cut out" with a click feedback below. Push is kept in its original shape and matched in the black colour.

WOOFER

WOOFER is the more robust and durable design and is therefore combined with the robust looking control panel BOX and cable management CLIP. The feedback to Box is equal to candy bar's for which its overall shape is maintained. The link between the two products are again made in the colouring and material by transferring the brushed steel material from woofer to box. Box is furthermore made slightly bigger as mock-up brought to PIN UP THREE seemed to small (app. 14). The buttons are corresponding to this made bigger but maintained in the soft touch look.

When comparing clip and push there are no doubt that push has more value by having the play feature and the sucking functionality. To pay regard to the positive feedback, clip is given another round to improve the functionality and get it to the same level as PUSH. As some of the initial ideas had, the functionality of being able to attach the cable management underneath this is transferred to clip by adding a "clip". Hereby the product can be attached and detached when needed. It is a well-known principle where the clip is dimensioned to fit around the table edge and make it possible to store the cable underneath the table.

CHOOSING FAMILY

Based on the feedback from the internal walk-around session at Jabra and the family pictures, the design team is now faced with the choice of which series to continue with. The walk-around session revealed there are unique qualities to both headsets.

Even though the design team believe AMY has a lot of design related value the feedback given at the walk-around was essential. Here the majority believes that AMY is a cool headset but fits better for a consumer market. Where WOOFER is the safer choice business wise. The both positive and negative aspects of AMY is that it is a headset with a design not seen within contact centres and Jabra products, where as WOOFER better fits into Jabra's existing product portfolio.

It is decided to continue with WOOFER as it both at PIN UP THREE and the walk-around session got the most votes and positive feedback. Furthermore it is also the headset that fulfils the user-research the best in relation to durability and quality expression.

Despite WOOFER in the family picture is presented with the CLIP cable management and BOX control panel it is decided to choose the PUSH cable management instead due to simplicity and functionality. During the design process PUSH furthermore receives a lot of positive feedback from other employees at Jabra who think is a fun and clever idea.
More value has also been added to CLIP in relation to adding a clip to it. However these are still two elements combined and even though it is a simple and low-tech solution it still seems more complex than PUSH.

STILL NOT GOOD ENOUGH...

3 PRODUCTS WITH 3 DIFFERENT EXPRESSIONS

With the three products united as a family it is time to adjust and make the final photo shoot. However the WOOFER family picture appears more and more like a marriage of convenience than a marriage of love. The family is therefore reconsidered and refined to design a more unified solution but without compromising the functionality.

The design team finds that the control panel is the main issue. PUSH has more and more been seen upon as a low end cable management accessory that can be fitted for all headsets as mentioned at PIN UP THREE (page 68). It is no longer perceived as a part of the family but as an commercial product Jabra can hand out for free. It is therefore decided to maintain the solution on a more exclusive level, which is not possible with PUSH included as it is a low-tech and "cheap" product.

It is decided to see PUSH as an accessory, or a cousin to the WOOFER family. PUSH is still an important part of the family that supports the solution based on the findings from the user-research regarding cable management and play feature.

Now where PUSH is made a commercial accessory, the product system is reviewed in order to ensure that the overall solution still fulfils the demands set up by the user research.
When looking back at the concept illustration (page 36) it is clear that the solution consists of a headset, a control panel with charger cable and some sort of cable management. The focus is therefore now to incorporate a cable management solution into the dock which can be used as an alternative to PUSH or as a *cable storage* for the long cord. This will besides creating a more unified solution furthermore enable the user to adjust the length of the cable in the control panel.

CONTROL PANEL

The cable management in the control panel is redefined as cable storage enabling the user to adjust the length of the charger cable from the control panel to a wished location. The cable storage is, as the cable management, imagined as a manual low-tech solution.
With the overall design of the headset defined, the control panel will take its starting point in achieving the same expression and still maintain the wish for an easy understandable interface as in BOX.
A new ideation of the control panel is initiated and three proposals are designed. In all three proposals the round and chamfered expression is implemented and all proposals are kept simple and oriented towards the user.

Furthermore the overall picture of the headset when not in use, is considered in the designs. Not by designing a specific "home" for it but the overall product picture is considered.
The cable storage is in all three solutions imagined in the bottom of the product as it is not wished to expose the cable.
When evaluating the three design proposals the design team agrees on that DISK is the design that complements WOOFER the most. The slightly exaggerated chamfer creates a clear link between the headset and the control panel and make the products seem as a united family. The slightly tilted surface on the top adds a direction to the product and orients the interface towards the user.

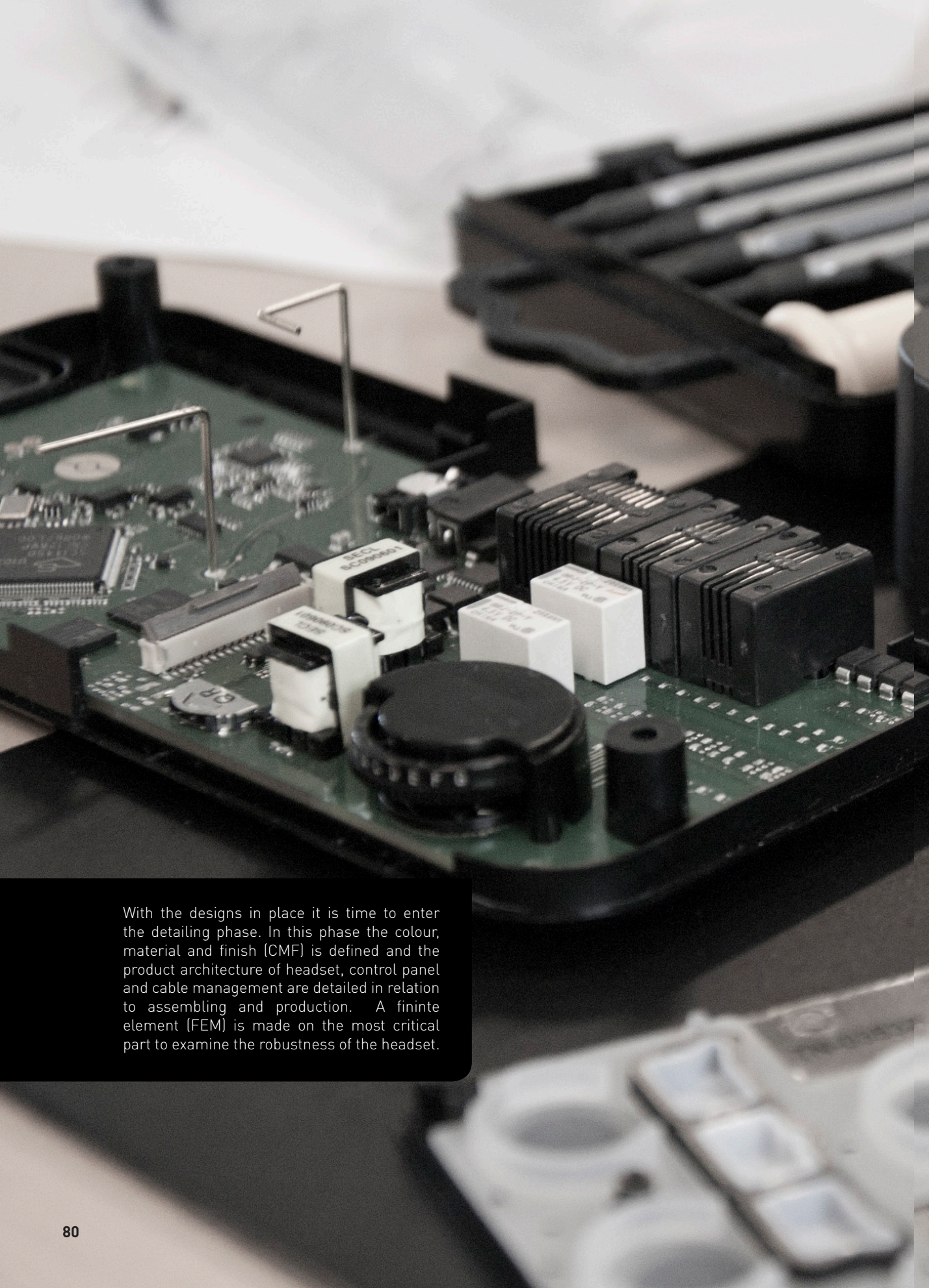
INTERFACE

The control panel will besides function as a controller for the headset also be used as the visual feedback for the user. This is done to ensure the user always is aware of which state headset is in.

The control panel has to indicate when:

- The headset is connecting and connected.
- The battery is charging, fully charged, low and very low.
- The headset is in pairing and listen mode.
- The call can be answered or ended.

Indications as these is in particular necessary when the headset is cordless and the indicators are furthermore kept as simple and easy understandable as possible by avoiding several information levels in the same indicator unless they are related.
The icons are based on Jabra's existing icon library. The volume icons has been updated with the icon for sound to ensure a clear-cut perception. The icon for listen mode is designed by the design team but is based on the icon from pairing mode since these two functions are related.



With the designs in place it is time to enter the detailing phase. In this phase the colour, material and finish (CMF) is defined and the product architecture of headset, control panel and cable management are detailed in relation to assembling and production. A fininte element (FEM) is made on the most critical part to examine the robustness of the headset.

04. DETAILING

CMF - COLOR, MATERIAL & FINISH

Before being able to define the product architecture the Colour Material & Finish (CMF) needs to be specified.

The following CMF suggestions are kept in neutral colours in order to pay regard to the wish of making it appear professional. Too many strong colours can easily make it more a consumer headset which is not wished. However a fine balance between consumer and professional is aimed for. This is done by using neutral colours combined with surface textures applied to the decoration sphere on the headset. This adds the proffessional appearance with a touch of consumer, which gives it a little edge and makes it stand out from other proffessional headsets.
By adding the textures to the headsets it makes them differ from Jabras existing product, by being more expressive. However this also makes them more interesting and not boring as stated on some Jabra products in the product analysis. (page 11)


Jabra
Jabra


Jabra
Jabra

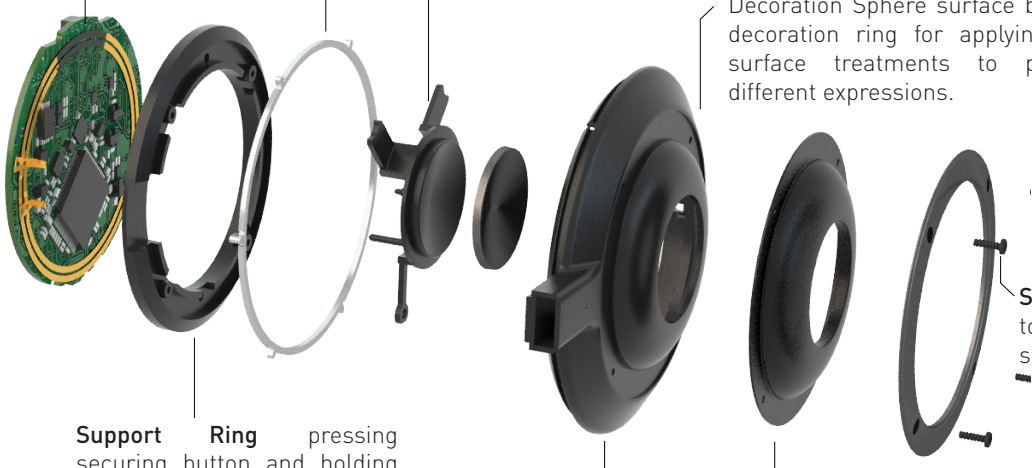
HEADSET EXPLODED

Metal Spring Ring functioning as a disc brake by sliding against the inside wall of the speaker house.

Multi Function Button fixed to pins in the outer shell. Secured by the support ring. It has a pin in the centre that presses on the button component on the PCB when pushed.

Printed Circuit Board (PCB)

Decoration Sphere surface behind the decoration ring for applying various surface treatments to play with different expressions.



Screws holding together the rotating section of the parts.

Support Ring pressing securing button and holding the spring ring, and "slider shoes" which establish connection to the sliders on the PCB making it possible to have connection in a 360 degree spin. It furthermore has screw towers for fixing the screws.

Outer Shell containing opening for boom arm, and snap for locking and rotating in the speaker house.

Decoration Ring defining the circular shape of the outer shell.

SELECTED PARTS DESCRIPTION

From the exploded diagram four of the more complex parts are chosen to describe in detail in order to provide an insight into which considerations the design has been dealing with.

HEADBAND

The headband (HB) is assembled from two parts an INNER and OUTER, which is a well known principle from Jabra and the cheapest way of transferring signal between the two speaker units. The inner HB is made in steal and have two milled tracks holding two cords from the circuit board connection the two two speaker units. With regard to the connecting the grooves and cord are always on the outside of the HB. To protect the cords the HB is wrapped in KYNAR which isolates the HB and provides it with a softer touch and look.

Headband house

HEADBAND HOUSE

The headband house (HBH) is assembled from a principle which is the only principle Jabra assembles HBH. The HEADBAND CLIP is a reuse of Jabras part but is scaled in dimension to fit the broader headband on 10mm. Inside the headband grooves are added on the INNER HBH to ensure a tactile and safe feeling of when the headband is adjusted. In the bottom of the OUTER HBH the FEMALE ROTATION part is mounted to ensure a smooth friction between the headband house and the speaker house. The cords for the speaker units in the secondary speaker house is also transferred through this opening inside the MALE ROTATION part and by chaos principle around the HEADBAND CLIP and to the milled grooves in INNER HEADBAND. The INNER and OUTER HBH is assembled with a simple snap lock where the INNER HBH is guided inside the opening in the top of the OUTER HBH and forced to snap together in the bottom. Both the INNER and OUTER HBH are added construction ridges to enforce the rigidity of the construction and are 2/3 wall thickness of the parts to avoid shrink marks.

Headband house

MUTING

As it is wished to get a tactile feedback when entering muting mode on the headset there is a need for some kind of mechanical solution which can provide the tactile feedback.
The metal spring ring functions as a disc brake which creates a smooth motion when rotated and prevents it from getting "loose" over time. As the spring ring rotates with the outer shell it is equipped with a wider knot at the boom arms position which passes another placed knot in the speaker house at eleven and one o'clock enabling it to give a small tactile feedback in this position.
Inside the outer shell the support ring is mounted. On the support ring the slider shoes are mounted which connects to the gold covered sliders on the PCB. This makes it possible to maintain the connection without any cords, which also makes it possible to rotate the boom arm in a 360 degree spin. As the muting mode is entered between eleven and one o'clock there needs to be a disconnection between the slider shoes and the sliders on the PCB. This is solved by not covering the PCB sliders with gold in this gap.

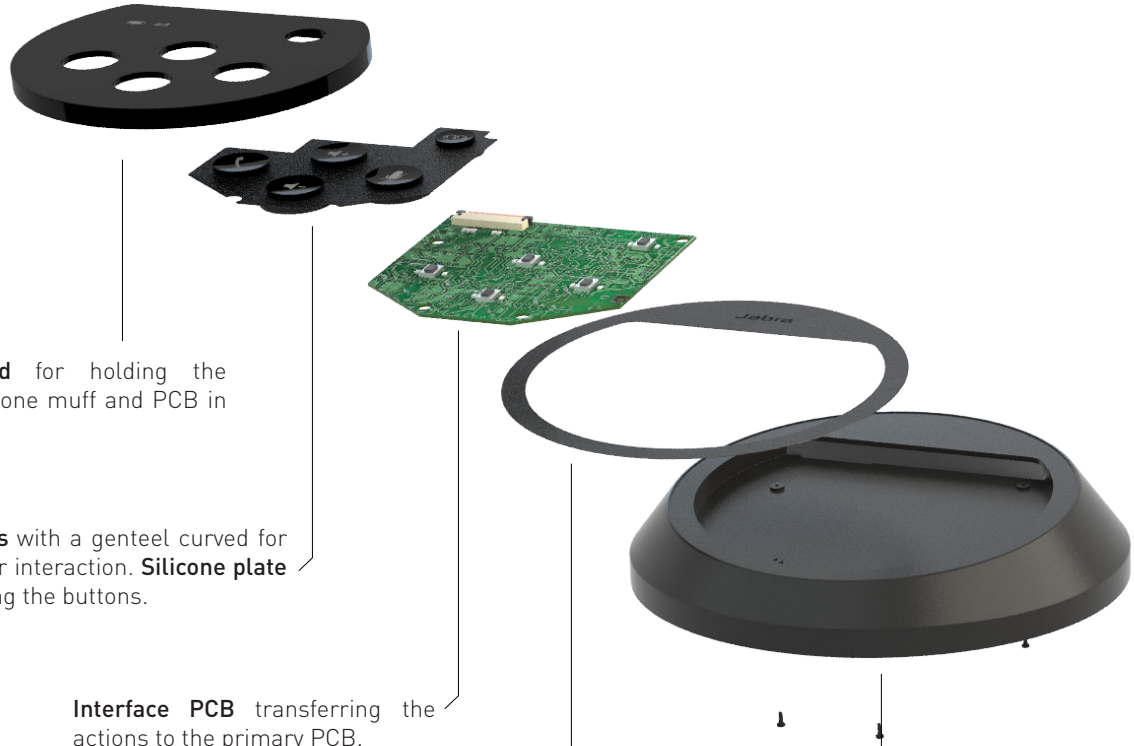
Speaker house and outer shell components

Exploded boom arm

BOOM ARM

The boom arm is joined with the outer shell via snap locks at the end of the boom arm. It is simply pressed into the opening of the outer shell which is the most effective way of joining a bend able and a stiff material. By letting the boom arm enter the outer shells opening and create an overlap it minimizes the chance of it breaking when bended.
The microphone is placed in the end of the boom arm in the microphone head. The mic head is provided with an input and out hole for the microphone.
As the boom arm has to be bendable it is made of the material PA, which sets some demands for the moulding process. It has to be moulded in one part in order to avoid the part from splitting in its dividing line when bended. As it is moulded as one part a "slider" is needed to make the boom arm hollow for the wiring from the mic to the PCB. This is done by applying a tensioned solid metal pipe inside the mould, which the plastic shrinks around when injected. Directly after the injection moulding is performed the solid metal pipe is pulled/ slided out of the parts leaving it hollow inside.
This process is commonly used, however it is especially tricky on a boom arm due to its length.

CONTROL PANEL EXPLODED



Interface lid for holding the buttons, silicone muff and PCB in place.

Buttons with a genteel curved for a better interaction. **Silicone plate** for fixing the buttons.

Interface PCB transferring the actions to the primary PCB.

Decoration plate in dark brushed steal.

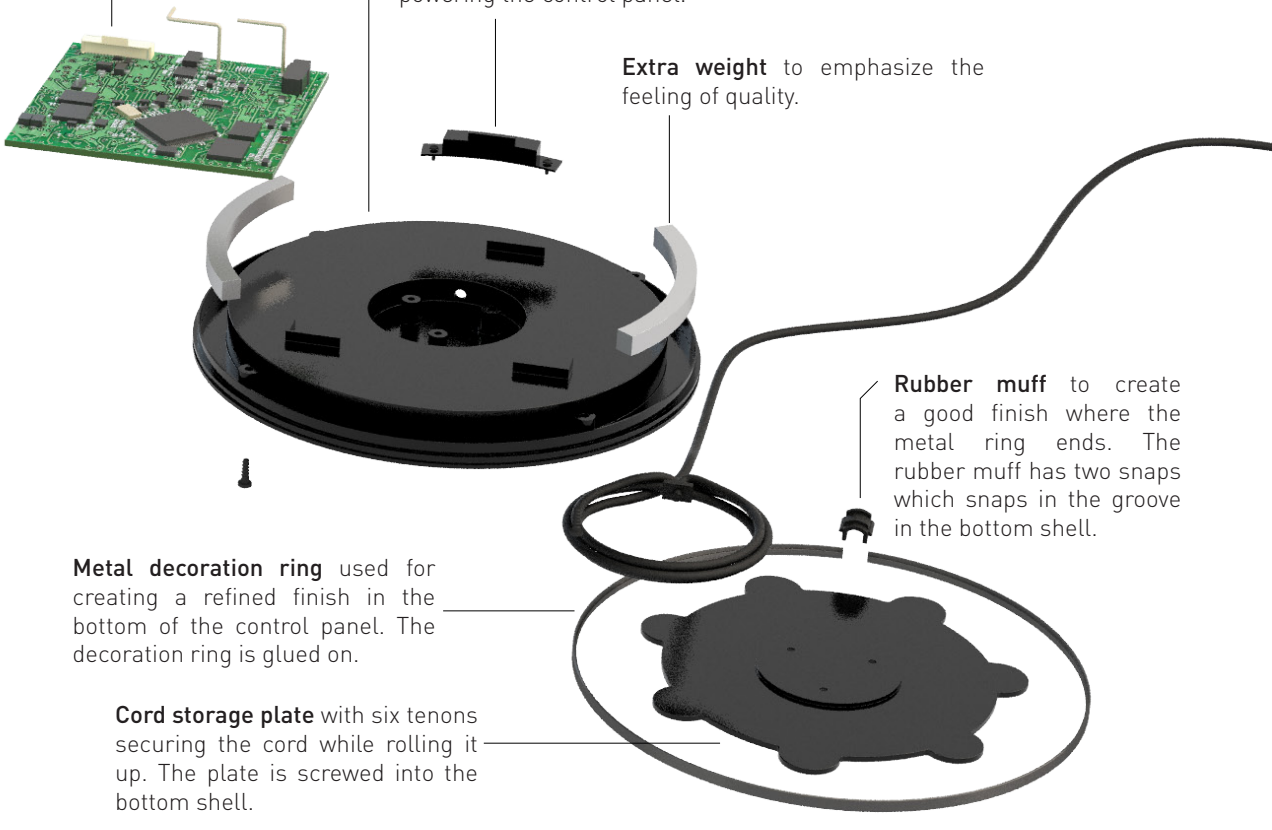
Top shell with small pins fixing the interface PCB and screw towers holding the top shell and bottom shell together.

Primary PCB with two DECT antennas located in the highest part of the control panel.

Bottom part with DECT antennas located in the highest part of the control panel. Walls are made to fix the PCB horizontal.

DC Power Connector and Micro USB plugs for connecting and powering the control panel.

Extra weight to emphasize the feeling of quality.



Rubber muff to create a good finish where the metal ring ends. The rubber muff has two snaps which snaps in the groove in the bottom shell.

Metal decoration ring used for creating a refined finish in the bottom of the control panel. The decoration ring is glued on.

Cord storage plate with six tenons securing the cord while rolling it up. The plate is screwed into the bottom shell.

SELECTED PARTS DESCRIPTION

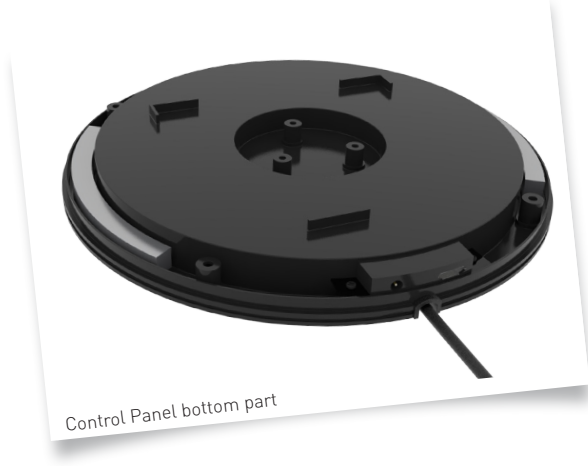
TOP SHELL

The top shell is 1.5 mm thick and injection moulded with a two part casting tool moving in the z-axis. In order to remove the shell from the tool the straight wall and some of the surface area in the interface immersion has been removed. By removing this it is possible to bring the data cable through connecting the interface PCB with the primary PCB underneath.
When the interface lid is assembled it is fixed by screwed it together from the inside of the top shell.
When taking a closer look at the inside the shell has three towers which is used for preventing the primary PCB from moving in a vertical position by pressing it against the bottom part.

Control Panel top shell

BOTTOM SHELL

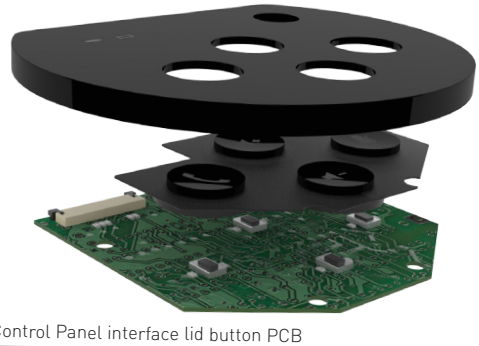
The bottom shell also is 1.5 mm thick and injection moulded with a two part casting tool moving in the z-axis.
On the top it has three small walls preventing the primary PCB from moving in horizontally. In the middle the shell have a hole creating a cylinder to roll the cord around. The hole is supplied with three screwing towers to fix the cord storage plate.
In the periphery is glued two weight blocks to emphasize the feeling of quality.
The power and connector plugs are raised in order to have them in the middle on the backside, as the charger cord is coming out underneath.



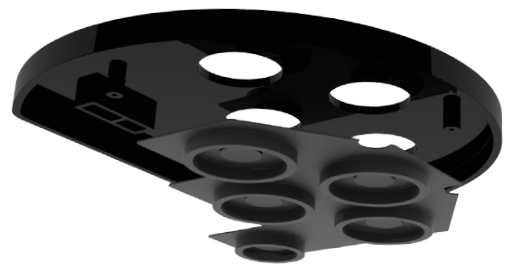
Control Panel bottom part

INTERACTION LID

The interaction lid consist of a outside top shell, buttons, a black silicone plate and a PCB.
The buttons are glued together on the top of silicone plate which is attached to the lid. The opposite side of the silicone plate has a cylinder for each button fit tightly to the PCB with the PCB button and indication light in the middle. The cylinders furthermore prevent the PCB from moving vertically. As the silicone is black it prevents the light from lighting up in the surrounding buttons.



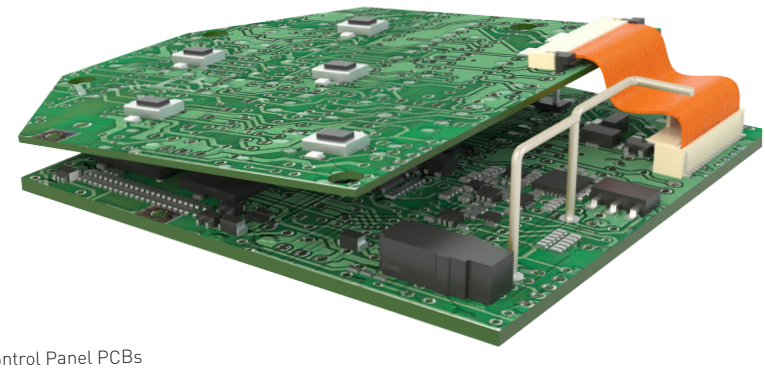
Control Panel interface lid button PCB



Control Panel interface lid and button silicone overlay

PCB'S

The control panel has two different PCB's, one for providing the feedback from the buttons and another for running the software. On the interface PCB the five buttons can be seen along with the small indication lights on each side. The data cable is connecting the two PCB's through the hole in the top shell.
On the primary PCB the two DECT antennas are located in the highest part of the control panel.



Control Panel PCBs

CABLE MANAGEMENT CONSTRUCTION

ONE PART

The most appropriate way to produce PUSH is to injection mold it as one part to keep the costs low. In order to do this and to add most volume to create the vacuum the part is made hollow so the part can be injection moulded with tool divided in four axis. The material is considered as a type of TPE, which is a sort of soft touch plastic (high E-module). To make the part stabile when pushing it the wall thickness in the hollow part is increased. However the face pointing downwards has to be as thin as possible in wall thickness to enable the part to suck better to the surface.

TWO PARTS

A more stabile construction can be made by dividing PUSH in two parts. The middle plastic part is made of two similar parts and therefore moulded from the same tool. By adding this simple plastic joint that is glued together the construction are made stronger to avoid PUSH from being wobbling together when pushed.

It is difficult to chose between these two ways of producing because the functionality is the dictating feature. This has to be made from a series of trial and error prototypes to ensure a functional cable management solution.

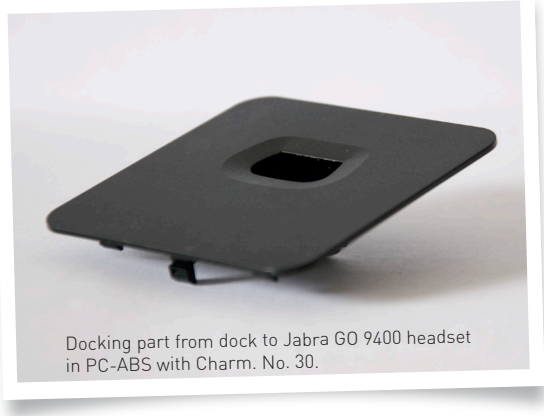
MATERIALS AND SURFACES

PLASTIC

The material for the headset and control panel parts are made of the material PC-ABS (app. 80% PC and 20% ABS) which is the most commonly used plastic in Jabra headsets (app. 15). By combining these materials the impact strength from PC and the chemical properties from ABS are obtained, which is needed to make the headset resistant to sebum, hair spray and cremes etc. (app. 15).

SPARK EROSION

For all of the plastic parts electric discharge machining (spark erosion) is applied. The spark erosion applied is Charmilles or VDI (Verein Deutscher Ingenieure) No. 30.
This spark erosion roughness, when applied on PC-ABS, demands a minimum draft angle of 2.0° (app. 16).
Only the visible part when assembling is eroded. The internal non-visible parts such as ribbons, walls and screw towers are not surface treated which leave the surface blank. Parts like these has a general draft angle demand of 0,5°.



Docking part from dock to Jabra GO 9400 headset in PC-ABS with Charm. No. 30.

Decoration sphere with photo etched surface texture

SURFACE PATTERN

For applying a texture or print on the outer shell there are several production methods which have been considered.

PHOTO ETCHING

By using photo etching a wished pattern can be applied as a surface texture. The mould is covered with acid resistants covering the applied pattern. The exposed metal surface is dissolved leaving the pattern visible in the mould. Photo etching only creates surface texture and colours cannot be applied.
Photo etching pattern are most commonly referred to as a Mould Tech standard.

IN-MOULD LABELLING

If the outer shell is decorated with a pattern containing colour variations there are two production methods which can be applied. The first is in-mould labelling where a thin film with the print is laid inside the mould. When the part is injected into the mould the film sticks to the plastic surface.

AQUA TRANSFER

The other method is a method known as aqua transfer. In large basin filled with water a thin film with the print lies on the water surface. The film is sprayed with glue and the part is then dipped in and out of the basin making the film transfer to the surface of the part.

FEM

When taking a closer look at the critical elements within the headset, the joint between the speaker house and the headband house is one of many well known problem area when constructing a headset. For this reason the following section will be dealing with an Finite Element (FEM) of this particular area, in order to determine and evaluate the stress intensity and displacement of the pin holding the to parts together.

The size of the headband pin is determined from other similar Jabra headset to minimize the stress intensity from the beginning and hereby make use of the internal know-how. Concerning the force it is from Jabra's point of view acceptable if the pin can resist a force on 10 Newton placed at the end of the headband house.

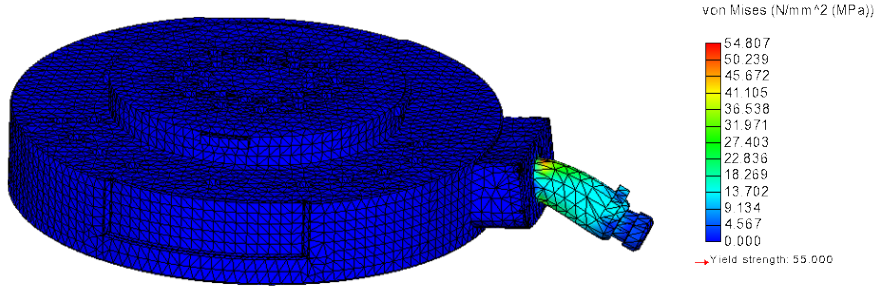
To imitate this scenario in a FEM the parts are simplified, which has made the analysis more fragile than it would be in reality. For instance does the FEM only include one of the parts effecting the deflection, in this case the speaker house. The headband house which also will help to support the weight, as the ends will be pressed together and hereby support the pin when bending is not included because of limitations in the software. Because it has not been possible to include the headband house the length of the torque arm is not present in the analysis, which is solved by multiplying the force with a factor six, as the headband house is six time longer than the pin.

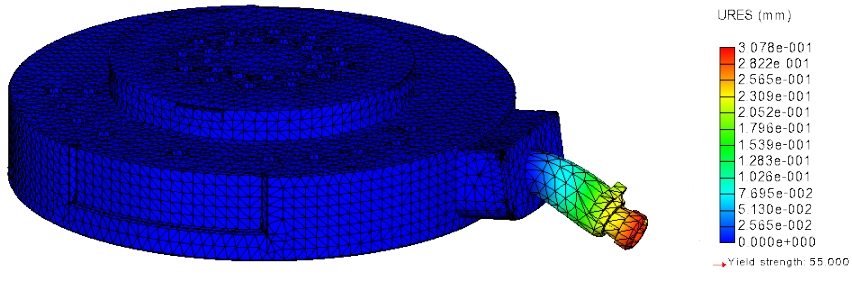
Before running the simulation the different parameters are determined:

L = 60 mm

P = 10N (1 kg)

Modulus of Elasticity for PC/ABS : 2400 N/mm2
Tensile strength, Yield: 55 Mpa
Conversion to element:
L = 10 mm
P = 60 N (6kg)

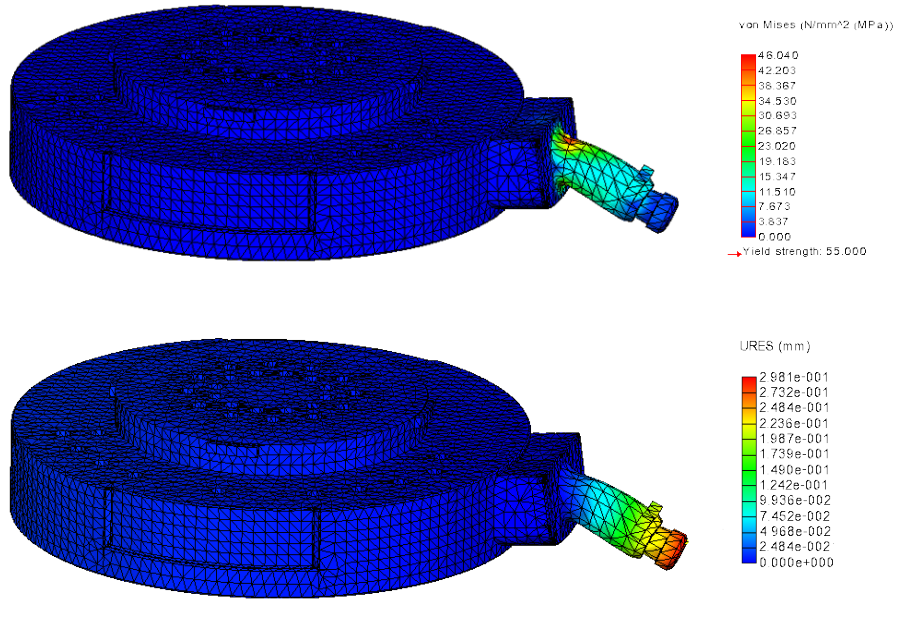




In the first FEM simulation the pin has no fillet in the edge between the speaker house and headband house, which result in the stress intensity drawing near to the yield strength. With a stress intensity at 54,8 Mpa and a displacement at 0,3 mm the result is not acceptable for which reason the pin is given a fillet to strengthen it.

In the second FEM simulation the fillet has improved the construction by reducing the stress intensity to 46 Mpa and still a displacement at 0,3 mm, which is more acceptable as the simulation is considered to be worst case and only for short therm stress. Furthermore the overall simulation is simplified to a more fragile example and will therefore be more robust in reality.

FEM simulations is rarely made at Jabra as it only gives a indication of the critical areas, which is far from enough in order to ensure the quality. Therefore dimensioning of the parts is mainly based on experience and by testing the construction of the headset in practice using automatic operation setups.



INTERACTION

LISTEN MODE

The user research showed that listen mode is an essential function at the contact centers due to the often replacement of employees that needs to be coached through the feature. The research also showed that the people on listen mode always are located near the same desk as the employee whether it is a cordless headsets or not.

The cordless headset needs to be easy and fast when enabling listen mode and most likely possible with several headsets. When enabling listen mode on cordless headsets it is necessary to somehow mate the secondary headset with the control panel transmitting the signal to the primary headset. This can be done physical or cordless in several ways.

In order to implement an easy and fast enabling of listen mode a specific listen mode button is implemented. By implementing a listen mode button with an integrated light the control panel can provide instant feedback on the function.

When pairing a secondary headset the headset is connected with the charging cable and the listen mode button is pressed, the button will then start flashing indicating that the headsets is in listen mode. A voice promt will in the primary headset notice to press the multi-function button to approve the listening mode. After accepting the listen mode button on the control panel will light constant and indicate listen mode is enabled.

HEADSET

The headset is kept as simple and intuitive as possible by only having an answer/end call button on the headset. The user research showed that there is some problems in having multiple buttons on the headset and touch buttons are not appropriate on the headset. The answer button is placed in the center of the primary speaker house where the form is concave which gives a tactile feedback and guides the fingertip to find the center.

The user research showed some employers are concerned about employees being cordless without having a reason for it. To take these concerns into consideration the cordless range of the headset is imagined reduced significantly compared to the normal 100-150 meters. This will keep the employees near their desk and increase the maximum amount of cordless headsets in the area and hereby improve the talk time.

The computer is the users primary tool and should therefore be kept in a distance close to it at all times. To avoid more than one button on the headset the volume control adjusted by the Automatic Gain Control (AGC) technology, which is a well-known principle from many devices including the car speaker phone Jabras Freeway. The AGC ensures and adjust the sound level is sufficient in relation to its sorrounds. The user can adjust the wished volume level on the control panel and the AGC will always ensure the volume level is kept.

STATUS INDICATOR

The status indicator on the headset is limited to one colour to keep the feedback as intuitive and unambiguous as possible. The light is only visible for surrounding people when and only visible for the user when not wearing the headset. Therefore the status indicator in the headset only needs to provide three types of information; pairing / listen mode (flashing fast) and connecting to the control panel (flashing slow) and the status (constant light). Information as low battery and listen mode will be indicated by the control panel and through voice prompts.

When the user turns on the computer the control panel will automatically be turned on and the control panel and status indicator on the headset will flash indicating they are connecting. When the headset is connected successfully the light in the control panel will stop flashing and constantly be illuminated and the status indicator on the headset will turn off.

The rotate to mute function in the boom arm on the headset indicates when the headset is muted but not when the headset is in an active call. When the user is in a call and mutes the headset the light will illuminate and indicate the user is in an active call but muted. It is chosen to only use the status indicator in these short term scenarios in order to pay regard to the talk time by minimizing the use of the battery.

05. EVALUATION

CONCEPT EVALUATION

The project concerns the design of a cordless headset for contact centres in collaboration with GN Netcom - Jabra. The approach to the project has been somewhere in between the user centered approach taking starting point in the users and the design centered approach regarding the designers' profession as designers. The aim of the project has been to demonstrate the design teams abilities to design an advanced electronic product design to an unknown user group. The team wanted to demonstrate their abilities to observe, interview and locate problems through user research and implement the acquired knowledge into strong and innovative design concepts. Furthermore the aim has been to demonstrate the teams' sense of aesthetics through various design proposals without compromising the usability and the overall objective. The project is intended to reflect the learned capability of transferring strong concepts into a product design from early sketches to 3D models and photo realistic renderings, mechanical engineering and branding.

The result of the project is the cordless headset for contact centres, Jabra Communicator, designed specific for solving the observed problems and findings from the conducted user research. The user research showed lots of smaller and bigger fragments of problems, issues and areas to improve but where in general caused by the fact that the existing cordless headset on the market is designed for office use and not contact centre use. The prerequisites for the project has been that we are moving towards a cordless society which is supported by the conducted user research that showed increasingly more cordless headsets in the contact centres.

The charger cable supports the transition from corded to cordless headset by transferring the core value from the corded headset to the cordless headset. The headset is added unlimited talk time through a simple charging principle known from mobile phones, laptops, electric shavers and several other products where the product still can be used when charging opposite the existing solutions where the headset needs to be docked. A cable storage solution in the control panel is implemented to accommodate the users wish for a clean desk and is furthermore supported by a cable management solution, PUSH.
PUSH is designed as an accessory to meet the wish from Jabra of making a headset with a play feature that prevent the users from playing with the cord and hereby tearing it apart.

The control panel is designed to, besides storing the charger cable and transmit to the headset, replace the existing desk phone which also functions as the control panel for user today. In this way the transition from corded to cordless headsets are supported and the core values from the corded headsets are maintained in the result. The control panel is furthermore designed to be easy understandable so the users without further instructions can operate and use Jabra Communicator. As solution to one of the key features at the contact centres, listen mode is made easier to enable simply by adding a dedicated button supported by voice prompt in the headset. This ensure no doubt of how to connect secondary headsets and no accidental disconnects.

The headset is made more intuitive in its use and only the essential features are added, rotate-to-mute and a multi-function button. The rotate-to-mute function is paying regard to the users already existing habits and together with the LED light it indicates when the user is available or unavailable. The multi-function button is placed in the center of the primary speaker house and the concave shape of it makes it easy and tactile for the user to locate when answering and ending a call.

It can be concluded that the result of the overall design is a robust, simple and Scandinavian design that is considered as a realistic proposal for tomorrows cordless contact center headset. The design has trough the entire process been evaluated through user feedback, online survey and with huge participation from a group of Jabra employees. By involving Jabra through the entire process from early research to production and mechanical engineer considerations a more realistic solution has been designed. It can be concluded that the process has ended up with a close to realistic proposal for tomorrows cordless contact center headset that pays regard to essential findings from the user research. Furthermore the entire process towards the final design has supported the design team in identifying and developing their title as industrial designers in a bigger company as Jabra by getting an insight in their process behind producing headsets.

CONCEPT DISCUSSION

With the opportunity of being part of Jabra in Ballerup throughout the thesis project, the team has been provided with at lot of first hand knowledge which has improve the quality of the project. Jabra has from the beginning left the assignment open for the design team to decide which direction to take. However it has also from the design teams point of view been important to involve Jabra in the process in order to make the project as realistic as possible. For this reason Jabra's opinion about the product and its design has been crucial to the design team and it is therefore debatable whether the design team should have listened less to Jabra and more followed their own gut feeling. Despite this the design team found it important to follow Jabra's interests in order to make them an important part of the decision process and learn how to use and communicate with a "client".
Not only Jabra has been used to get feedback, the online survey was also created to have feedback from as many people as possible. The team received over 300 replies over a period of four days, which created a clear picture of what the users preferred. However this material was not used to its full extended even though the replies represented a wide range of the users with relation to contact centres. Even though the survey participants working at contact centres had strong opinions about how the headset should be designed, it is in the last end the purchasing agents takes the buying decision. As the user research showed, the purchasing agent are very focused on price, audio and durability. However the given feedback was still very useful in relation in relation to knowing how to design something that APPEARS comfortable, durable and has aesthetically values.

During the ideation phase it became clear how difficult it was to visualize and explain a the early headset ideas as it easily came to resemble the archetype of a headset. Therefore 3D modelling was taking into use very early in the process in order to visualize the ideas in a sufficient level of detail. This resulted in a longer ideation phase with more hours spend in front of the screen, however it was a good way of understanding the product architecture of a headset and furthermore getting an insight in which elements and areas of the headset to focus on. The result of the digital sketching created an advantage in relation to the presentation material, which were considered as being on a high level and very respected by the people at Jabra. This resulted in some additional side projects along with the thesis project that provided the team with a good insight in the design process at Jabra.

After defining the product system it was clear that more than one product had to be designed. At first the focus was on each product, however this changed when entering the detailing phase. Here the team realized the challenges of designing in series and it was necessary to review some of the designs one more time, in order to make them complement each other.
Through the process it therefore has been discussed what to design first when designing more then one product and designing in series. The team has no final answer, but has done it by choosing a primary product, in this case the headset, as the common denominator as this was seen as the most important element in the product. The team furthermore found it more convenient to design the control panel when the headset design was determined.

LIST OF ILLUSTRATIONS

APPENDIX 01

TELMORE

Telmore support is a mobile service company serving and helping customers. They only handle inbound calls concerning support and frequently some sales occur in connection with changing or adding something to a customers existing subscription.
The calls vary from customers having question about the bill to customers wanting for help to configure their new mobile phone.
In connection to this the Telmore support staff are very dependent on being mobile as they sometimes have to get a phone from the "phone-shelf" placed away from their desk.
Telmore has a lot of young customers and is a company that can be described as "young & fresh". This is also seen in the average age of the Telmore support employees which is in the young category.
One of Telmore's main focuses is that the employees should have the possibility to walk around and not sit down all day. Therefore fruit baskets and candy are placed so they have to walk to get it. Furthermore footballs are placed around the office to play with - also while serving customers.
Telmore wants their employees to have the best conditions.

ADDRESSE
Telmore A/S
Carl Gustav Gade 3
2630 Tåstrup

CONTACT PERSON
Henrik Mølgaard
Department Manager
hm@telmore.dk

TASKS
Inbound - Support

HEADSETS
Sennheiser DW Office

NUMBER OF EMPLOYEES
100

SOS INTERNATIONAL

SOS International handles both inbound and outbound calls most commonly regarding injuries acquired when travelling abroad. The greater part of the inbound calls are clients reporting an injury whereas the outbound calls are used for following up on a specific case regarding practical and medical information.
Sometimes the calls can be very serious, for example death cases, for which reason the employees have to be well prepared mentally. Therefore they have to be able to trust their tools such as the headsets and telephone lines - which must be of the best quality.
SOS International is a "white label" company as they do not brand themselves in their own name but provide a service for other insurance companies.
A team at SOS international consist of 8-10 people who work very flexible by being able to join other teams and speak different languages. This combined with a common duty shift and no fixed workstation makes it easier for the employees not to have a personal headsets.

LNeurocom
tele services a|s

LN Eurocom is the largest Contact center in Denmark with over 1000 employees in offices in Aalborg, Århus and Copenhagen. They offer standard and customized solutions for customer service, technical support, telemarketing and outplacement to their partners - and to their customers.

LN COPENHAGEN

The department in Copenhagen had recently bought some used headsets from the company ISS, which means that they now have four different types of headsets. Most of the headsets at LN are corded but they also have cordless models, however these are only distributed to employees which have the need for moving around when serving a customer. Otherwise they prefer corded headsets as the employee then is fixed to a specific place and with a long cord they still have the possibility to stand up within a limited area if needed. LN in Copenhagen handle inbound support and service calls for Garmin, Telia, Viasat etc.

LN AALBORG

The Aalborg department recently moved to brand new offices which compared to the Copenhagen department provides they employees with a very good indoor environment. They use only one type of corded headsets, Globe, which are used by both sales and support staff. The support and sales staff has the same needs for being mobile and being able to walk away from their desk during a call - however they still have corded headsets. The Aalborg department has customers such as Falck, Nordjyske, DLG and Telia.

ADDRESSE
SOS International A/S
Nitivej 6
2000 Frederiksberg

CONTACT PERSONS
Brian Kristensen
Team Manager
brk@sos.eu

TASKS
Inbound & Outbound
Emergency centre
Accident claims

HEADSETS
Jabra 9120 Flex
Jabra Pro 9240 Flex

NUMBER OF EMPLOYEES
200-250

ADDRESSES
LN Eurocom
Bådehavnsgade 2A
2450 København

Langagervej 6
9220 Aalborg Øst

CONTACT PERSONS
Copenhagen dept.
Nikolaj T. Jacobsen
Department Manager

Aalborg dept.
Betinna Christoffersen
Department Manager

TASKS
Inbound & Outbound
Support & Sales

HEADSETS
Jabra Ellipse
Jabra 9120 Flex
Jabra Pro 9240 Flex
Globe

NUMBER OF EMPLOYEES
1000+

APPENDIX 03

USER SCENARIO DIAGRAM

The diagram shows a typical work flow for respectively an inbound- and an outbound-user. The variation between corded and cordless headset are marked with different colours.

Reporting in for work

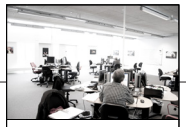
Pick up equipment from personal box

None personal equipment

Personal ear cushion

Personal headset

Fixed seating



Floating seating

Login on system

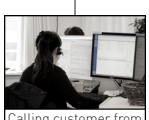
INBOUND

OUTBOUND

OUTBOUND

= Possible with cordless headset on

Looking up customer data on computer



Calling customer from database on computer

Sitting

Standing

Walking

On phone

Ends call

On headset

Typing in result on computer

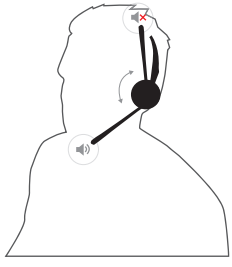
No sale

Sale (register on scoreboard)

Send package to customer

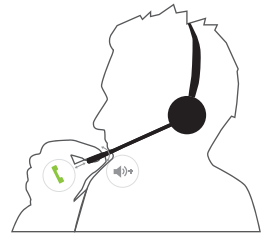
New call

APPENDIX 08

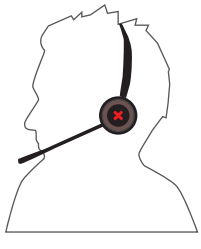


Rotate to mute

Charger cable

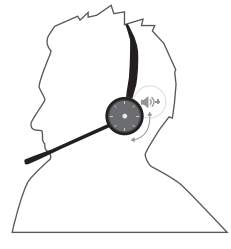


Controller in mic.

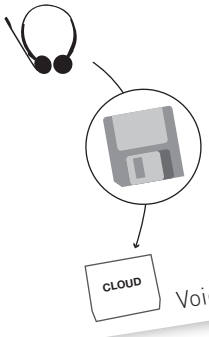


Status indication

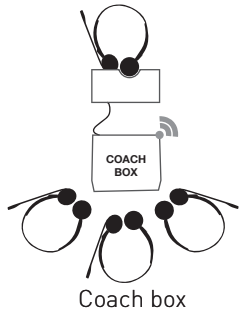
Shape indicating on/off



Volume wheel



Voice recording



Coach box

Charging plate

APPENDIX 09

HEADBAND

The headband is produced in spring steel and is extra durable in connection with horizontal adjustment. It houses two cords which connects the left and right speaker.
The headband bar is adjusted by sliding it into openings in the headband house. The adjustment in each side must be 35 mm to fit all size heads and approximately the double on mono headsets.

HEADBAND HOUSE

The headband house contains adjustment grooves for the headband clip and also houses the cords for the speakers. The headband clip inside creates a tactile and auditive "click" feedback when it slides on the grooves inside the headband house. The headband house is assembled from two parts the inner and outer headband house.

SPEAKER HOUSE

The speaker house is the main part of the headset connecting and containing the inner components; speaker, battery, circuit board.
The speaker house rotates around the headband house to ensure a comfortable fit. Ear cushions are connected to the speaker house. The pillows are made of leather and covers the actual speaker unit with a thin layer of textile.

BOOM ARM

The boom arm spins in a 360 degree angle and is an important feature that contributes to the durability in the headset.
At the end of the boom arm the microphone house is located. It houses a microphone with noise cancellation which requires both a mic in and out opening.

APPENDIX 14


FEHLMANN

APPENDIX 15

INTRODUCTION

This section will be dealing with the different materials used by Jabra for headset production. The majority of the materials are plastics, however materials as stainless steal and rubber are also part of the GN material portfolio.

TYPES OF PLASTICS AND PURPOSE

There are a lot of plastic types on the market, which has different characteristic and therefore also different purposes. These are furthermore mixed to thousand of different composite materials to fulfil the quality demands of the products.

PC/ABS

The most common plastic material used by GN Netcom is the composite material PC/ABS which consist of the amorphous materials PC (Polycarbonate) and ABS (Acryloitrile butadiene styrene). By combining these materials GN Netcom get the striking force from the PC and the chemical properties from the ABS, which fulfils the demands for the headsets quality.

The PC/ABS is mostly used for construction the headband houses, speaker houses and boom arm as these are the exposed elements containing the electronics and therefore has to be impact strengthened. Regarding the exposure to chemicals these headsets elements are in contact with the hair and skin of the user, for which reason the ABS in PC/ABS makes it resistant to sebum, hairspray and all varieties of cremes.

TPE

Thermoplastic elastomer is a different type of plastic with a more soft touch feel. Colloquially it is known as rubber, however it is a different type of rubber than used for tyres as it can be used for injection moulding.

GN Netcom uses different types of TPE in their headsets such as TPE-S, TPE-O, TPE-C and TPE-U. The most common TPE's used by GN Netcom is the TPE-S and -C, where the TPE-S primary is used for ear-hooks and the TPE-C, which is a slightly harder material, is used for the T-part in the mono headsets.

PC

Polycarbonate is a amorphous material, which has the quality of being transparent. Unfortunately it is not resistant to chemicals and does not have a high striking force, for which reason it is only used for small see through icon lights and hard case packaging.

PET

Polyethylene terephthalate is a cheep partly crystalline material, however it is possible to prevent it from crystallising and hereby keep the transparency, which leaves it ideal for soft packaging.

STAINLESS STEEL

Steel is in general used in the headsets as a selling proposal to support the idea of good quality. Therefore It is important that the headsets look and feel robust when introducing the product to the contact centres. The stainless steal for instance used in the lower part of the headband house on the BIZ 2400 headset.

The stainless steel elements are constructed by metal injection moulding (MIM), which is a process where the metal crystal grains are combined with a small percentage plastic, just enough to separate the crystal grains. When the element is moulded the plastic is removed by burning it after which the metal part is heated up to around 1000 degrees for the metal crystal grain to tie again.