USER CENTERED DESIGN
A helmet for two wheeler riders

Prof. B. K. Chakravarthy
IDC  I.I.T B
THE CONTEXT

• Exponential increase in traffic density and the number of casualties.
• Outcry against making helmet usage compulsory.
• Life saving devices which people refuse to wear!
• Conflict of wanting to protect oneself but not wanting to wear a helmet.
SCOPE OF INTERVENTION

- Organization of the product
- Materials
- User aspirations
- Existing ergonomics
TYPES OF HELMETS

- Full face helmet
- "Convertible" or "Flip-up"
- 3/4 face helmet
- ½ helmet
TYPICAL CONSTRUCTION

PU Padding

Composite shell pierce protection. Fiber glass Carbon fiber Kevlar

Acrylic visor protection from dust and foreign objects

EPS foam absorbs kinetic energy. Reduces declaration of the heard.

PVC trimming
MATERIALS USED

- Kevlar
- Carbon fiber
- Lexan
TECHNOLOGIES

• Designed to protect the head from rotational injury.

• Polymer membrane slips in a controlled manner over the inner carbon-Kevlar shell.

• Reevu rear view system:

• Inbuilt rear view mirror through a sequence of mirrors.
FALL
**BRAIN INJURY**

**Open type:**
- Skull bone fracture

**Closed type:**
- Caused by violent acceleration of head
- Brain tissue collides with inside of the skull
ENERGY ABSORBING DEVICE
STANDARDS

Indian standards:
• BIS - IS 4151

Test lines:
• Minimum area to be protected
• Six sizes-550 to 600mm circumference of inside band
• Constructional requirements
• Performance
SIMILAR PRODUCTS

• Protection
• Armor
• Crumple zones
• Packaging
• Securing
• Watches
• Belts
• Caps/monkey caps
FIELD STUDY

Locations
• Mumbai - Powai market, Powai road, Santacruz
• Pune - Aundh, F.C road, Inner city.

Observing Users
• Traffic lights - to understand what users do.
• Pan shops/stores - to observe behavior
• Storage habits - during stops and at office
• Journey start/end points - to see ingress egress actions
• Informal discussions, gentle probing
OBSERVATIONS

Securing
• Helmet comes loose
• Excessive play
• Constant adjustment
• Buckle irritates skin
• Buckle difficult to operate
• Riders seldom buckle up
COMFORT

- Becomes hot and muggy
- Higher CO2 levels
- Excessive sweating which hinders vision
- Deterioration of the helmet lining
- Bad smell
- Scarf or a balaclava underneath
- Ride with the visor up
STORAGE

- Place it on rear view mirrors or on the fuel Tanks, done even if helmet lock is present.
- Have to dismount the vehicle and use both hands to secure the helmet to the vehicle.
STORAGE

- Apprehensive about available helmet locks
- Some use chains and wire locks.
- Tendency to place the helmet or hook it on to something.
- Hung on rear view mirrors, kept on footboards and fuel tanks.
PERCEPTION ISSUES

- Perceived as a barrier
- Tendency to wear it on highways
- “It won’t happen to me” attitude
- “Getting into” the helmet
- Claustrophobic feeling
- Loss of identity
- “Wind in the air feeling” is lost
- Helmet is a hassle
- Interaction with the environment
- Helmet restricts the field of view
- Isolation from the various sounds of the road
- Talking to the pillion rider is difficult
PRODUCT BRIEF

• Should encourage use
• Should look protective and safe
• Should protect the head against impact and piercing from any side
• Provide protection against environmental factors
• Have a single operation securing
• Be conducive to carry in multiple ways
• Occupy less volume when not in use
• Easy to wear and right fit for the head
• Should not wobble or shake on wearing
IDEATION
Idea sketch 1: Single hand securing
Idea sketch 2: Scarf like securing
Idea sketch 3: A head band to absorb sweat
Three part folding helmet
Two part receding helmet
Unique finish to differentiate fielding part
A self collapsing helmet
Swiveling helmet
Laterally folding
Laterally folding
Opening up when stationary
Positioning and number of vents
Dimple shaped foam- air channels
Slits from front to back
Helmet with padding on the outside
Integrated pollution mask
IDEA CLUSTERS

Grouping according to the core functionalities.

**Ventilation cluster:**
Comfort when in use.

**Storage cluster:**
Short term and long term.

**Wearing cluster:**
Convenient wearing and removing of the helmet.
VENTILATION CLUSTER
REPRESENTATIVE
Large gaps reduced
Contour changed to ear profile
Profile changed for better grip
CONCEPT A - VENTILATION

- Handle grip for holding
- Fine slits for ventilation
- Cut outs for eye wear
- Additional element to cover the sides
- Nylon net to cover the ear, protects against dust, dirt without hindering hearing
- Elastic nylon band for securing comfortable to use and single hand
Reduction in storage volume
The arrangement of interlocking extended to the shell. Two strips that can be pulled above one another and then turned to accommodate for the foam padding.
CONCEPT B - EASE OF STORAGE
EASE OF USE OF CLUSTER
Overlapping parts
Reduce contact area with skin while wearing
Securing can be integrated with the helmet
INITIAL SKETCH
Single hinge changed to two
Lateral movement accounted for
CONCEPT C – EASE OF USE

- Hinge points
- Grip for easy holding
- Securing band passes through grooves in the side panels and is attached only to the top portion.
- Side panels can be pushed up when stationary for better ventilation.
CONCEPT D - EASE OF WEARING
Representative ease of wearing
Use natural wearing action
Surface Area exposed reduced
Rings made bigger and wider
CONCEPT D – EASE OF WEARING

- Net provides ventilation
- Three rings of titanium or kevlar held together by a strong nylon net
- Band doubles up as retention when helmet is folded
  Can also be used as a sling
- Adjustable band with side locking system
- Foam
  - Net
  - Shell
EVALUATION OF CONCEPTS
Evaluation of Concepts

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<thead>
<tr>
<th>Concept</th>
<th>Advantages</th>
<th>Disadvantage</th>
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<tbody>
<tr>
<td></td>
<td>Good air circulation</td>
<td>No reduction in volume</td>
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<td></td>
<td>Multiple ways of gripping</td>
<td>Difficult to manufacture in FRP</td>
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<td></td>
<td>Light weight</td>
<td>Rare chance of piercing injury</td>
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<td></td>
<td>Strong style statement</td>
<td>Problem of dust</td>
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<td></td>
<td>Reduction in volume</td>
<td>Moving parts add to complexity</td>
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<td></td>
<td>Ventilation on sides</td>
<td>Projects a weak image</td>
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<td>Easy to carry and hold</td>
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<td></td>
<td>Reduction in volume</td>
<td>Three part manufacture</td>
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<td></td>
<td>Good ventilation all around</td>
<td>Does not look robust</td>
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<tr>
<td></td>
<td>Convincence of</td>
<td>Loose parts</td>
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FINAL SELECTED CONCEPT
VALIDATION

- Dr. Dinesh Mohan (IIT-Delhi) an expert in the areas of impact and bio-mechanics.
- Design changed to a 2 part configuration.
- Gap between the shell reduced to min of 4 mm.
- Integral height adjustment provided for snug fit on the head.
REFINEMENT

- Three ring to two ring shift.
- Exploration of relative proportions of the rings.
- Detail of foam cross section to enable sliding.
- Detail of upper ridge for locking.
- Rain protection.
SECURING
FORM OPTIONS
FORM REFINEMENT
MANUFACTURING DESIGN

- Shells made of engineering plastics
- Liners and ear guards made of Elastomers
- Silicon gasket at partition
PROTOTYPE TESTING
INNOVATIVE DESIGN

• Collapsing helmet
• Ventilation through partition
• Smart looking
• Excellent wear comfort
• Easy to store
• Easy to wear
• Fits all head sizes
THANK YOU