IDUS748

FINAL PROJECT _PROCESS BOOK

REIMAGINING POWER TOOLS - 1

PREKSHA GAJJAR

Agenda

01
GanttChart

02
Introduction

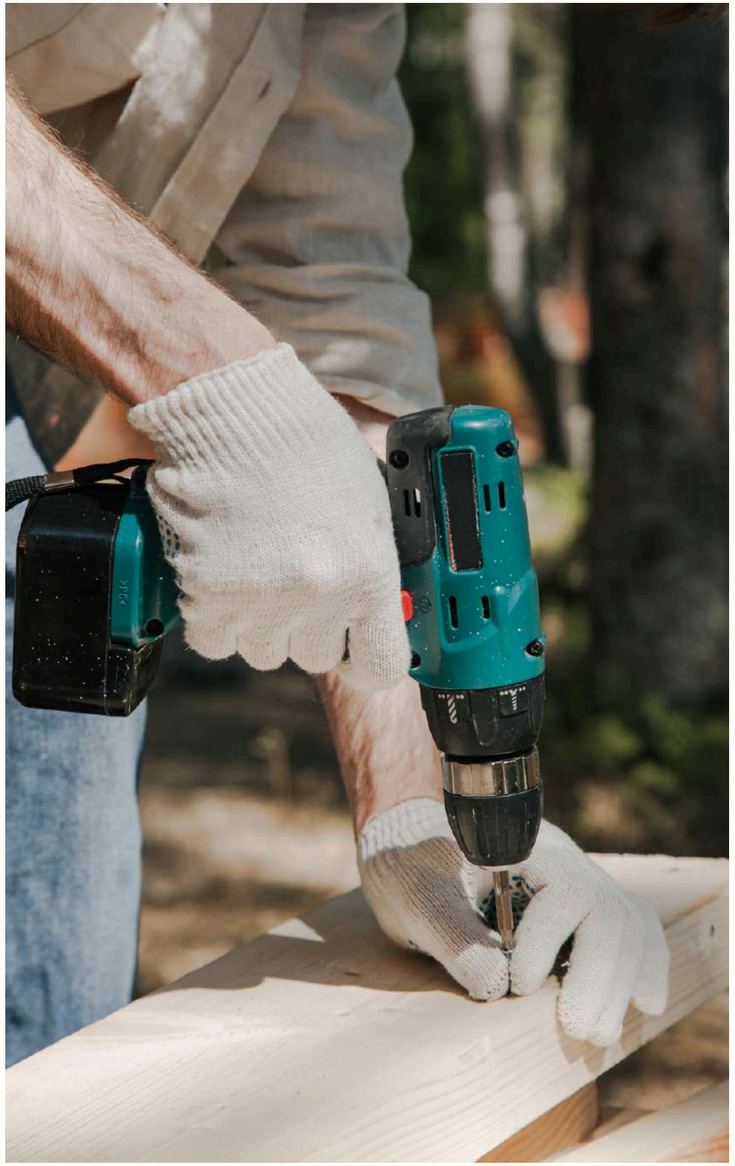
03
Personas

04
Market Trends

05
Opportunities & Proposal

Introduction

This project focuses on finding ways to make hand power tools easier to use through assistive support solutions. The goal is to improve comfort and control without altering the tools themselves.



One - Handed Operation

More power tools are being redesigned to be fully operable with one hand, reducing the need for excess grip strength.
Potential growth in pressure-sensitive triggers that activate with minimal force.

Sensor - Enabled Grips

Some high-end tools are starting to integrate pressure sensors to detect grip fatigue and adjust operation.
Potential for vibration-dampening grips that adapt to how tightly you hold the tool.

Weight Redistribution

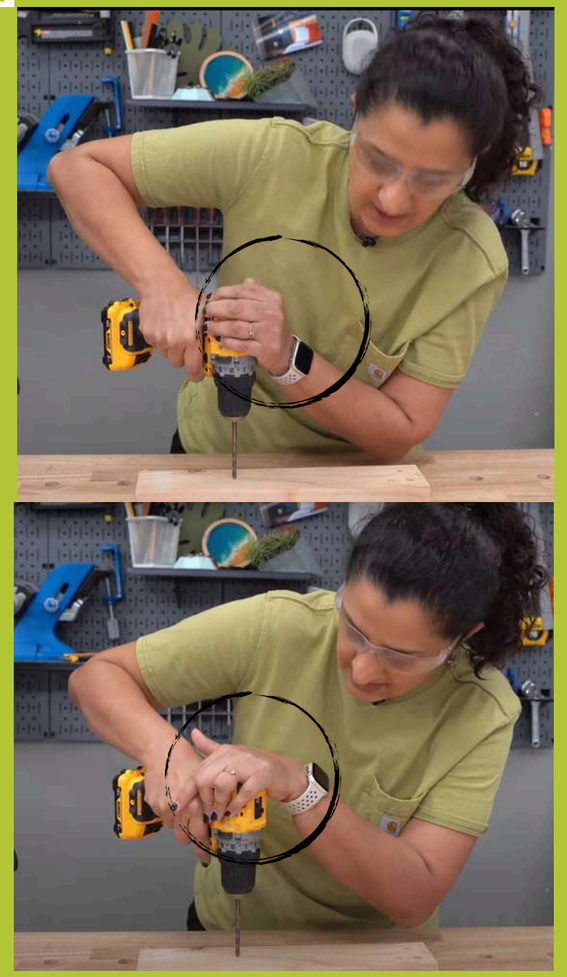
Brands are moving towards better-balanced tools rather than just making them lighter. Newer lightweight battery tech (such as solid-state or graphene-based) will likely lead to even smaller and more manageable tools.

COMPETITORS

	MISSION AND FOCUS	PRIMARY USERS	ERGONOMIC FEATURES	HANDLE DESIGN	FEMALE USERS (%)	MALE USERS (%)
DEWALT	Rugged durability for professionals in construction and industry	Contractors, builders, industrial workers	Anti-vibration, balanced for prolonged use	Thick, rubberized grips for larger hands	15%	85%
makita	Innovation and lightweight performance, known for cordless tech	Contractors, electricians, home/DIY users	Angled, lightweight, ergonomic for smaller hands	Slim, contoured handles with textured grips	25%	75%
BOSCH	Engineering precision and smart tech for pros and consumers	DIYers, engineers, precision-focused pros	Precision grip with anti-slip texture	Compact, cylindrical grips	30%	70%
Milwaukee	High-performance tools for trade professionals	Electricians, plumbers, trade workers	Anti-fatigue, balanced, high-friction grip	Wide, textured grips suited for gloved hands.	10%	90%

Position 1

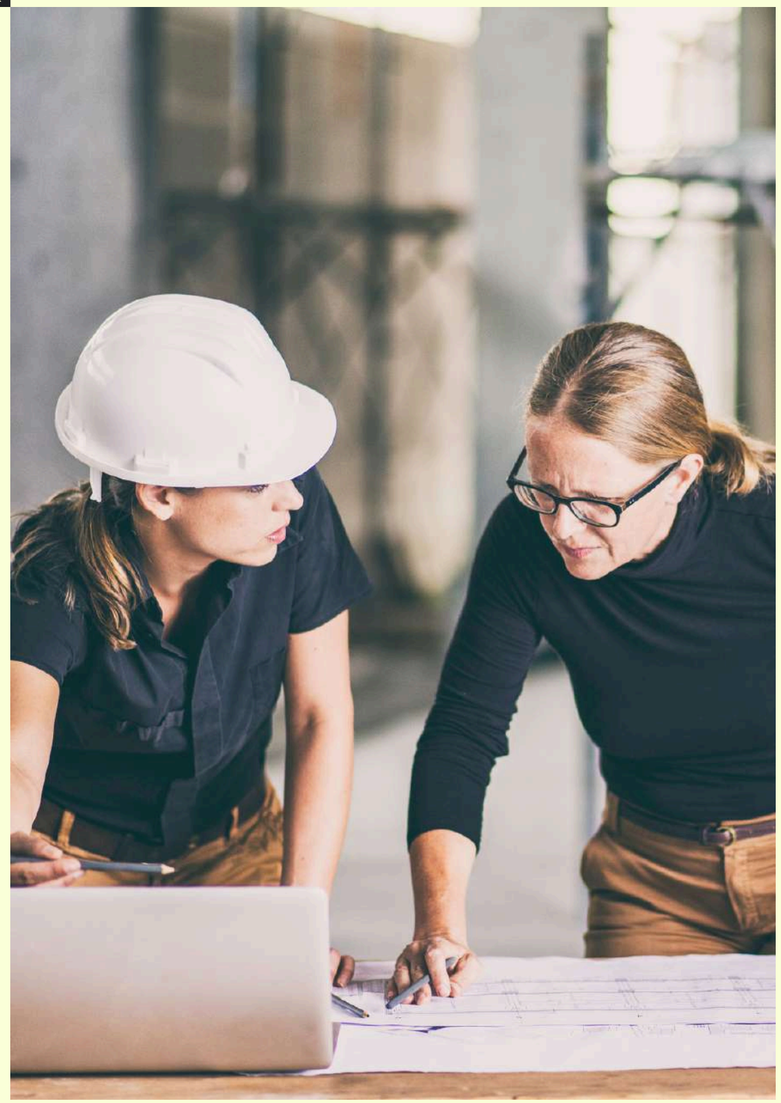
Position 2



Position 3

Visual Ethnography

USER PERSONA



Trish Brown

Trish is a 42 year old in the construction business.

Above average income (Segments S06, S10, S12)

Role includes :

Managing her own inventory.

Balances heavy - duty work with detail work.

Her Pain Points

Has Arthritis, which causes wrist pains.

Fatigue from using heavy tools all day.

Difficulty handling overhead or high reach tasks.

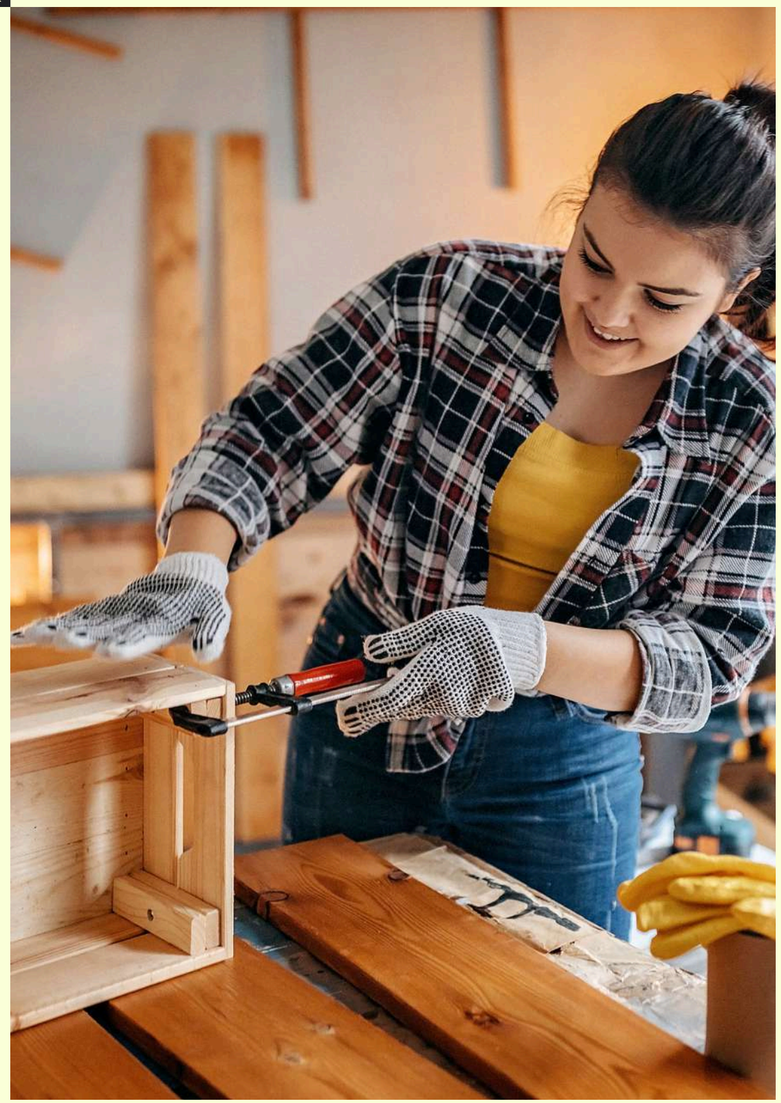
Handles aren’t too comfortable to grip all day long.

GOALS

Tools that fit her hand size better.

Less Fatigue while working long hours.

USER PERSONA



Julia Bedell

Julia is a home diy-er, at the age of 30 she loves taking up bug home improvement projects in her free time.

Above average income (Segments S06, S10, S12)

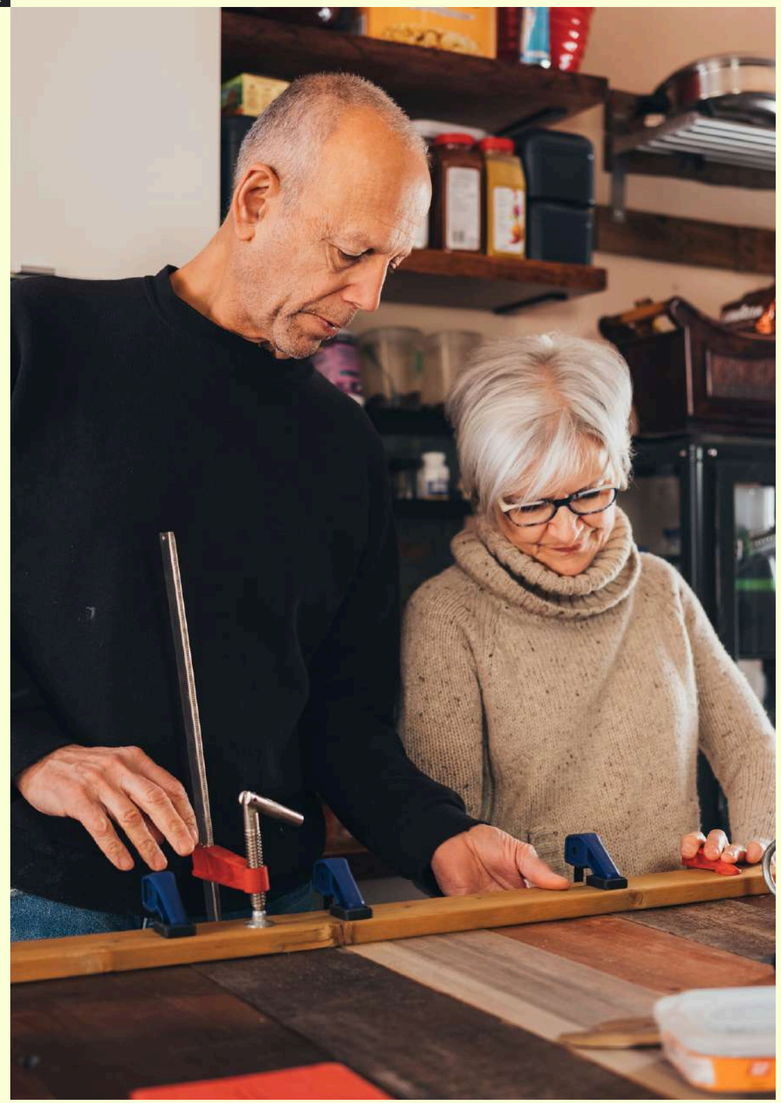
Her Pain Points

Most tools are too big for her hand.
She has weaker arms than most people and often struggles to perform intensive tasks for a long period of time.
Often struggles with the weight distribution of the tools she uses.

GOALS

Tools that fit her hand size better.
Less Fatigue while working long hours.
More stability and weight distribution while using the tools.
Leveraging upper body strength more while performing drilling or sanding tasks.

BUYER PERSONA



Micheal Glee

Micheal is a retired 60 year old, whose wife loves to assemble furniture. His wife 56 years old, suffers from carpal tunnel syndrome. Both of them are still very much active in terms of body strength. Above average income (Segments S06, S10, S12)

Her Pain Points

His wife is unable to bend her wrists in many different angles.
She requires a very steady balance while using any power tool.
Wants ease of use for her tools so that she doesn't get wrist pain easily.

GOALS

Stability and control of inertia for the hand tools.
Easy Holding and essentially being able to balance the weight of the machine in two hands instead of one.
Wrist stability and no extreme twisting.

The Opportunity

After benchmarking brands like DeWalt, Milwaukee, Bosch, and Ryobi, a clear gap emerged: most tools are not designed with diverse users in mind. Efforts to improve usability often stop at surface level changes. This opens an opportunity to create supportive solutions that enhance grip, balance, and comfort making power tools easier to use for a wider range of people. It's a chance to lead with thoughtful design.

DESIGN PROPOSAL

Project Title: Reimagining Hand Power Tools

Product Category : Construction Tools and Equipment Design

Target Audience: Individuals with lower upper body strength, users with weak arms and wrists, and arthritis patients.

Product Strategy : The strategy is to design a universal, ergonomic attachment that can be added to existing hand power tools to improve usability.

Product Background: Most hand power tools are built for general use but can be hard to handle for many users. Instead of redesigning the tools, this project explores an add-on attachment that improves grip, control, and ease of use.

Manufacturing: The attachment will be produced using lightweight, durable materials such as injection-molded ABS plastic with rubber overmolds for grip and comfort.

Designer: Preksha S Gajjar

Date: 3/24/2025

UPCOMING

Thank You

Product Specifications and Inspiration Board

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FINAL PROJECT

REIMAGINING POWER TOOLS - 2

PREKSHA GAJJAR

Agenda

01

Design Brief

02

Product Specifications

03

Inspiration Board

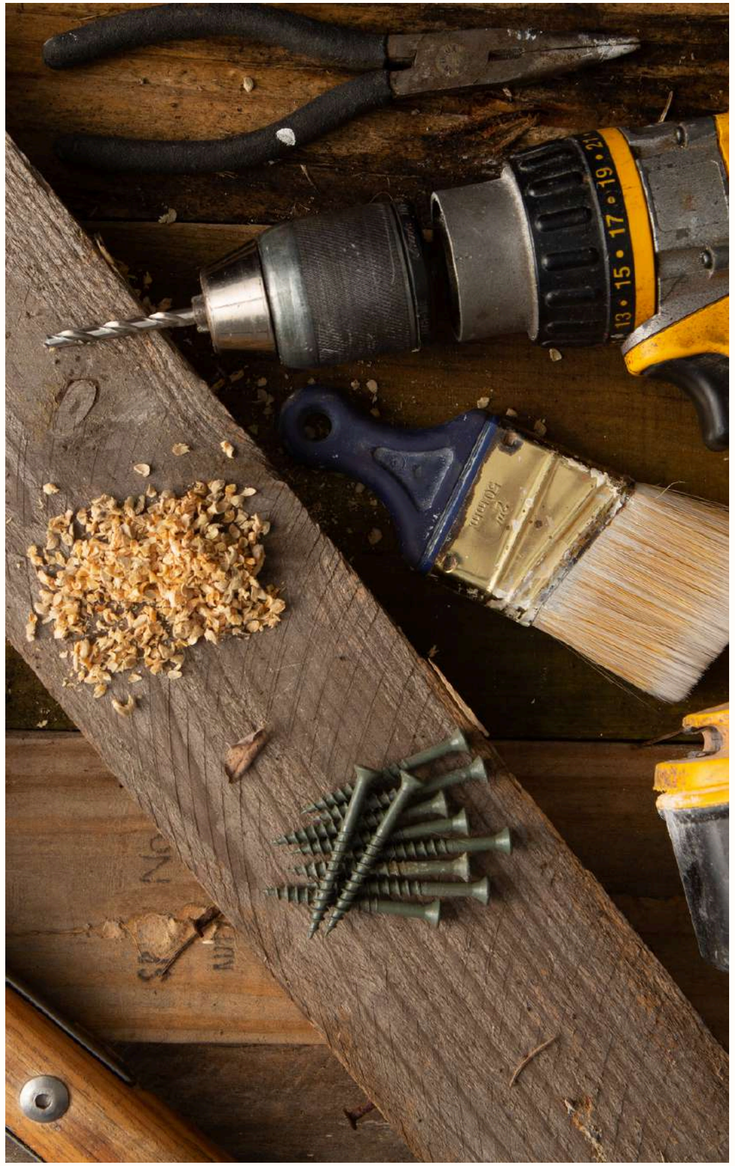
04

Ideation Exploration

Brief

This project focuses on designing an assistive product that supports individuals with lower upper body strength in using standard hand power tools more effectively. Instead of changing the tools themselves, the aim is to develop a wearable or attachable aid that enhances upper body strength, control, and comfort—especially during overhead or hard-to-reach tasks.

Grounded in ergonomic and gender-inclusive research, the product addresses common challenges like fatigue, limited leverage, and unstable grip. The goal is to boost confidence, safety, and efficiency by offering support that adapts to their movements and needs.



Product Specifications

User & Design Requirements

Safety & Environment

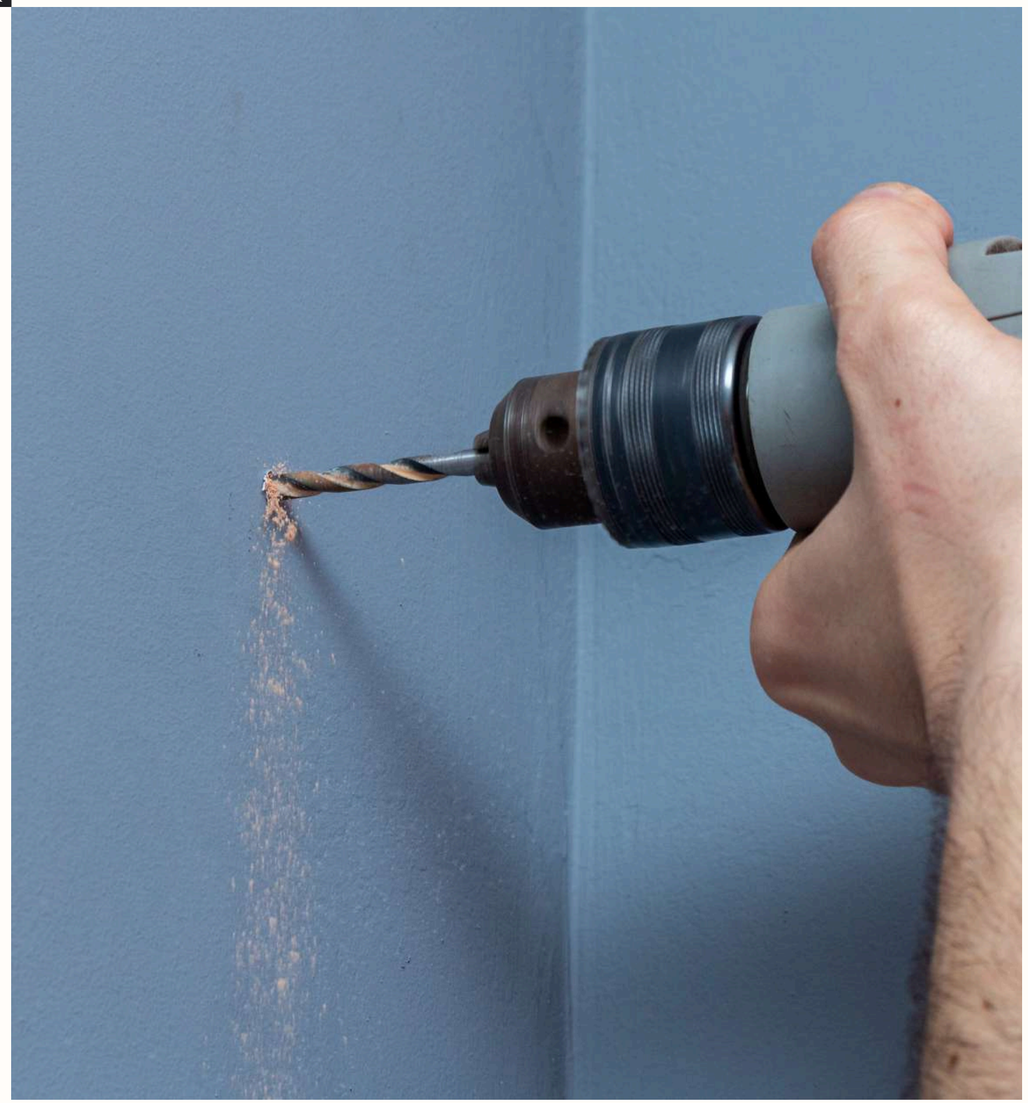
Ergonomics & CMF

User Requirements

- Must be easy to wear, attach, or remove without assistance
- Should be compatible with common hand tools without altering their function
- Should improve the user's reach or ability to exert downward or outward force
- Must be suitable for repeated use and easy to clean
- Must be affordable for personal or small business purchase
- Should be lightweight enough for extended use without fatigue

Design Requirements

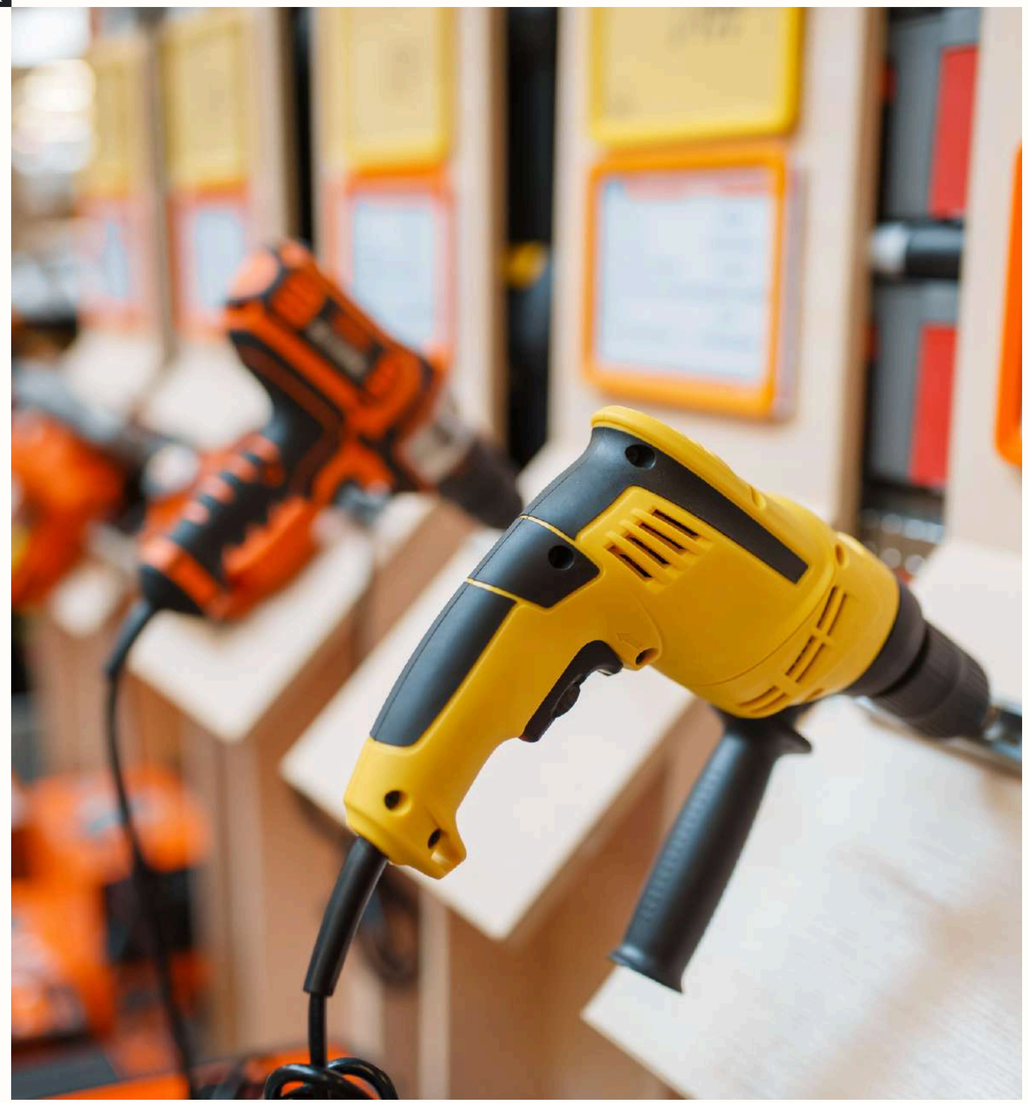
- The product must be compact and lightweight for comfortable wear or handling
- Should be operable with one or both hands
- Must allow mobility and flexibility for repositioning during work
- Should not exceed a use cycle of ~45 minutes per session multiple times per day



Safety & Environment

- Must avoid sharp or abrasive edges
- Skin-contact materials should be non-irritating and breathable.
- Should function effectively indoors and outdoors
- Must resist sweat, dust, occasional moisture or debris exposure
- Must maintain integrity over at least 12 months of regular use
- Should withstand mechanical stress (e.g., pressure exertion, joint movement)

Shelf Life & Size



- Should not degrade in hot or humid environments
- Ideally can be stored for long periods without damage
- Should be compact enough to fit into a small toolkit or be foldable/flat-packable

Ergonomics & Appearance

- Should have a soft, minimal appearance that conveys strength without bulk
- Colors and finishes should be subtle, professional, and functional
- Consider appeal to both first-time and repeat users (DIY and pro audience)Should reduce required force by redistributing or extending it.
- Should fit comfortably on a variety of body types (adjustable sizing)

Inspiration

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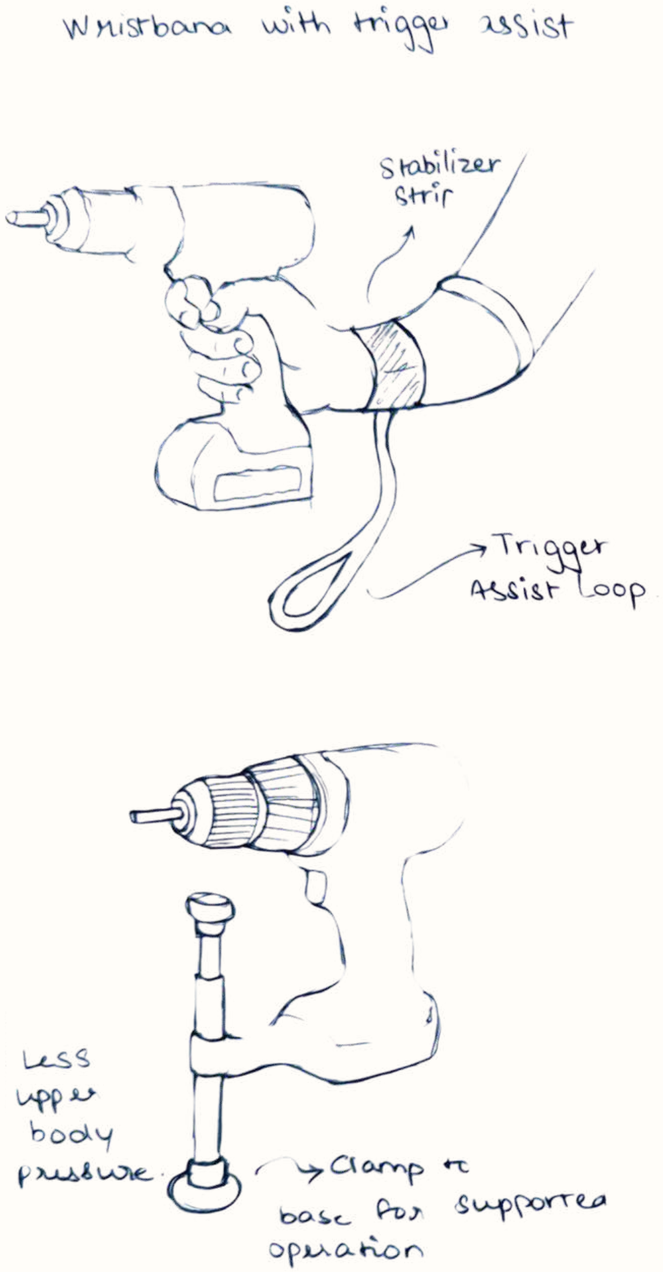
Geometric Shape

Biomimicry

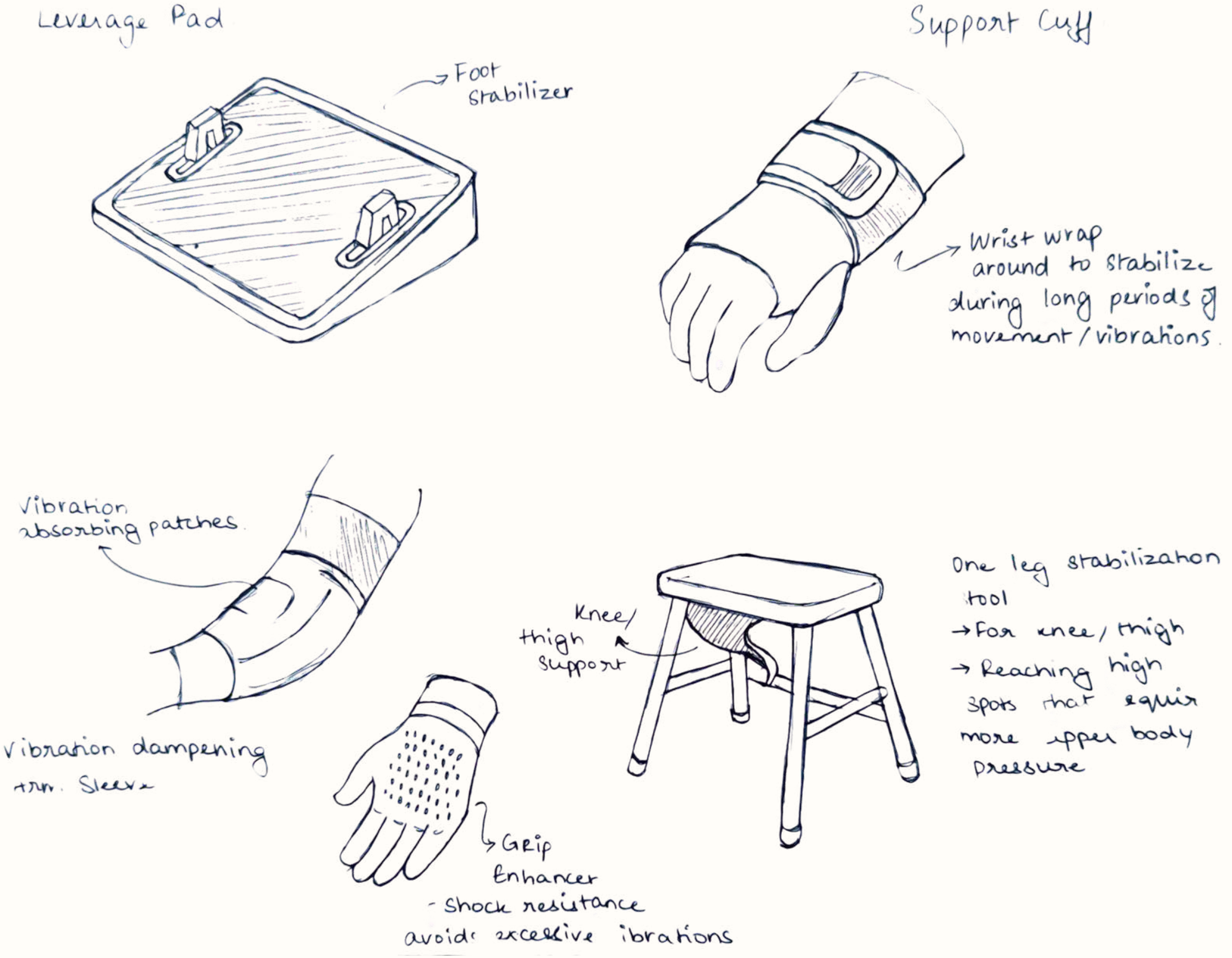
Futuristic

Double Lined Hollow

IDEATION SKETCHES



IDEATION SKETCHES



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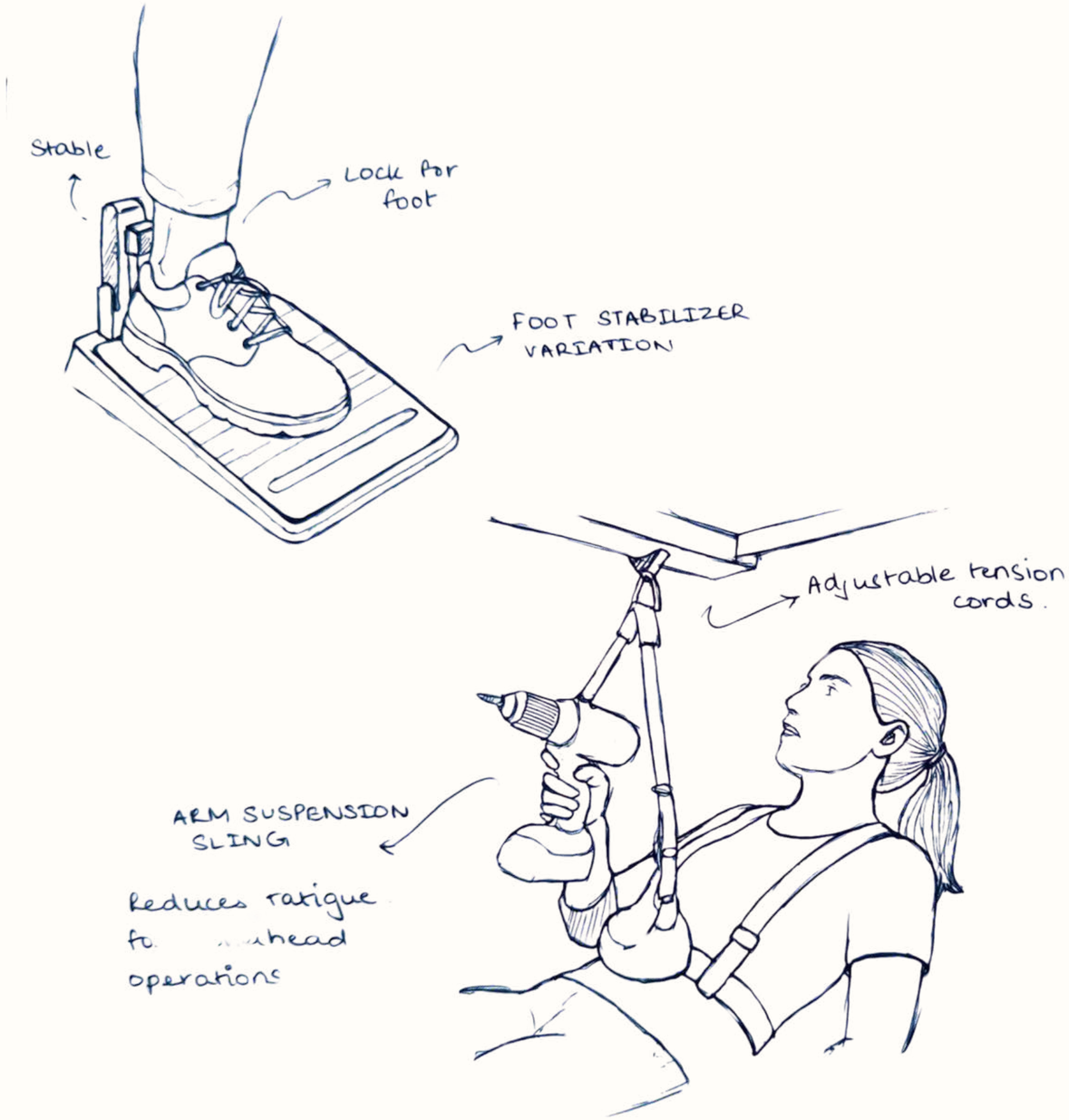
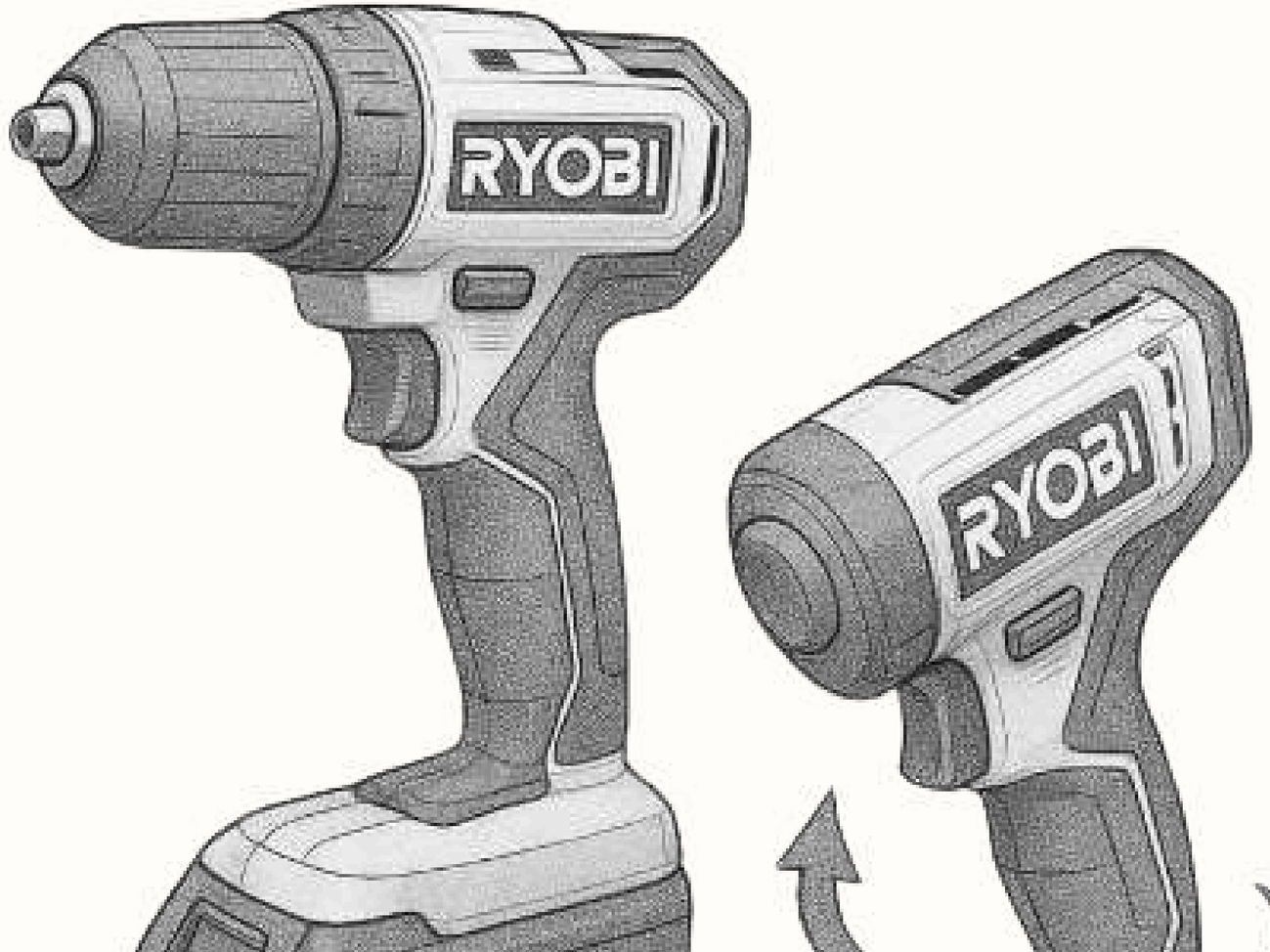


UPCOMING

Thank You

User Scenarios, Concepts,
Human Factors



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FINAL PROJECT

REIMAGINING POWER TOOLS - 3

PREKSHA GAJJAR

Agenda

01

User Scenarios

02

Concept Exploration

03

Human Factors

04

Concept Scoring

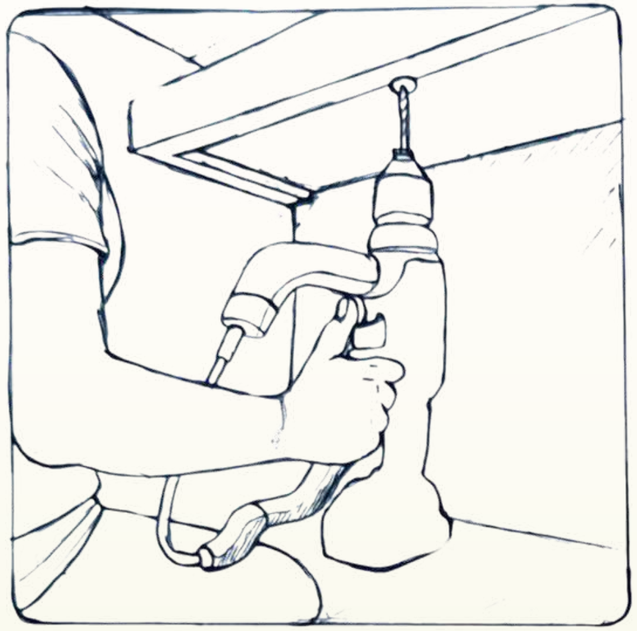
DIFFERENT POSTURES

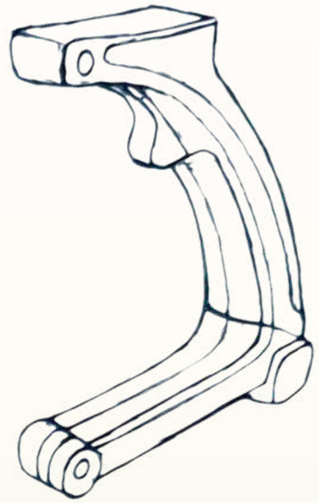
User Scenarios

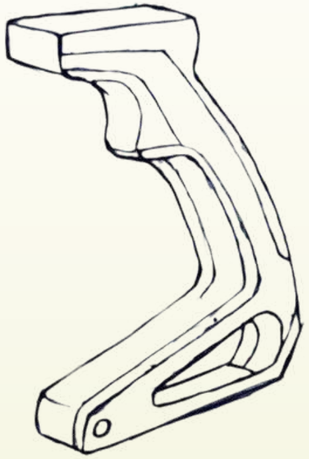
DIFFERENT POSTURES

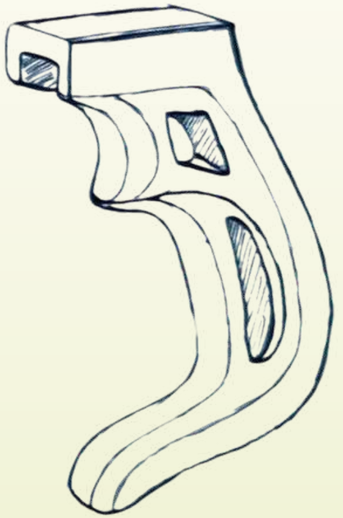
User Scenarios

CONCEPT 1 - HANDLE VARIATIONS FOR SIDE ANGLE









PROBLEM STATEMENT:

DESIGNING AN ASSISTIVE ARM SUPPORT TO MINIMIZE STRAIN ON THE WRIST AND FOREARM DURING REPETITIVE OR HIGH-TORQUE POWER TOOL USAGE.

DESCRIPTION:

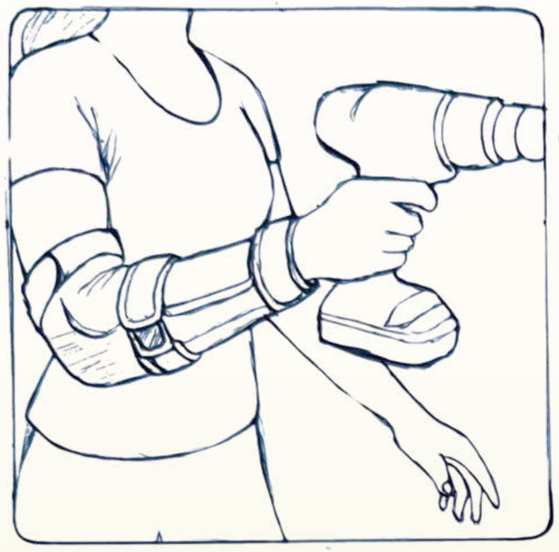
THIS CONCEPT EXPLORES MODULAR ARM BRACE VARIATIONS DESIGNED TO ENHANCE UPPER LIMB SUPPORT WHILE USING HAND POWER TOOLS. THE BRACES ARE ERGONOMIC SLEEVES THAT WRAP AROUND THE FOREARM AND ELBOW, DISTRIBUTING STRESS AND PROVIDING STABILITY DURING TASKS.

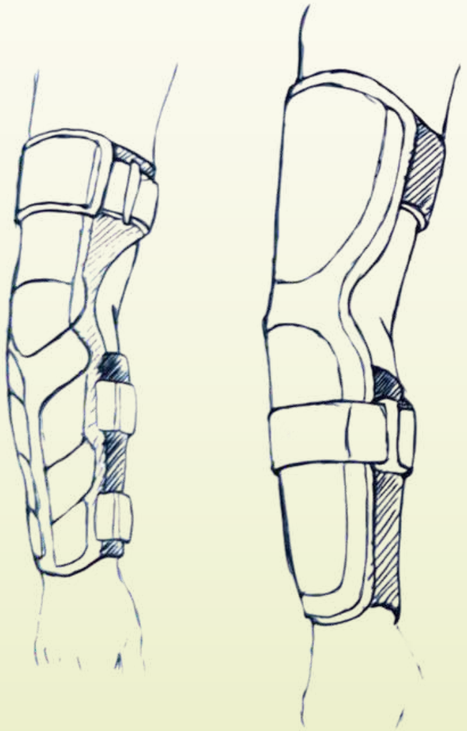
- REDUCES FATIGUE AND STRAIN
- ENHANCES PRECISION AND CONTROL
- SUPPORTS NATURAL ARM MOVEMENT

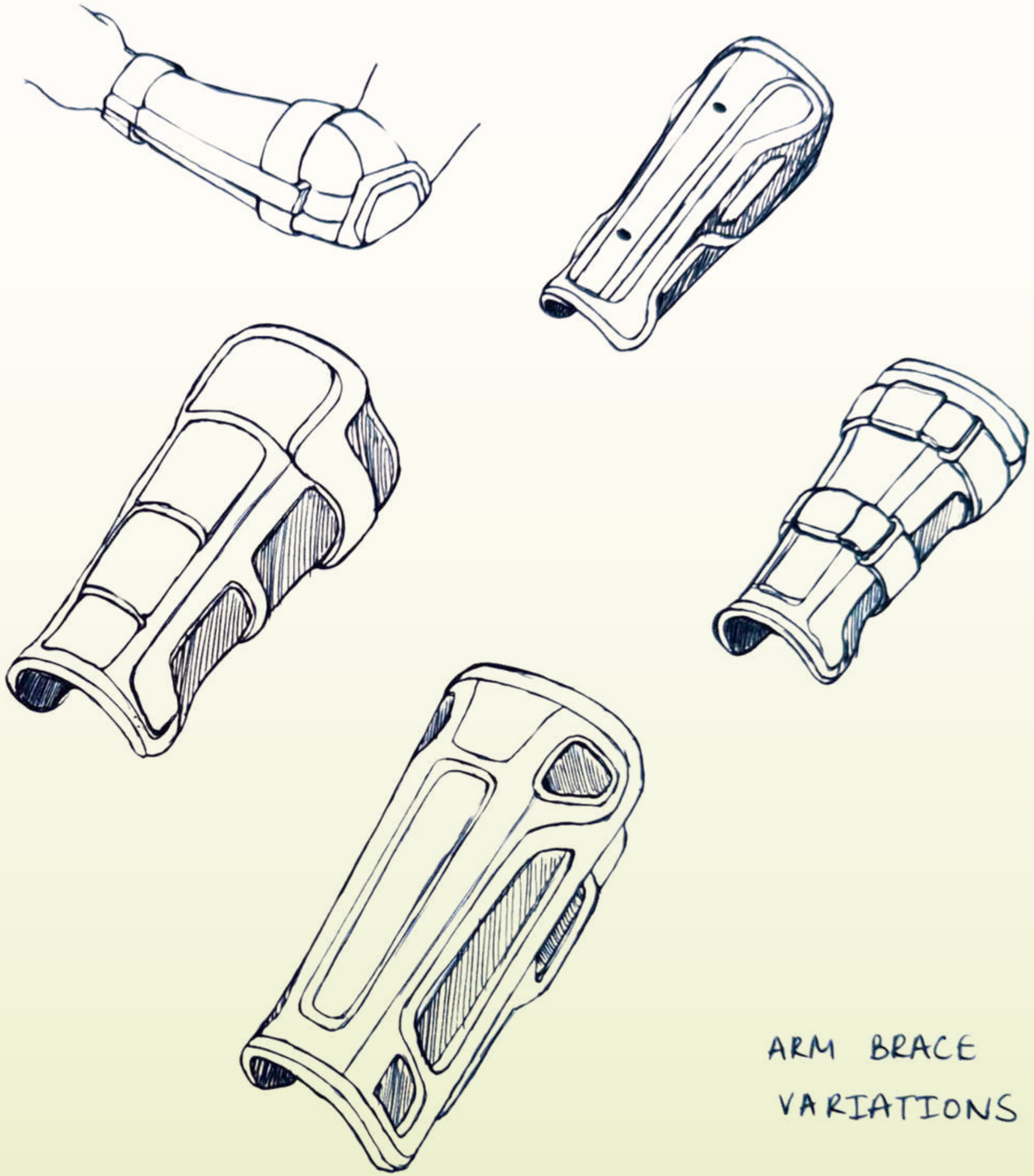
Inspiration - soft forms

Concept Specs 1

CONCEPT 2 - ARM BRACE TO REDUCE FATIGUE & VIBRATIONS







PROBLEM STATEMENT:

DESIGNING ERGONOMIC HANDLE ATTACHMENTS THAT IMPROVE CONTROL AND REDUCE WRIST FATIGUE WHEN OPERATING POWER DRILLS IN ANGLED/TIGHT WORKSPACES.

DESCRIPTION:

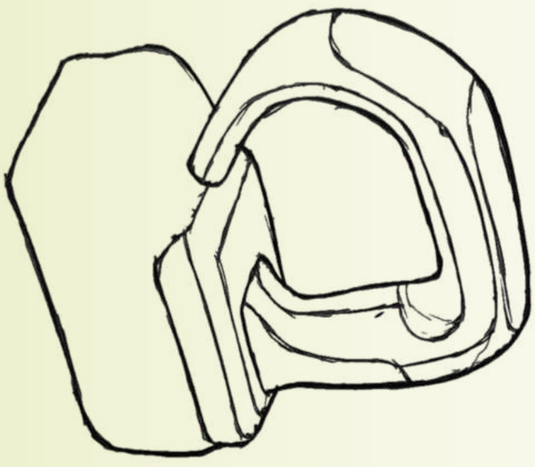
THIS CONCEPT EXPLORES MULTIPLE VARIATIONS OF A CURVED HANDLE ADD-ON DESIGNED TO ATTACH TO A STANDARD HAND DRILL. THESE HANDLES PROVIDE AN EXTENDED GRIPPING SURFACE THAT REDIRECTS THE USER'S FORCE, ALLOWING FOR EASIER CONTROL DURING HORIZONTAL OR UPWARD DRILLING.

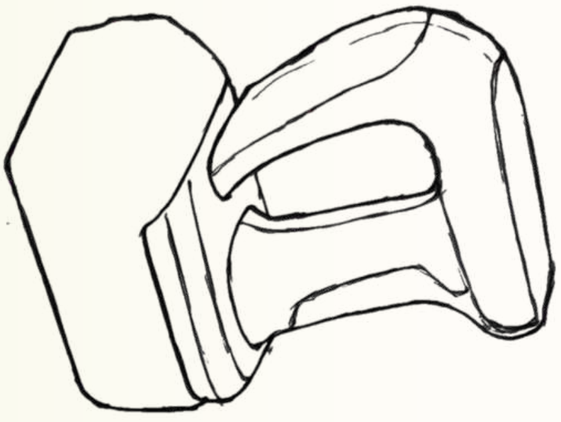
- IMPROVES FORCE APPLICATION DIRECTION
- REDUCES WRIST TWISTING IN AWKWARD TASKS
- ENHANCES USER CONFIDENCE AND STABILITY DURING USE

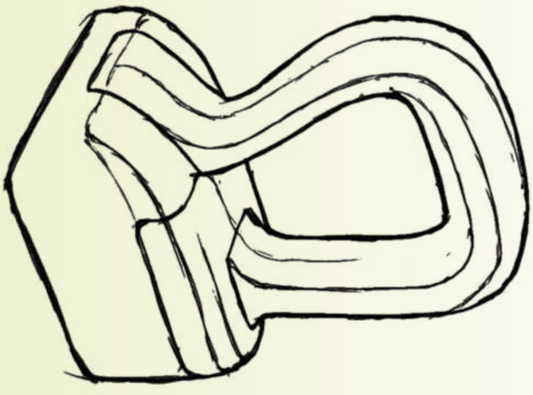
Inspiration - Concentric

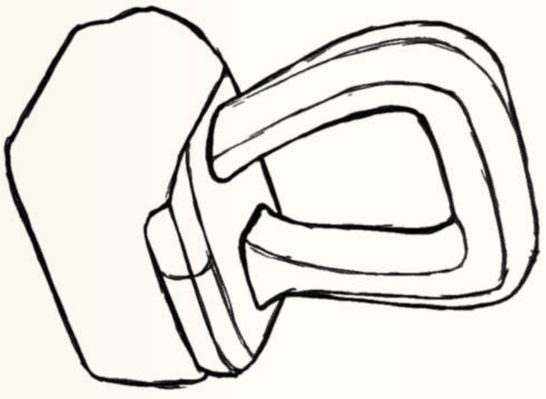
Concept Specs 2

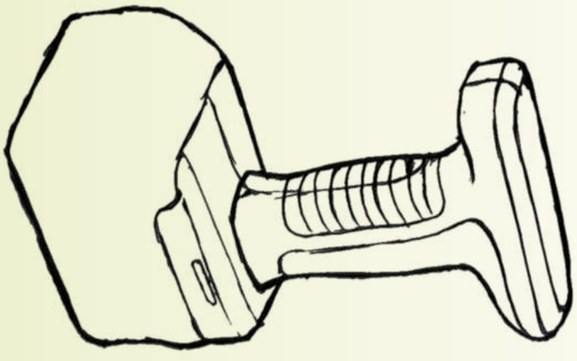
CONCEPT 3 - SECONDARY HANDLE T FORSTRENGTH & STABILITY

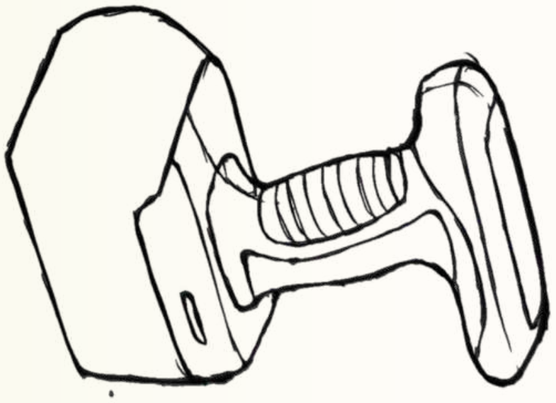












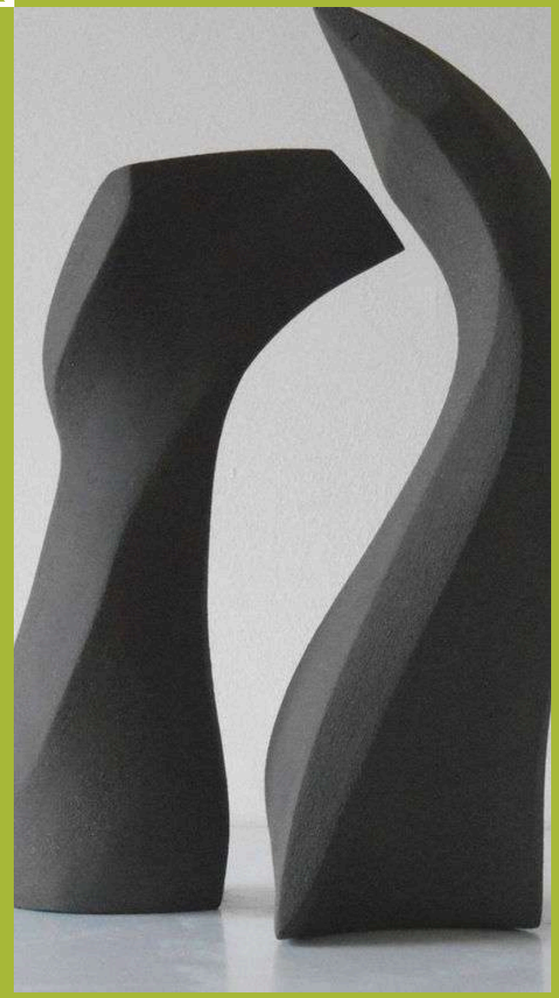
PROBLEM STATEMENT:

DESIGNING ERGONOMIC HANDLE ATTACHMENTS THAT IMPROVE STEADINESS AND REDUCE WRIST FATIGUE WHEN OPERATING POWER DRILLS IN HIGH REACHING POSITIONS.

DESCRIPTION:

THIS CONCEPT EXPLORES MULTIPLE VARIATIONS OF A HANDLE ADD-ON DESIGNED TO ATTACH TO THE BOTTOM BATTERY OF A STANDARD HAND DRILL. THESE HANDLES PROVIDE A SECONDARY GRIPPING SURFACE THAT REDIRECTS THE USER'S FORCE, ALLOWING FOR EASIER CONTROL DIVIDING IT BETWEEN BOTH HANDS, IN HIGH REACH POSITIONS.

- IMPROVES FORCE APPLICATION DIRECTION UPWARDS
- REDUCES WRIST TWISTING AND DISTRIBUTES WEIGHT OF MACHINE
- ENHANCES USER CONFIDENCE AND STABILITY DURING USE



Inspiration - organic forms

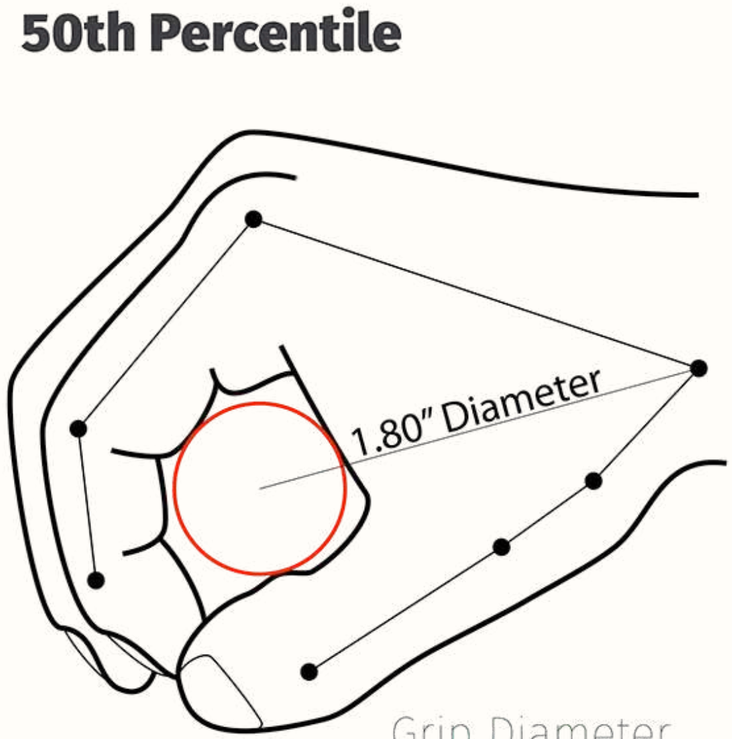
Concept Specs 3

CONCEPT SCORING

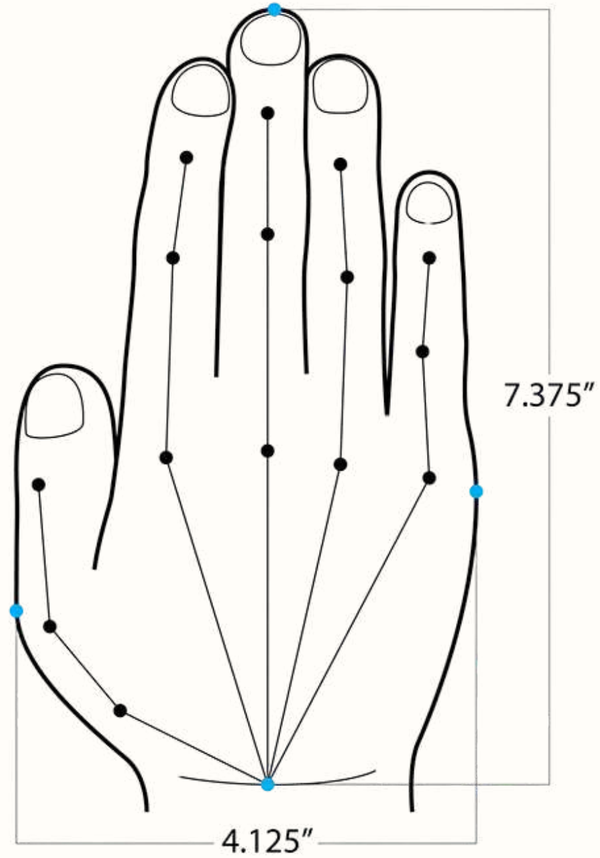
FACTORS	CONCEPT 1	CONCEPT 2	CONCEPT 3
Ease of Handling	3	4	5
Weight Distribution	3	5	4
Durability	3	2	5
Aesthetics	4	3	5
Wrist Angle	3	5	4
Adjustability & Size	2	3	5
Stability & Balance	2	4	5
SCORE	20	26	33

LOW (1) - HIGH (5)

Ergonomics



Grip Diameter



Palm Length and Width

UPCOMING

Thank You

CAD Renders , Form Exploration

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FINAL PROJECT

REIMAGINING POWER TOOLS - 4

PREKSHA GAJJAR

Agenda

01

Final Concept

02

CAD Forms

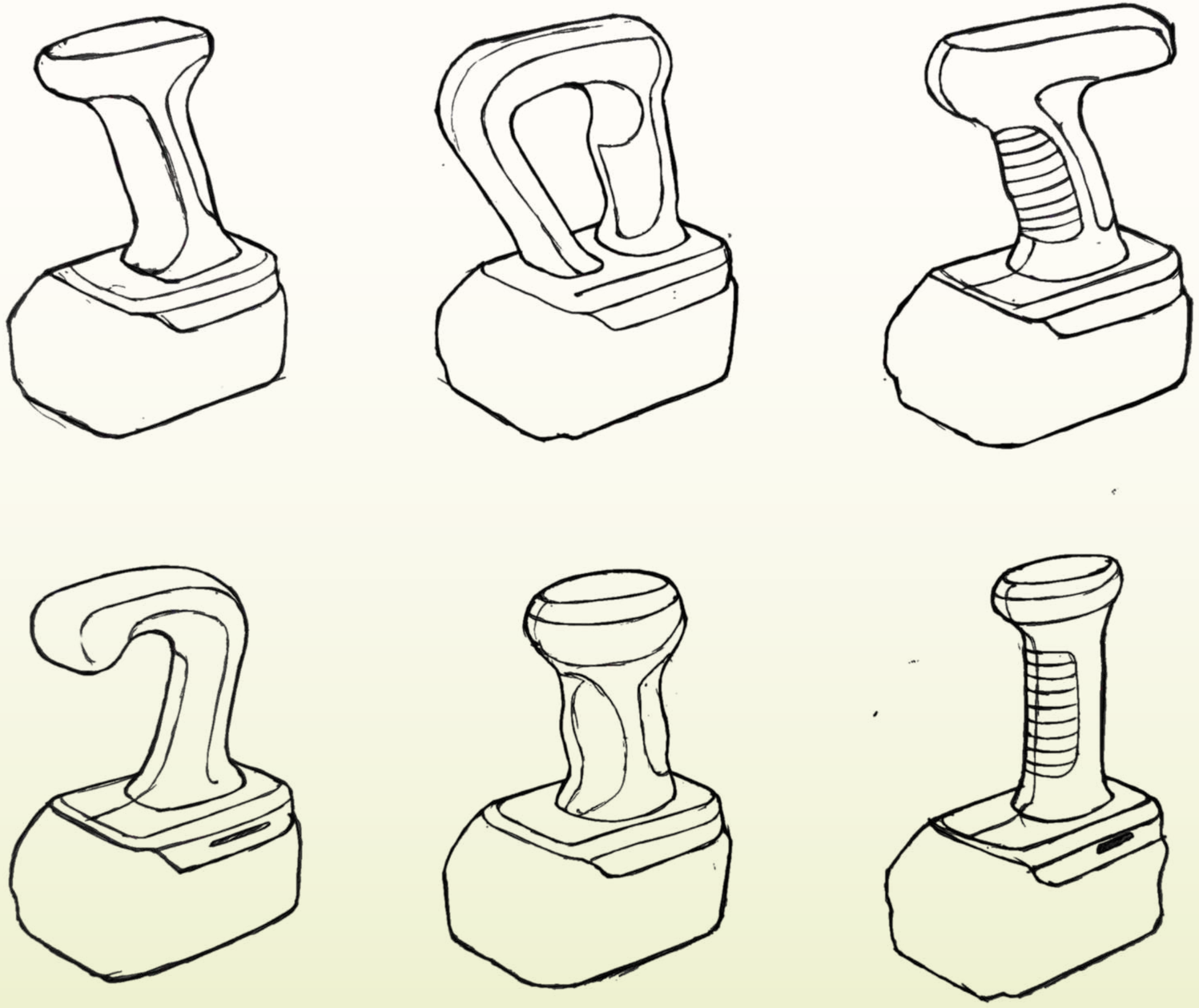
03

Physical Form Exploration

04

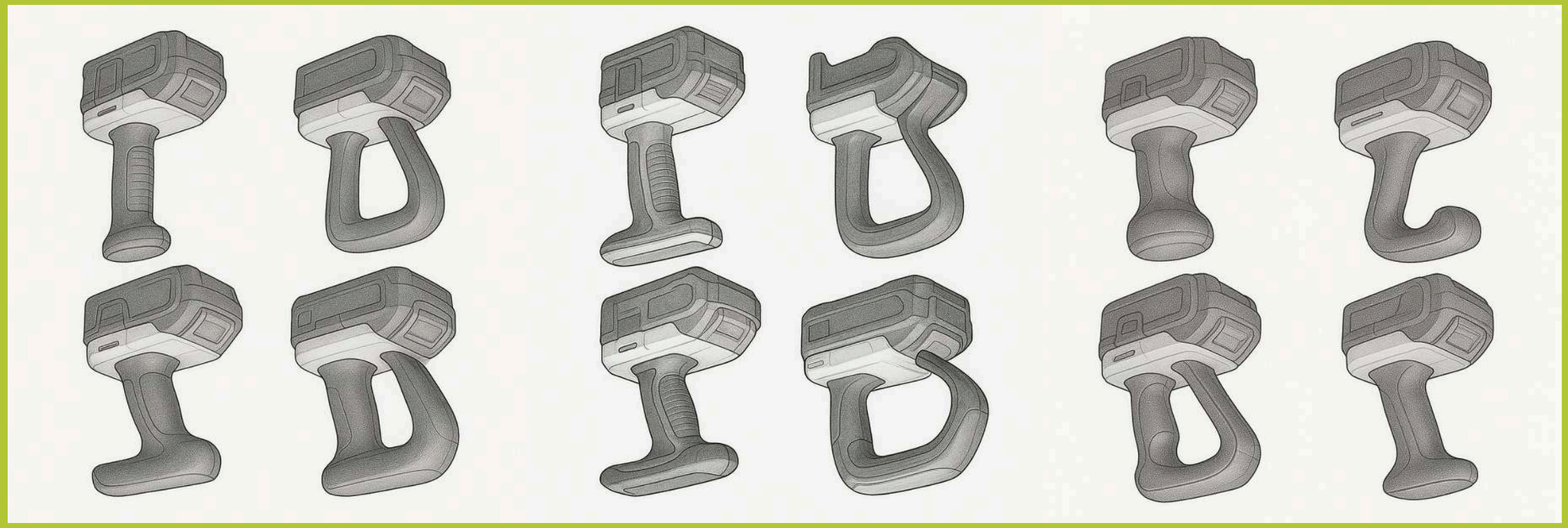
Tech Pack

FURTHER DEVELOPMENT



Final Concept

Secondary Handle- attachment provided for power drill which connects to the base of the battery. Allowing users to use both hands for enhanced grip and wrist stability. Allows them to leverage maximum upper body strength.



CAD FORM EXPLORATION

FORM STUDY

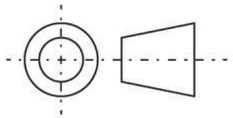
Form Exploration ↘

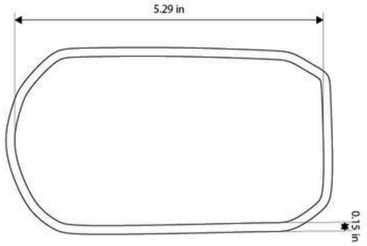
Form Exploration ↘

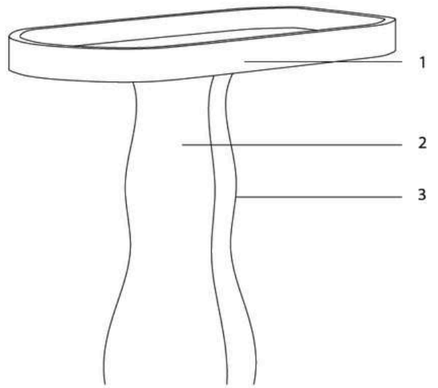
FORM STUDY

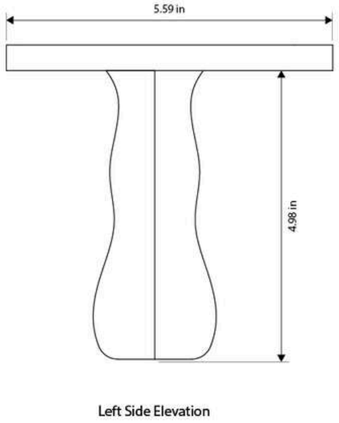
Form Exploration ↘

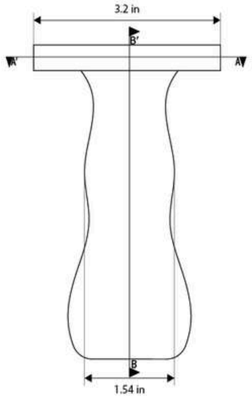
TECH PACK

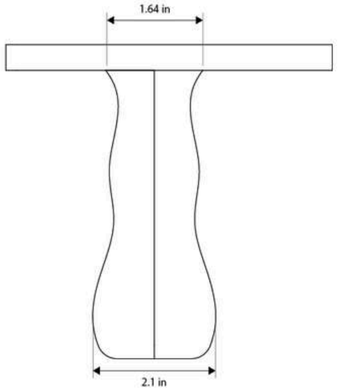


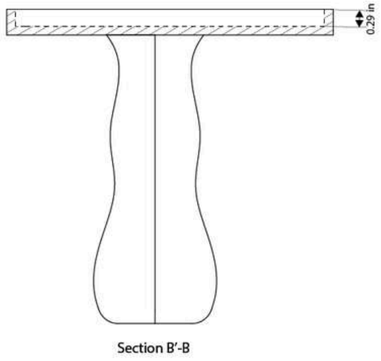


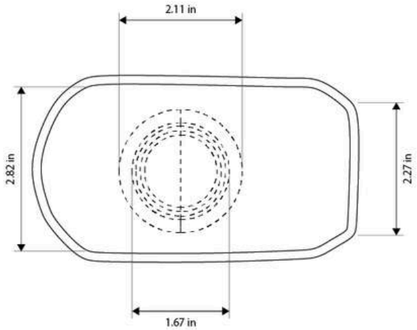


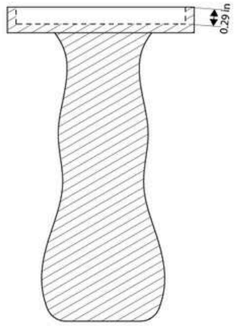






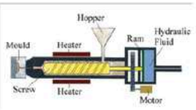






Manufacturing Process: Injection Moulding

ABS Plastic injected into mold cavity under high pressure, where it cools and solidifies.



Product ejected out of mould after solidifying

Section	Material and Finish
1	ABS Plastic with Matte Finish
2	ABS Plastic with Matte Finish
3	Thermoplastic Rubber (TPE)

SteadyReach_PrekshaGajjar_May30_Ver2

Scale: 1:1 | Units: Inches

UPCOMING

Thank You

↘

CMF, Context Renders

IDUS748

FINAL PROJECT

REIMAGINING POWER TOOLS - 5

PREKSHA GAJJAR

Agenda

01

CMF Selection

02

Context Renders

03

Prototyping Process

CMF PALETTE

Rubber

ABS Plastic

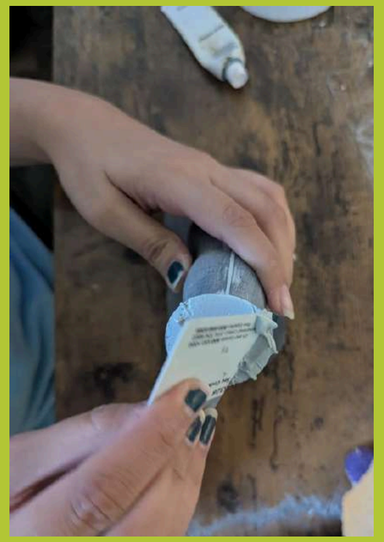
COLOUR, MATERIAL & FINISH

CMF

STEADYREACH

PROTOTYPE PROCESS







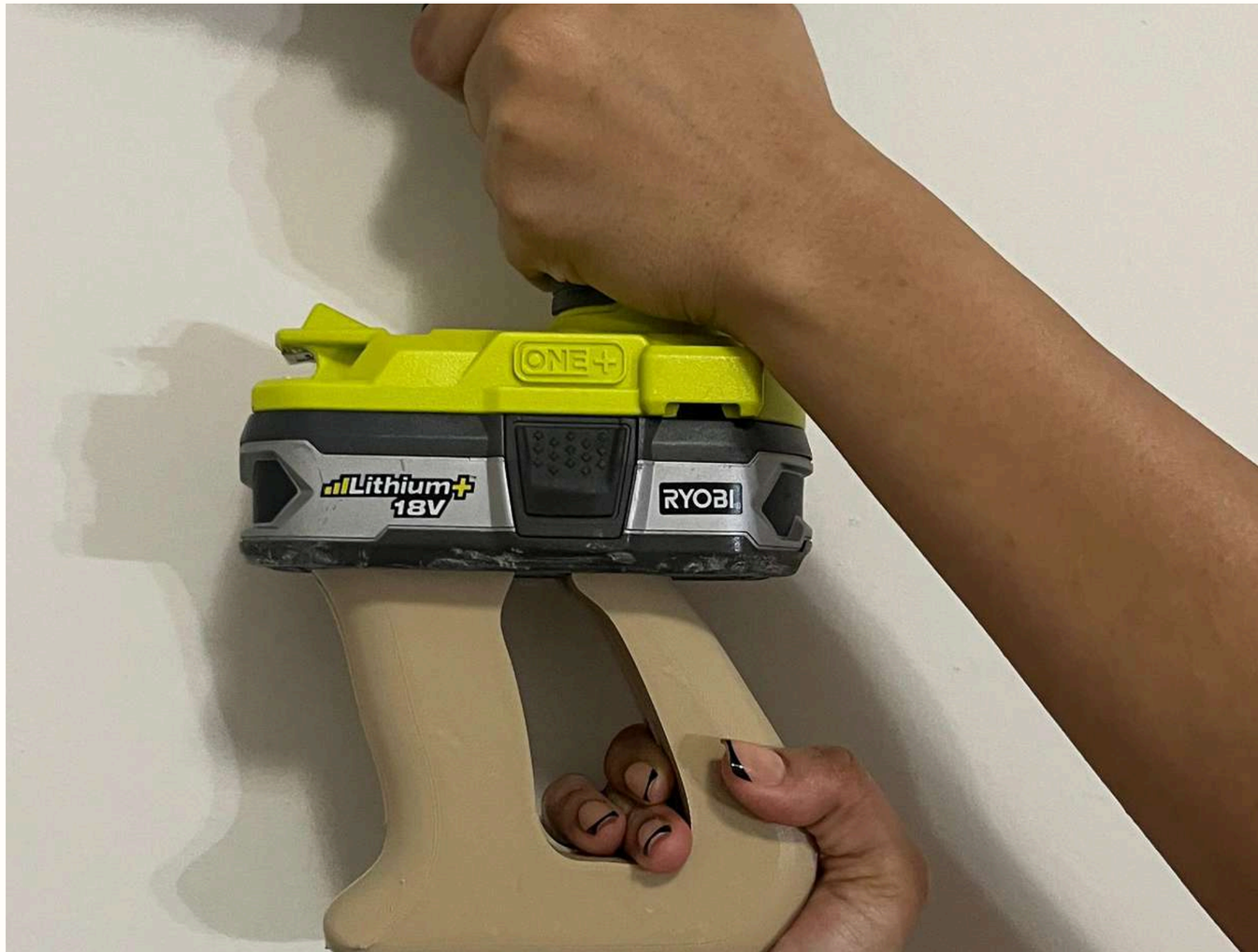
PROTOTYPE PROCESS






UPCOMING

Thank You



User Testing & Final Prototype

IDUS748

FINAL PROJECT

REIMAGINING POWER

TOOLS - 6

PREKSHA GAJJAR

Agenda

01

User Testing Different Forms

02

Final Prototype

03

Final User Testing

User Testing

User Testing

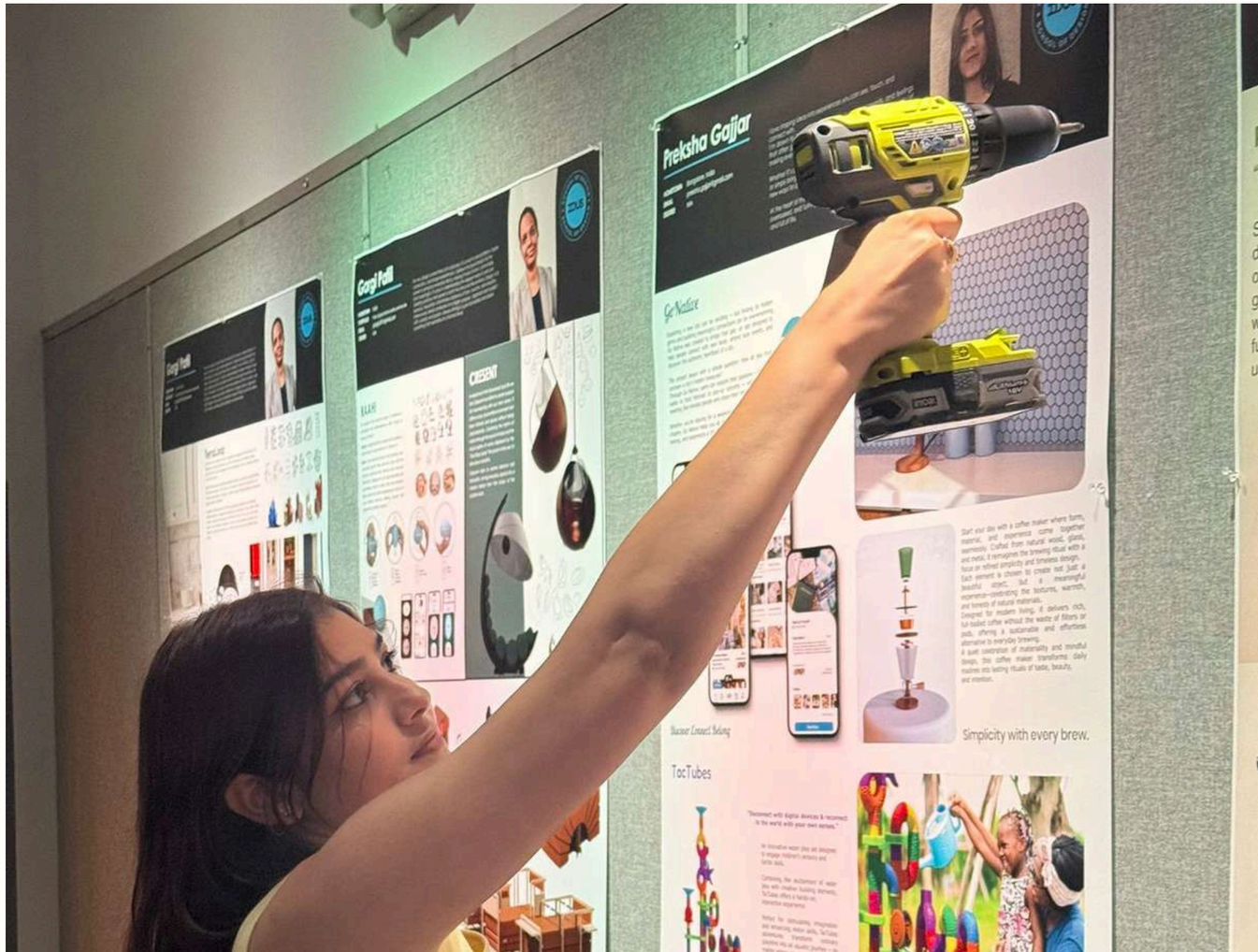
User Testing

User Testing

Final Prototype

FINAL USER TESTING

Thank You



Preksha S Gajjar