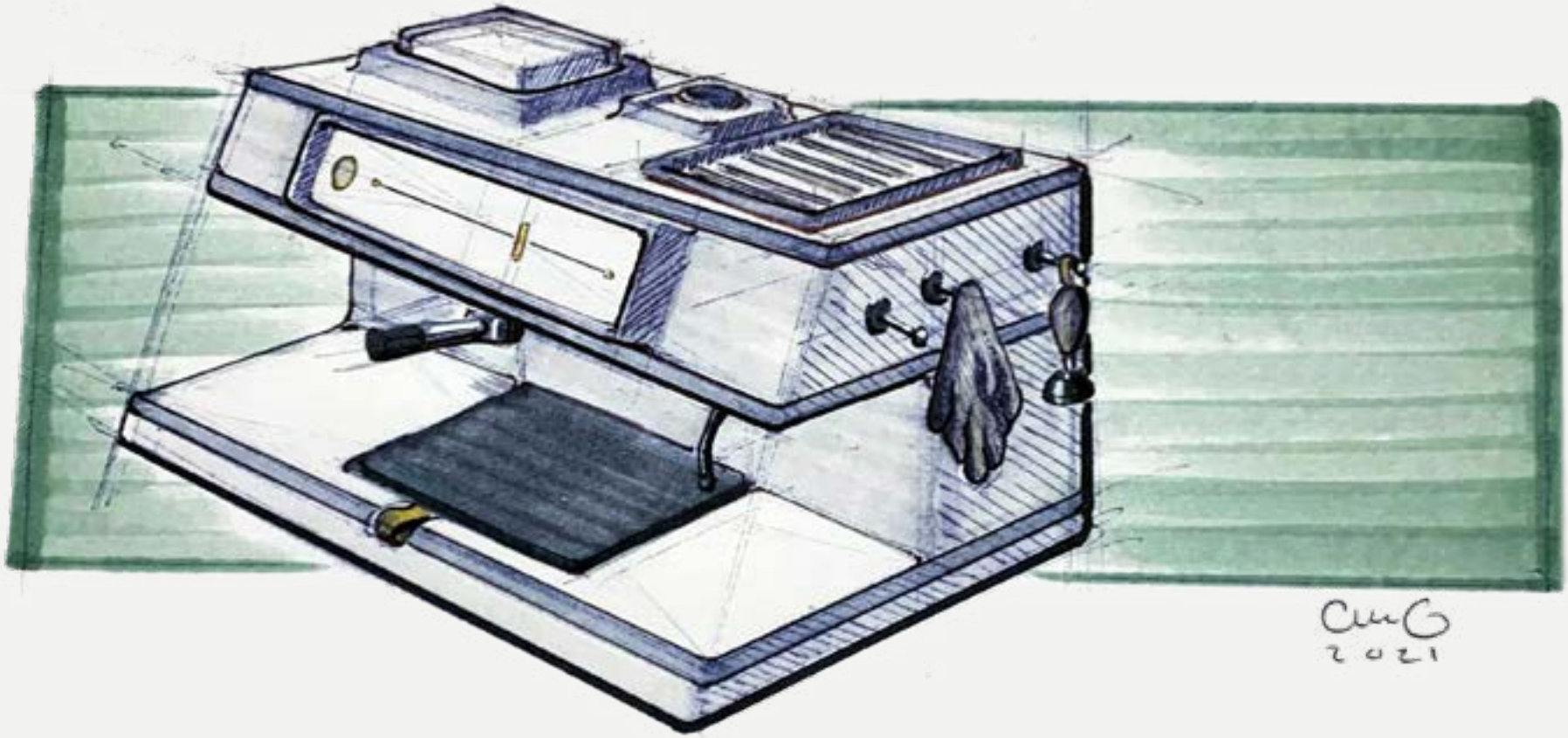
ESPRESSO MONO

PDES 3771 - Project 1



Chapin Galowitz

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MAKING DISCOVERIES

THE PROBLEM

Project Brief

How might we improve the coffee brewing experience at home or the workplace?

According to the 2020 National Coffee Association (NCA) report, 64% of American adults currently consume coffee every day. 45% of coffee consumers brew their coffee by single cup brewing systems, while 13% of coffee drinkers use espresso or other machines. 79% of Americans prepare coffee at home, making it one of the most used appliances in everyday life.

The research phase of this project is motivated by insights from 3 three key sources; business, technology, and users, which will guide ideation on the coffee consuming experience to deliver an innovative product.

Research is collected from online resources like blogs, informational sites, and YouTube channels, as well as interviews with coffee consumers, producers, and professional baristas. Products were compared through Amazon postings and other online retail sites to gather information on pricing, marketing, and specifications.

Competitive products were found online, in retail stores, blogs, articles, and reviews. Machines were chosen based on their relevance to the concept and relative popularity in the market.

Business 1
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WHAT MAKES ESPRESSO?

The Bean

Espresso is made from the same plant as coffee, though many roasters recommend espresso drinkers use darker roasted beans for a more consistent, sweeter flavor profile.

The Brew

The largest difference between coffee and espresso is the brew. Proper espresso requires very high water pressure. The Italian word espresso translates to 'expressed' which refers to how quickly the drink can be made, and is where espresso gets its name. Espresso also uses a much higher ratio of coffee to water, which results in a more concentrated drink of only one fluid ounce.

The Grind

Because espresso gets brewed quickly and at pressure, it is in contact with water for a shorter period of time. This requires the beans to be ground finer than standard coffee in order to expose more of their surface area to water during the brew.

The Steps:

1

Roast
Choose high quality beans roasted the way you like

2

Grind
Dial in the optimal grind size for full extraction of flavor

3

Dose
Weight out the proper dose of grinds

4

Tamp
Evenly compact the coffee grinds into a puck

5

Temperature
Heat your water to the correct temperature

6

Pressure
Apply pressure to catalyze the extraction

7

Ratio
Draw the desired amount of water through the coffee puck

8

Time
Ensure that the extraction took the correct amount of time

USER RESEARCH

Grace, 21

- Graphic Designer
- Lives in a one person apartment
- Minneapolis, MN

Every morning on her way to work, Grace stops at a local cafe for a cappuccino. She appreciates the quality and consistency of cafe style drinks, but wishes she had the tools and know-how to make them at home. Grace is intimidated by the complicated machinery and the many steps involved in making espresso.

Pain Points

- Spends lots of money on coffee monthly
- Isn't confident in her own espresso making ability
- Feels that getting into espresso at home requires lots of research

Needs

- An all-in-one, at-home system that doesn't require expensive refills
- A simplified and intuitive user interface
- Clear and meaningful feedback to better learn the process

INTERVIEW QUOTES

From Baristas and Home Users

"The most common mistakes I see beginners make is either starting with the wrong amount of grinds, or over-tamping them."

"Most people either don't care or don't notice if their espresso isn't perfect."

"When I make espresso and it tastes bad, it's really hard to tell what I did wrong."

"The easiest thing a new coffee drinker can do to increase the quality and freshness of their brew is to buy whole beans and grind them at home"

"The hardest thing for me to learn was probably all of the different recipes and ratios for each drink as well as the texture and consistency of the milk."

BUSINESS RESEARCH

Brand Benchmarking

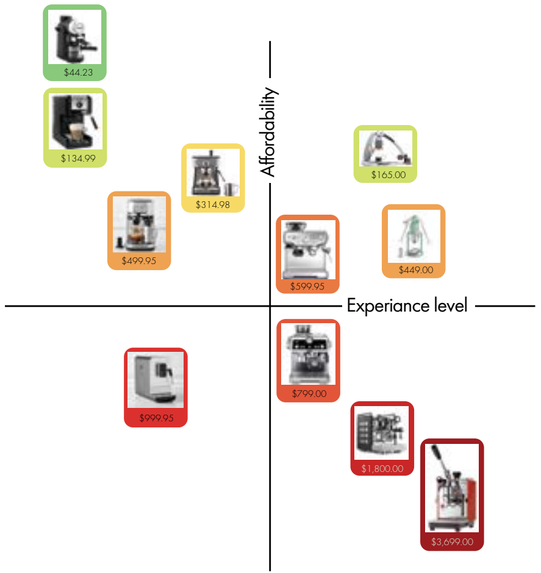
Company	DeLonghi	La Marozocco	Biatelli	Breville	Rocket	Smeg	IMUSA
Global Presence							
User Experience Level							
Price							
Number of Products							
Build Quality							

Brand Aspects to Emulate

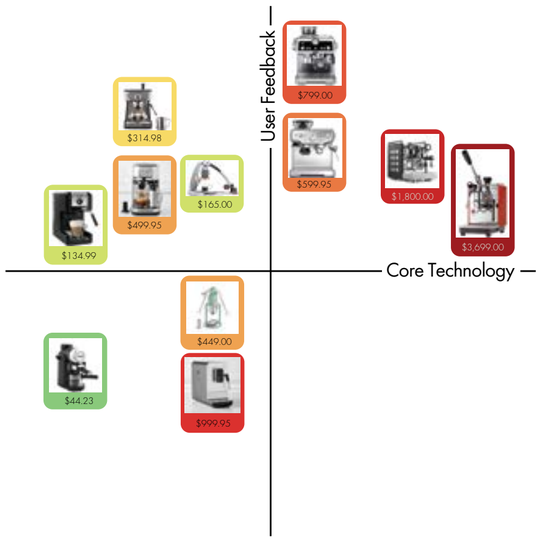
- Target market of beginner to moderately experienced users
- Full range of products for grinding, brewing, and milk steaming
- High build quality; premium color, material and finish
- Mid to high price range

TECHNOLOGICAL RESEARCH

Biaxial Maps



Entry level espresso machines become scarce above about $1000.



Low end hardware often keeps critical information from the user in exchange for a decluttered UI.

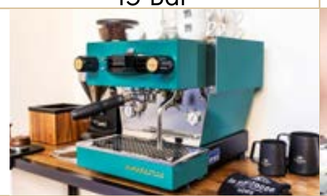
A Note on Pressure

Some of the machines listed below are not capable of reaching 9 bars of pressure, which is the pressure under which genuine espresso is made.

Product Name	Aeropress	Moka Express	Bambino Plus	Electric Espresso Maker	Classic Series	Europiccola	Pump
Brand	Aeropress	Biatelli	Breville	IMUSA	Flair	La Pavoni	HandPresso
Dimensions	9.5"H x 4"W x 4"D	10"H x 5"W x 5"D	17"H x 9.6"W x 16"D		10"H x 6"W x 12"D	12.5"H x 10"W x 8"D	3"H x 4"W x 8.5"D
Material	Polypropylene	Aluminum	Stainless Steel	Plastic	Aluminum/Steel	Stainless Steel	Aluminum
Price	$29.95	$35.95	$499.95	$44.23	$165	$702.58	$97.45
Core Technology	Full Immersion	Percolation	Espresso	Espresso	Manual Espresso	Manual Espresso	Manual Espresso
Pressure	0.5 Bar	1.5 Bar	9 Bar	5 Bar	9 Bar	9 Bar	9 Bar
Image							
Notes	Popular drip coffee for enthusiasts on a budget	Classic Italian method for espresso-like drinks	Popular mid-tier option for beginners	About as cheap as a real espresso machine gets	Entry level manual machine - high quality	High end manual machine - Classic	Travel espresso maker - interesting tech.

A Note on Core Technology

Consumer and pro-sumer machines use an array of heating and pumping technology that affects price and customizability greatly. Typically the more automated a machine is, the less customizable it becomes.

Product Name	Appartamento	Barista Express	LUCCA A53 Mini	Linea Mini	Steel DUO PID	S8	Dedica Deluxe
Brand	Rocket	Breville	La Speziale	La Marzocco	ASCASO	Jura	De Longhi
Dimensions	14"H x 17"W x 17"D	12"H x 13"W x 12"D	15"H x 17"W x 17"D	15"H x 14"W x 21"D	15"H x 10.5"W x 12.5"D	14"H x 17"W x 11"D	12"H x 6"W x13"D
Material	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Plastic	Stainless Steel
Price	$1,800	$699.95	$1,995	$5,400	$1,625	$2,999.95	$349.95
Core Technology	Heat Exchanger - Semi Automatic	Single Boiler - Automatic	Double Boiler - Semi Automatic	Double Boiler - Semi Automatic	Double Boiler - Semi Automatic	Single Boiler - Super Automatic	Single Boiler - Semi Automatic
Pressure	9 Bar	9 Bar	15 Bar	15 Bar	16 Bar	9 Bar	15 Bar
Image							
Notes	Popular mid range enthusiast pick	Beginner forums recommended pick	Styled like a professional machine	Professional machine adapted for home use	Simple, customizable UI with digital display	Grinds, brews, and steams milk internally	Very simple and small footprint

INSIGHTS

	Findings	Insights	Design Objectives
Business	• Many high end machines are needlessly complicated	• Complicated machines overwhelm and put off potential users	• Simplify user input/touch points
Technology	• Creating steam pressure is an expensive mechanical challenge • Most drinks require several pieces of equipment to be made	• New users don't want to invest in very expensive equipment • Create a coffee grinder, water heater, espresso maker, milk steamer, scale, and timer	• Cost effective • Create a product ecosystem with all the required elements
Users	• Users expect to replicate cafe style drinks at home • Users don't understand the reason for a bad shot • Simple repeatable tasks take lots of time and practice to do correctly and consistently	• Low barrier to entry allows novice users to create good coffee • Many variables make failure difficult to troubleshoot • Remove the burden of hand weighing and timing specific tasks like dosing, ratio, and milk steaming	• Beginner friendly • Create a user feedback loop to dial in variables • Automate less impactful steps

Crafting the How-Might-We Statement

Insights from business, technology, and users have been reduced to six key design objectives, which will guide the ideation phase of the project. As ideation develops it is important to continue to loop back to these objectives to ensure that the brainstorming remains accurate and that the product solutions created, solve the needs identified in the product opportunity gaps.

These design objectives are combined with each other to form several how-might-we statements. Statements with multiple objectives will help to diversify the outcome of ideation as they force the concepts to solve multiple problems at once. After ideation is completed, concepts will be combined into one product which addresses most or all of the design objectives.

POGS

Product Opportunity Gaps

How Might We...

- Create a cost effective machine that is beginner friendly?
- Create an ecosystem of products that encourages learning through feedback loops?
- Automate a machine for beginner espresso makers while maintaining a simple user interface?
- Deliver an entire ecosystem of beginner friendly products that uses feedback loops to encourage learning?

IDEATION

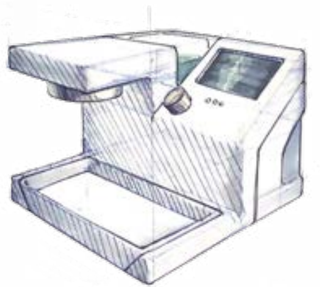
SKETCHING

Espresso machines have been designed with a focus on user feedback loops. Sliders and digital sliders are used to allow users to customize settings independently in an understandable ecosystem.

Automatic machines are preferred over manual ones for better consistency over multiple uses. Materials include stainless steel, anodized aluminum, plastic, wood, and leather for their high perceived quality and ability to be cleaned effectively.

Final concepts should include a grinder, brew head, and milk frother in the design along with a method by which to control them. A central screen is used in most concepts as a way of displaying information to the user.

Most machines aim to lower the barrier to entry for new users by simplifying the user interface. By including all 7 variables of espresso on the same machine, users can more easily play with different settings, and are encouraged to find a brewing style that suits them.



The preferred concepts include a simplified user interface that encourages positive development through feedback loops. The machine will act as an ecosystem which houses all the appliances and accessories needed to make cafe style drinks.

When possible, design choices have made which are beginner friendly but don't restrict the appliances use for more advanced users.

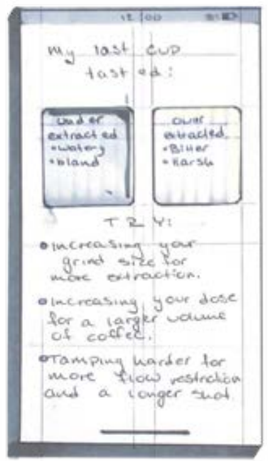
For example, automated milk frothers have been eliminated at this stage because they don't allow for as much control in the hands of a proficient user.

Accessories are designed with a focus on automation, simple user interfaces, and consistent repeatability for beginner users.

The machine and it's accessories are developed alongside an app experience that allows users to customize settings and encourages passive use through social features and feedback loops. The apps and on board control system should be capable of controlling all 7 variables of espresso as well as providing feedback on those settings.

The app will include a method for changing brew settings as well as an experience for learning more about, customizing, and dialing in those settings based on extraction theory.

After a shot of espresso has been brewed, the user will be prompted with a taste evaluation page in which binary answers about flavors can be transformed into actionable advice on brew settings.



One major enemy of a user in pursuit of consistent brews is unintentional variances in brewing conditions which can come from human error.

The main goal of accessorizing this product is to remove variances in the process of making espresso which come mainly from difficulties in milk foaming and tamping pressure.

By automating either of these processes, variances can be cut down, but the user experience may be negatively effected. A milk frother that takes control from the user will make more consistent foam for beginners, but allows less control for advanced users. The ideal accessory makes it easier for novice users to brew correctly, but still allows advanced users to have fun and experiment.

CONCEPT DEVELOPMENT

Ideation sketching is used to explore divergent areas of the product opportunity gap. Through the exploration of espresso machines, accessories, and digital ecosystems, we are able to address all six design criteria assembled in the research phase.

After assessing the concept directions with industry professionals and peers, one main concept is chosen for further development. The chosen concept is a combination of the app interface which uses sliders to adjust the 7 variables of espresso, and a 3-in-1 dual boiler espresso machine. The developed concept will feature a touchscreen for input which aligns with the information displayed in the app.

MOOD BOARD












A SUCCESSFUL ESPRESSO EXPERIENCE NOT ONLY SMELLS AND TASTES AMAZING, BUT LOOKS, SOUNDS, AND FEELS AMAZING TOO.

Materials and Finishes

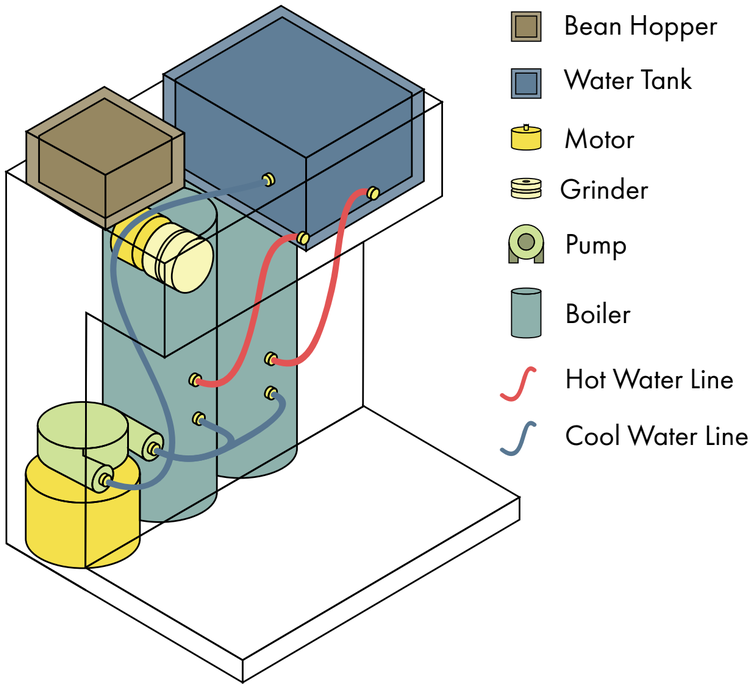
Inspiration for this project comes from high end home electronics, kitchenware, and furniture. The image board to the left features materials like anodized metal, leather, stainless steel, and silicone which have been chosen for their contemporary design aesthetic, quality, and durability.

Satin-textured metals will be used on surfaces where condensation is likely to make them easier to clean and less likely to accumulate smudges.

Leather will be used on touch points like bean and water hoppers, drip trays, and portafilters, to make the process of brewing espresso look and feel engaging and important.

The screen of the brewer will take inspiration from home devices like the Nest thermostat and Google home which feature intuitive digital touch controls.

INTERNAL COMPONENTS



Bean Hopper

Water Tank

Motor

Grinder

Pump

Boiler

Hot Water Line

Cool Water Line

Product Architecture

The bean hopper and water tank are located on top of the machine so that they can be loaded from the top and feed their contents down through the machine with gravity.

Beans fall from the bean hopper through the grinder, and out the grind shoot below. Water flows from the reservoir through the pump and into both boilers for brewing and for the milk frother. Hot water flows from these boilers out to the group head and steam wand respectively. A return line for overpressure steam from the group head back to the brew boiler is not pictured.

DESIGN LANGUAGE TABLE

Form	Boxy, angular, modern, minimal
Details	Magnetic connections, digital interface, leather accents
Materials	Leather, anodized aluminum, stainless steel, wood
Color	Black, silver, brown, sea foam green
Texture	Satin, gloss, matte, wood grain
Personality	Professional, modern, sleek, minimal, friendly, high-end

FORM STUDY

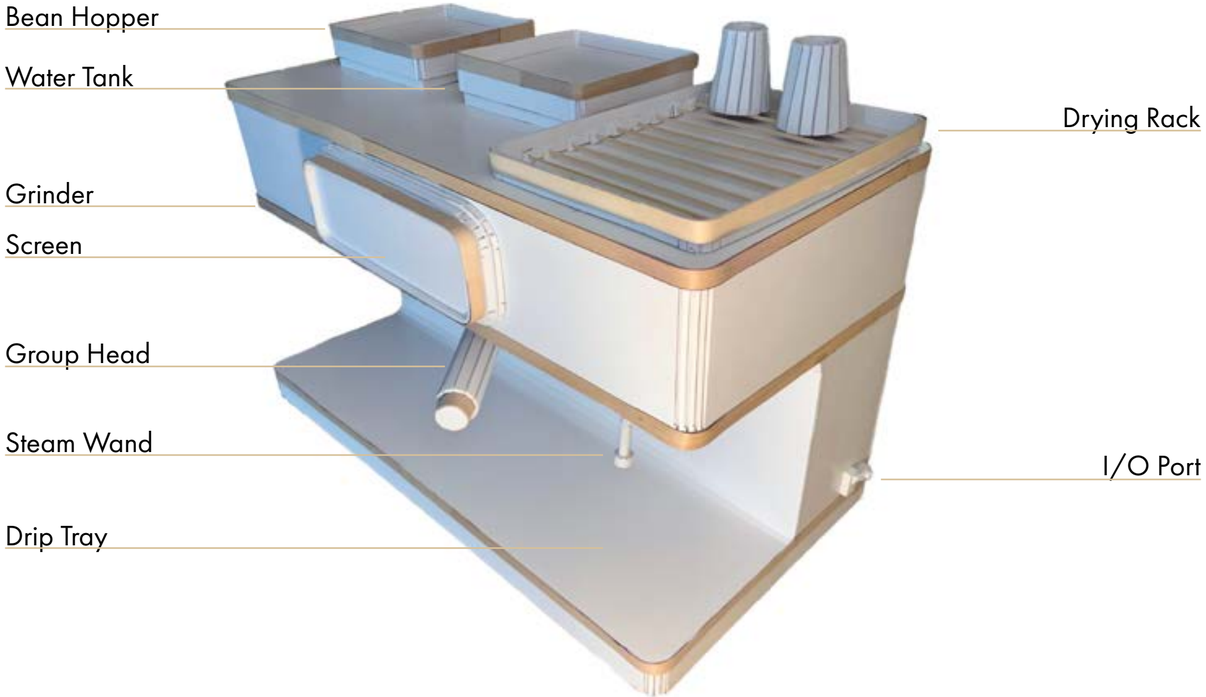
Specifications:

The foam model is made of 1/16" foam core and bass wood. The model is based on a rectangular prism with a depth of 12", a height of 15", and a width of 24". The drip tray extends 7.5" into the form. The top features a bean hopper and a water tank (6.5x6.5"), and a removable drying rack (8.5x11").

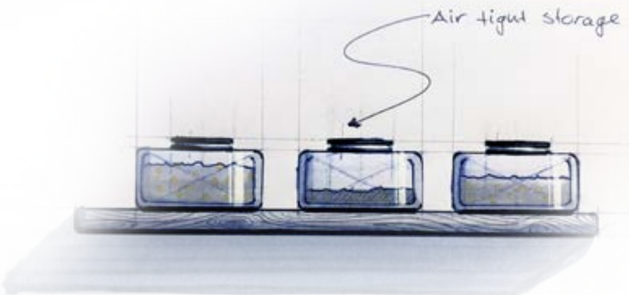
Observations:

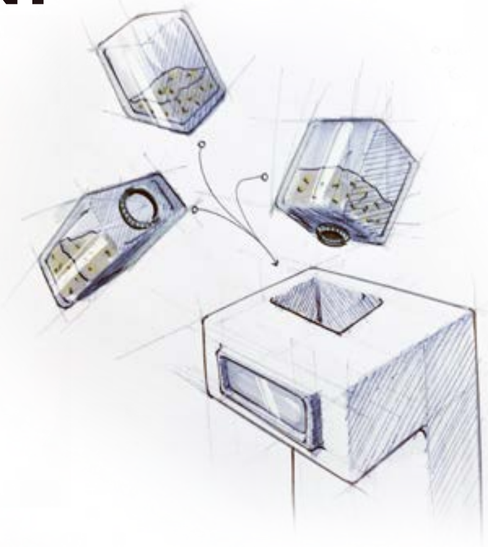
The model is very large and claims too much counter space and visual space in the home. Much of this size comes from its width of 2 feet which should be reduced in future iterations. This change will sacrifice work space on the drip tray and will require the internal components to be packed into the case more efficiently. The top of the machine has lots of unused surface area which is being taken up by the bean hopper and water tank.

The bean hopper requires real estate on the top of the machine so that it can be accessed and filled easily. The hopper's size can be decreased without negatively impacting it's usable volume so long as it retains a minimum of 30 cubic inches, the volume of a 1lb bag of coffee beans. The water tank can be moved to the inside of the case with a fill port left on the front or top, freeing up more room above. After these changes, the drying rack can be expanded and storage for tampers and dish rags can be added.



FEATURE DEVELOPMENT

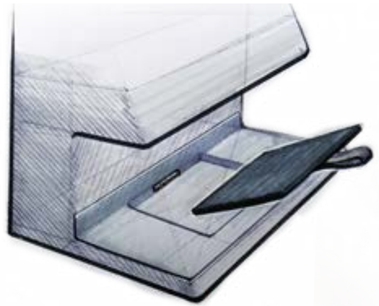


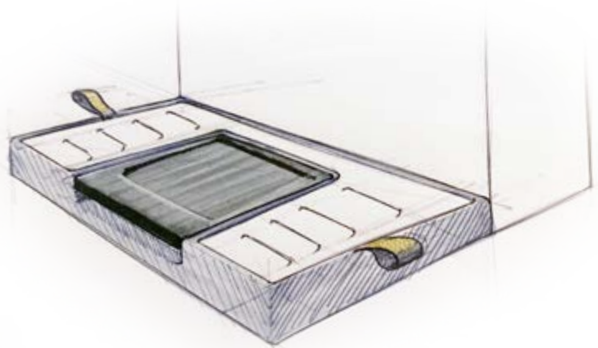


Bean Hopper

The bean hopper can be made modular, allowing users to switch their roast type between brews without emptying the grinder. The hopper is fitted with a quick connect lid which engages with the bean hopper port on the machine allowing it to open when installed and close when removed. The quick connect mechanism can be unscrewed from the container, acting as a lid through which users load fresh beans.

This allows the hopper to double as a storage container for beans which are not in use. Hoppers should be air tight to preserve freshness, and should include a place for users to label the roast contained in each hopper.

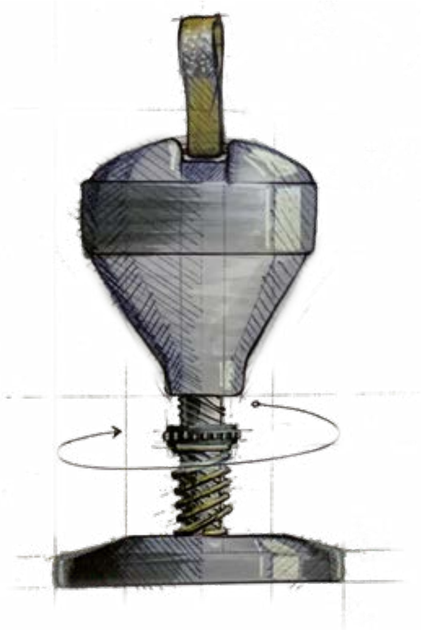




Scale

A scale has been added to the drip tray of the machine, allowing it to collect data on the weight of each shot. This information is used to tune the ratio setting in the machine. The scale is fixed to the machine via a magnetic connection that allows it to be removed when not in use. Readout and adjustments for the scale are available through the main screen of the device.

The scale is connected to the bottom of the back splash via a smart connector set of pins which allow the scale to be installed and uninstalled easily. The scale will avoid liquid damage as the electronics are housed inside the machine, leaving only the load cell under the group head. The scale comes off when the drip tray is washed.

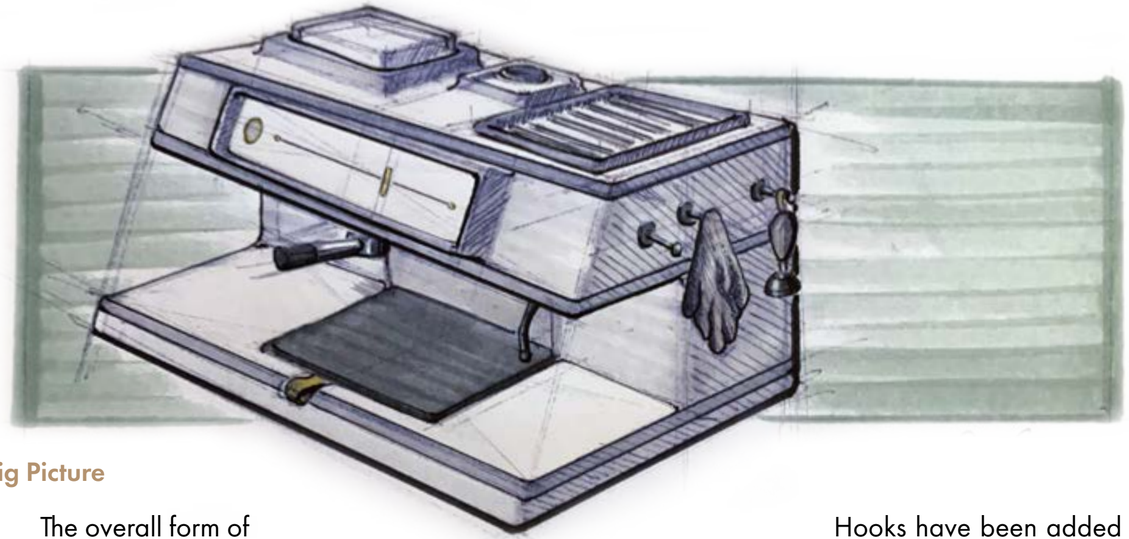


Tamper

The tamper has been made with a handle which rides along a threaded rod, around which sits a spring. When the coffee grinds are tamped, the handle travels down the rod to compress the spring. A nut is threaded onto the rod and can be positioned to stop the handles travel at any point in the compression of the spring. This is used to set the pressure at which the handle bottoms out.

Users are intended to set the tamper to their desired pressure, and then tamp the coffee puck with enough force to bottom out the device at whatever level of pressure it is set to. The nut can then be repositioned for subsequent uses depending on the desired adjustment.

FORM DEVELOPMENT

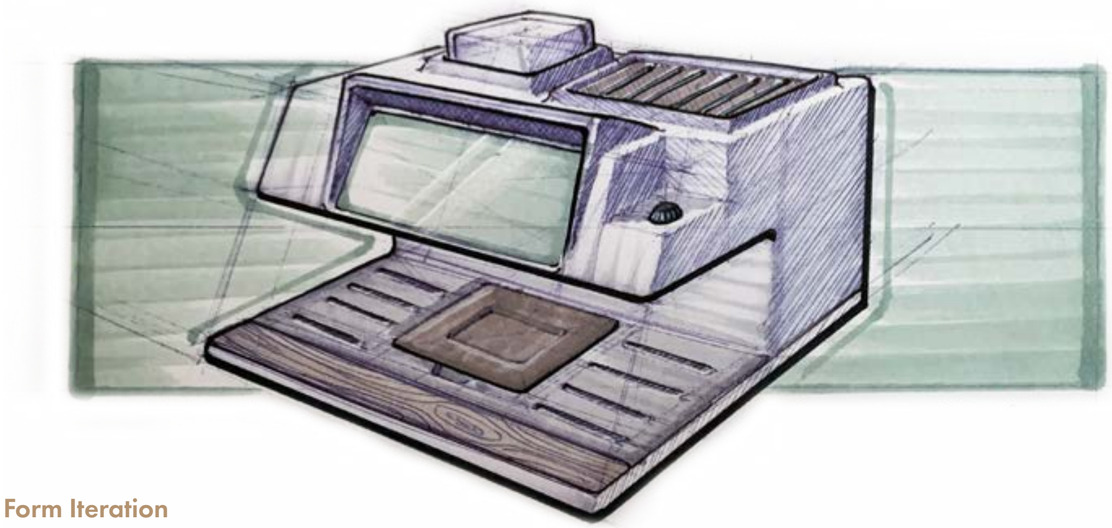


Big Picture

The overall form of the machine remains the same, but it has been cut down to 18" in width. The water tank has been moved inside the case to free up space on the top of the machine. This space can be used to store accessories like extra portafilters and tampers.

The front face of the machine has been raked backwards in an effort to improve both the viewing angle of the display, and to allow for better sight lines to the work happening on the drip tray.

Hooks have been added to the side of the form for storing items like rags, tampers, and utensils. The screen has also been extended in an effort to provide more room for user interfaces. Leather accents are used for touch-points like the scale and drip tray pull tabs.



Form Iteration

A final iteration of the form is made with ergonomic changes. The screen's protective cowling has been extended over the top edge of the front face allowing the screen to grown vertically. The frame around the screen has been made to taper off towards the bottom for easier touch screen access.

The accessory hooks have been removed to clean up the form and allow users to store the machine flush against a wall. The tamper will be given a storage space on the drying rack above.

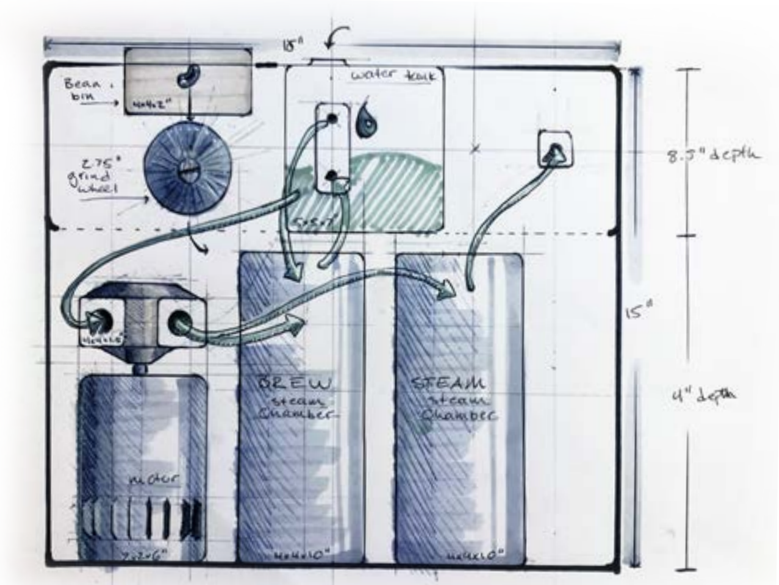
The fill port for the water tank has been moved again. This time it lives on the front right hand corner of the form. This allows users to fill the tank without reaching to the back of the machine. The cap is set into the form and placed on a concave surface so that spilled water tends to flow back into the fill hole.

Revised Internals

The cross-section drawing to the right shows the internal layout of components adjusted for the modified case dimensions. Electronic components are not shown, but a large gap has been left inside the machine where the scale and display need to sit along with their required hardware.

Water flows along the green arrows; starting from the water tank, cold water is pressurized at the pump, before teeing off into the brew boiler and steam boiler. Hot water leaves the boiler and exits at the group and steam wand respectively. The group also feeds water back to the boiler cyclically to maintain heat at the brew head.

Beans from the bean hopper are gravity fed into the grind wheel, to fall out the grind shoot below.



Both boilers will be insulated to aid thermal efficiency, and to protect nearby components from the heat being generated. The bean hopper is kept farthest from the boilers to ensure that the beans are not heated prematurely.

The motors for the grinder and pump are mounted to the case with rubber bushings to reduce noise, vibration, and harshness when in use.

PITCH

Problem:

Current espresso machines do not control all of the variables for flavor extraction in one system. This lack of alignment requires users to familiarize themselves with multiple ecosystems and to convert between them when making brew adjustments. This requires time consuming practice and knowledge.

Features & function:

Grinder, group head, steam wand, bean storage, scale, timer, digital settings ecosystem

Competitors

Beginner oriented brands like DeLonghi and Breville
Pro-sumer oriented brands like Rocket and LaMarzzoco

Product name:

Espresso Mono

Target Users:

At home users transitioning from beginner to advanced

Rational for development:

To lower the barriers to entry of specialty coffee by making the process more transparent and understandable, while offering experienced users more control over the process.

Primary function:

To customize and brew espresso and espresso based drinks at home

Secondary function:

To provide a comprehensive espresso education platform to foster experimentation and learning

Key technology:

Adjustable high pressure and high temperature water control
Adjustable coffee bean grinder
Connected digital ecosystem

Stakeholders:

Designers, manufacturers, distributors, retailers, coffee roasters, cafe owners, coffee shop chains

Approximate Price:

$2600

Product Pitch:

Espresso Mono is a new espresso brewing system for aspiring high-end coffee consumers that makes dialing in brew settings easier and more fluid than conventional espresso machines. The Mono allows users to input their coffee's roast type, and control the grind, dose, ratio, temperature, pressure, and steam pressure. The Mono companion app opens up a conversation between the user and the machine, allowing them to develop their brew settings to match their specific coffee, and meet their personal taste. Espresso Mono features a modular bean hopper which doubles as a storage system for users who want to switch up their roast on the fly. With an integrated grinder, group head, steam wand, scale, and timer, every variable of espresso can be fine tuned from one place. Espresso Mono gives the user full control over exactly what happens in the brew from start to finish.

SPECIFICATION BENCHMARK

Product Name:	Feature:	Part Name:	Specifications:	Notes:
Rocket Appartamento	Boiler	Boiler Tank	1.80 liters	Large enough volume to pull shots continuously.
Amazon Echo Show	Processor Display	Intel Atom x5-Z8350 Display panel	1.44 G Hz freq. 5.5" @92ppi	Wifi connectivity, and high speed processing.
Lucca A53	Group	Group Head	Semi-saturated	Group head stays warm as boiler water circulates.
Ascaso Dream	Temperature control	PID	110v, power saving, offset, shot length, pressure settings	High level of control over boiler settings.
La Speziale S1 Mini	Water Heater	Heating element	2700w, 110v, 190mm	Large enough to heat desired volume quickly - runs 110v.
Breville Barista Express	Brew Basket	Portafilter	58mm	Industry standard size.
Ascaso I-1 Mini	Coffee Grinder	Milling Wheels	54mm Steel	Industry standard size.

Specification Benchmarking

Specification benchmarking is used to compare internal components of competing products to those required by the concept. Important things to consider when choosing products to research for benchmarking is the price, target user, and use case of the existing product.

For example, the Amazon Echo Show was used in the benchmarking table to gather information on IoT hardware and screen technology. Though the use case of an Amazon Echo is very different from that of an espresso machine, the hardware is being used in similar settings like kitchens, and to do similar tasks like adjust settings and connect to the web. Competing pro-sumer espresso makers were evaluated as well to gauge quality and specs in the relevant price range.

FINALIZING THE CONCEPT

A CAD model of the final design was made in SolidWorks, and details the form and external features of the device. It is rendered in Keyshot to display surface texture details and colors.

In this phase, the user interface portion is also finalized. This element consists of an on-machine-UI and a smartphone app.

FINAL RENDER & COLORS

The final design is rendered in a black, lime cream, and leather colorway. These colors were chosen to reflect a modern and sophisticated palette while remaining playful and beautiful.

The Espresso Mono is a high end luxury item and should look at home in a nice home kitchen. Colorways are inspired by pricey-yet-playful kitchen brands like Smeg. The machine's accent color is placed on the backslash area, and can be replaced if it is broken or if a different look is desired. The machine is available in black or white with Pantone Lime Cream, Cannoli Cream, Pale Lavender, and Pomeian Red accent panels.

PMS 580

PMS 5595

PMS 2706

PMS 704

DESIGN ELEMENTS

Water Tank

The water tank is on the inside of the machine and is accessible via a port on the front right hand corner of the device. The fill port is set in from the edges of the form and slopes down towards the middle. This is so that spilled water still flows into the tank. The port is sealed with a silicone stopper.

Bean Hopper

The bean hopper, which loads vertically into the back of the machine, is air tight and opens automatically when inserted into the port. The hopper doubles as a storage container for extra roasts, and has a place for labels allowing users to stay organized and mix up their flavors.

Functions

The functioning section of the machine is located under the display and houses the grind shoot, the group head, and the steam wand. These parts are made of electroplated brass, aluminum, and stainless steel.

Scale

The scale sits under the group head, and locks in place with a magnetic connection on the drip tray. It has a leather pull tab, and is spray coated in silicone to keep mugs, cups, and shot glasses from slipping. It connects to the machines electronics through a 5-pin connector at its rear. The scale is water tight.

Drip Tray

The drip tray is removable and pulls out from the machine vertically with two leather tabs. It is made of stainless steel and has two main components. The lower section forms the pan half of the assembly and collects the excess liquid. The top half is slotted to allow liquid to flow through, and sits above the pan.

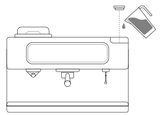
Display

The display is the main touch-point of the machine and the place through which users input commands and select settings. It is angled upwards for better visibility when sitting on a standard counter top. It is shielded by the aluminum housing of the machine. It is a matte display for lower glare in the kitchen and to hide smudges.

Tamper

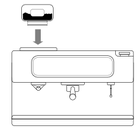
The tamper is made of stainless steel and smooth touch matte finish plastic. The handle sits on a steel spring to resist the downward press of the user and can be adjusted to stop at any point in the springs travel with a nut found in the center of the spring assembly. The nut is moved up and down by twisting the base of the tamper which is attached to the threaded rod which holds the nut.

STORYBOARD

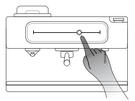


Fill water tank

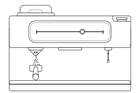
Fill bean hopper



Load bean hopper



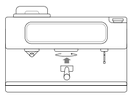
Select grind & dose



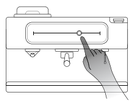
Grind beans

Set tamp pressure

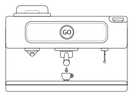
Tamp grinds



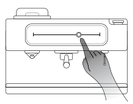
Insert portafilter



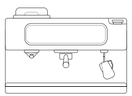
Select temp, pressure, & ratio



Pull the shot

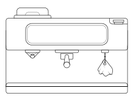


Select steam pressure

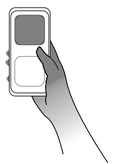


Steam milk

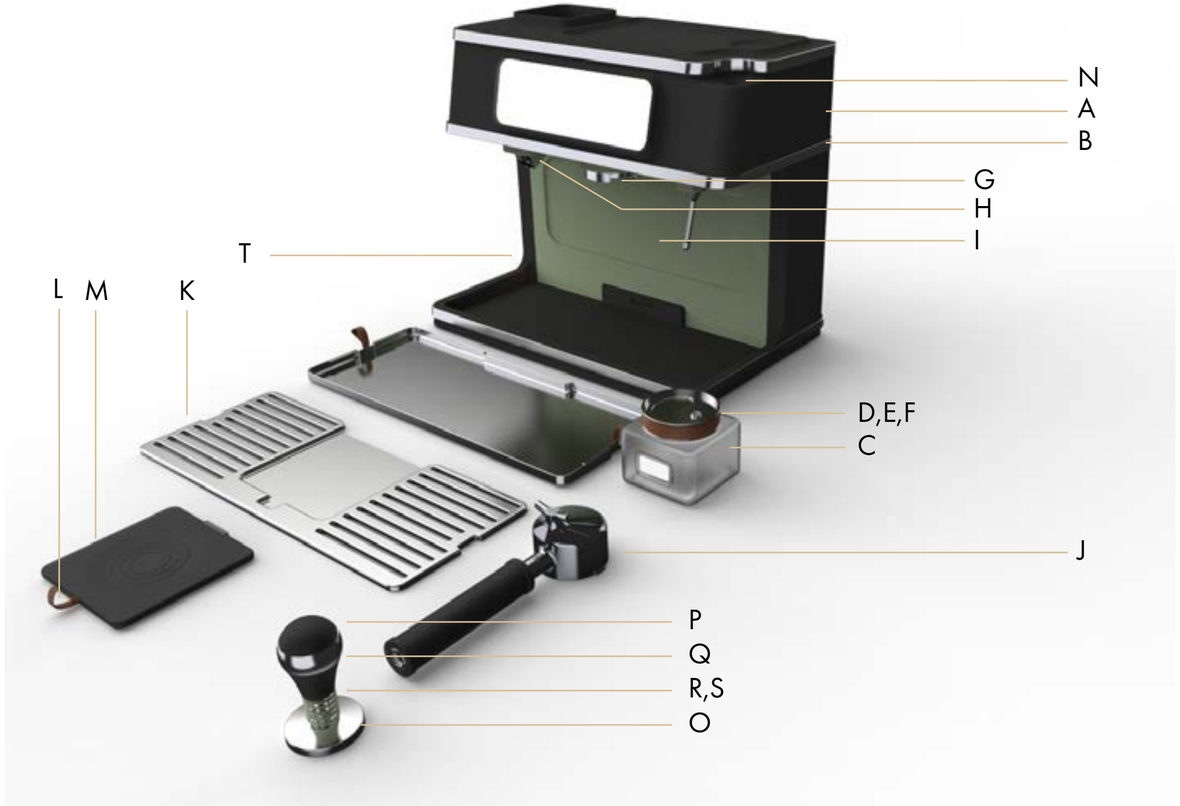
Knock puck



Wipe down steam wand



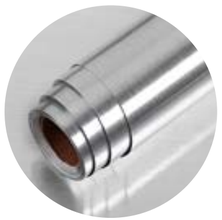
Evaluate



BILL OF MATERIALS

Part:	Name:	Material:	Manufacturing Process:
A	Chassis	Powder coated aluminum	Sheet metal fabrication
B	Chassis Detailing	Stainless steel	Sheet metal fabrication
C	Bean Hopper	SAN plastic	Blow molding
D	Hopper Lid Assembly	Aluminum	Die casting
E	Air Gasket	Nitrile rubber	Stock
F	Hopper Grip	Bees wax treated leather	Hand sewn
G	Group Head	Chrome electroplated brass	Die cast
H	Grinder Spout	Chrome electroplated brass	Die cast
I	Steam Wand	Chrome electroplated brass	Tube stock bending
J	Portafilter	Stainless steel	Die cast
K	Drip Tray Assembly	Stainless steel	Sheet metal fabrication
L	Pull Tabs	Bees wax treated leather	Hand sewn
M	Scale Housing	Matte spray coated silicone	Injection molded
N	Water Cap	Matte spray coated silicone	Injection molded
O	Tamper Head	Stainless steel	Turned
P	Tamper Handle	Matte spray coated silicone	Injection molded
Q	Tamper Detail	Stainless steel	Sheet metal fabrication
R	Spring	Rubber coated spring steel	Stock
S	Tension Wheel	Stainless Steel	CNC machining
T	Power Switch	SAN plastic	Stock

MATERIAL AND FINISH



A

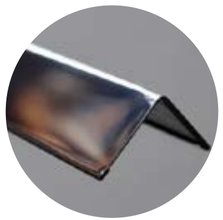
Brushed Steel

VDI 3400 12
Hairline Finish

B

Powder Coated Aluminum

VDI 3400 34
Satin Finish



C

Polished Chrome

SPI A1
High Polished Finish

D

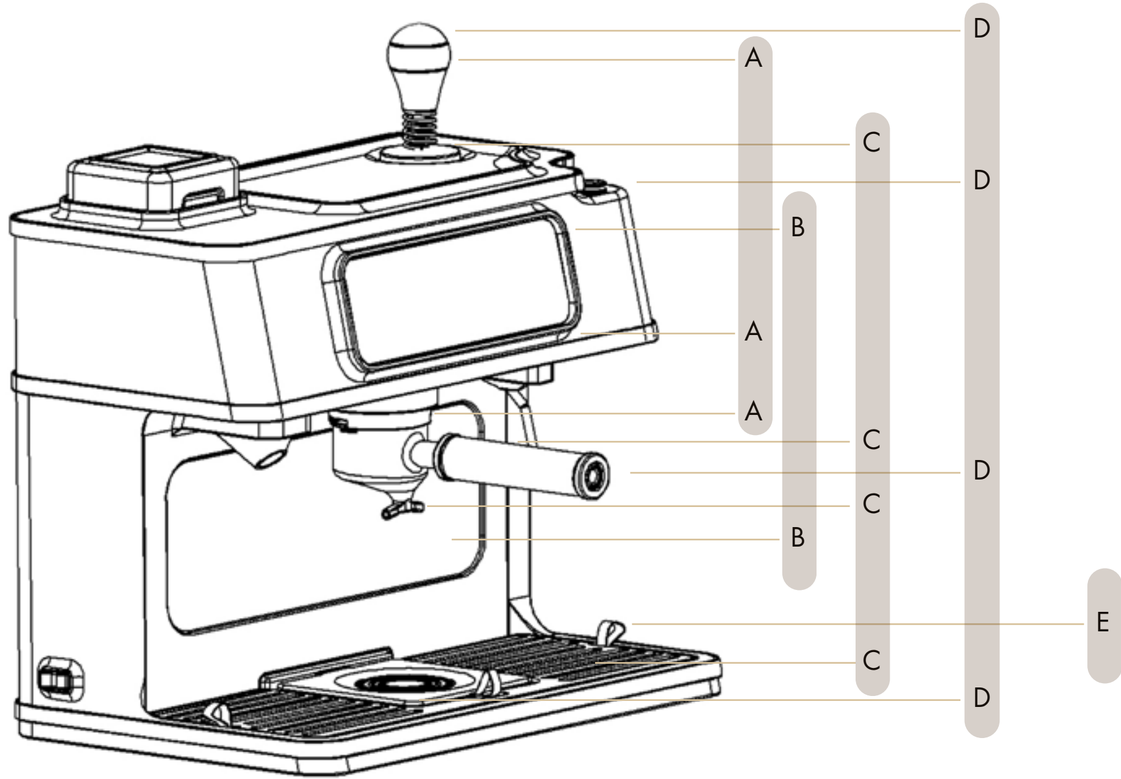
Soft Touch Plastic

VDI 3400 45
Satin Finish

E

Waxed Leather

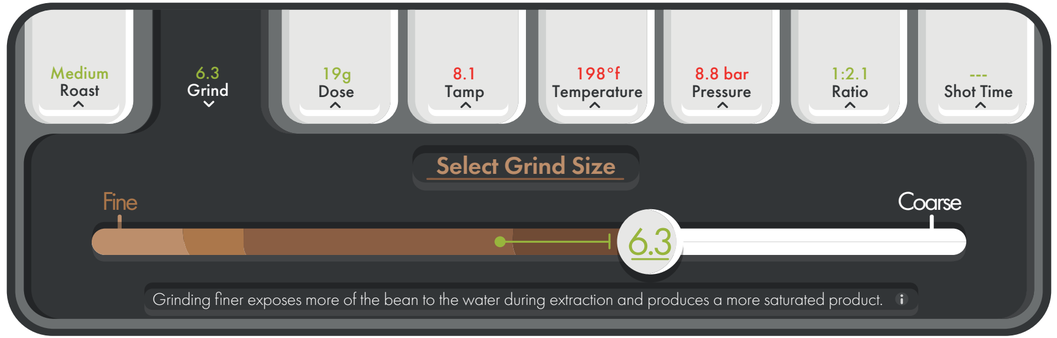
VDI 3400 12
Textured Finish



USER INTERFACE SNAPSHOTS

The Display

The main touch-point of the device is the screen which is located at the center of the machine. It functions as the mode by which users can address brew settings and turn the devices functions on and off. The settings are also accessible through a smartphone app which lets users get a more in depth experience and spend more time customizing their settings throughout the day.



The UI

The UI on the machine is layed out horizontally with all the variables displayed across the top of the screen in eight separate tabs. Seven of the tabs appear collapsed at any time and only display the title of the tab and its current setting, while one tab appears expanded so that the user can adjust the setting. In the example above, the user has just opened the grind settings tab and increased its value. This is seen as a green bar on the slider indicating the increase. Now, the machine recommends adjusting the tamp, temperature, and pressure settings in order to account for this increase in grind size. This is seen when the metrics in these tabs turn red, indicating that further adjustment is necessary.

Mobile

While the on-machine-display is used more for active use cases when the user is actively making coffee, the companion app is intended to be used passively for managing brew types and fine tuning settings outside brewing hours. The application serves not only as a remote settings menu for the device, but also as a portal for educating the user and introducing them to fresh coffee ideas. A user should be able to browse the app and explore coffee trends, discover new techniques and flavors, learn how they can be created, and then get ready to brew it themselves, all from within the app.