IDM Spring Final Presentation
May 11st, 2020

Enhancing Medication Management for Seniors

ROCKET TURTLE

Nani • Jordy • Ethan • John

Problem Statement

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Medication management is challenging for seniors.

Seniors' poor medication management leads to adult children's worries, and stress.

Prevalence of the Problem

68.9%

of hospital admissions were avoidable

125,000

Deaths

The New York Times

PERSONAL HEALTH

The Cost of Not Taking Your Medicine

Paul Rogers

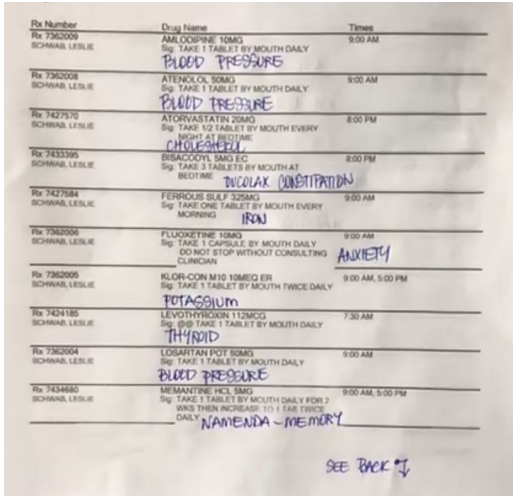
10%

of hospitalization

$100 - $289 billion

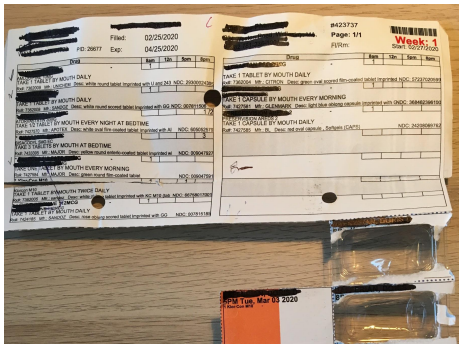
annual costs to the US Healthcare System

In-Person Observations of Current Methods



Rx Number	Drug Name	Times
Rx 7362009 SCHWAB, LESLIE	AMLODIPINE 10MG Sig: TAKE 1 TABLET BY MOUTH DAILY BLOOD PRESSURE	9:00 AM
Rx 7362008 SCHWAB, LESLIE	ATENOLOL 50MG Sig: TAKE 1 TABLET BY MOUTH DAILY BLOOD PRESSURE	9:00 AM
Rx 7427570 SCHWAB, LESLIE	ATORVASTATIN 20MG Sig: TAKE 1/2 TABLET BY MOUTH EVERY NIGHT AT BEDTIME CHOLESTEROL	8:00 PM
Rx 7433395 SCHWAB, LESLIE	BISACODYL 5MG EC Sig: TAKE 3 TABLETS BY MOUTH AT BEDTIME DUCOLAX CONSTIPATION	8:00 PM
Rx 7427584 SCHWAB, LESLIE	FERROUS SULF 325MG Sig: TAKE ONE TABLET BY MOUTH EVERY MORNING IRON	9:00 AM
Rx 7362006 SCHWAB, LESLIE	FLUOXETINE 10MG Sig: TAKE 1 CAPSULE BY MOUTH DAILY DO NOT STOP WITHOUT CONSULTING CLINICIAN ANXIETY	9:00 AM
Rx 7362005 SCHWAB, LESLIE	KLOR-CON M10 10MEQ ER Sig: TAKE 1 TABLET BY MOUTH TWICE DAILY POTASSIUM	9:00 AM, 5:00 PM
Rx 7424185 SCHWAB, LESLIE	LEVOTHYROXIN 112MCG Sig: @@ TAKE 1 TABLET BY MOUTH DAILY THYROID	7:30 AM
Rx 7362004 SCHWAB, LESLIE	LOSARTAN POT 50MG Sig: TAKE 1 TABLET BY MOUTH DAILY BLOOD PRESSURE	9:00 AM
Rx 7434680 SCHWAB, LESLIE	MEMANTINE HCL 5MG Sig: TAKE 1 TABLET BY MOUTH DAILY FOR 7 WKS THEN INCREASE TO 1 TAB TWICE DAILY NAMENDA - MEMORY	9:00 AM, 5:00 PM

SEE BACK



Interviewing Seniors

OBSERVATION

Potentially taking twice as much medication as prescribed.

Interviewing Seniors

OBSERVATION

Potentially taking twice as much medication as prescribed.

Managing a less independent spouse's medications can be a full time job.

Primary Persona: Elderly Individual

Harry Baldwin (81)

Lives in Independent Living Center

Has children & grandchildren in the NE

Manages 4 medications for himself

Cognitively can handle management of medication

Family members are always concerned about adherence and call to check in

Primary User's Needs List

- To **open** medication containers easily
- To read / receive medication **information** clearly and easily
- To require **minimal data input** from the user
- To be **reminded** when it is time to take medication
- To **easily know** if medication has already been taken
- To know if any medications have **adverse interactions**
- To know **when to order** prescription refills
- To have items that are **visually pleasing** and integrate into home environment
- To **feel in control** over his/her own medication management

Secondary Persona: Caregiver

Allison Garrision (57)

Daughter of Harry Baldwin.

Lives in a different state

Very concerned about her dad taking medication

Knows that her dad can handle for the most part but calls daily to check.

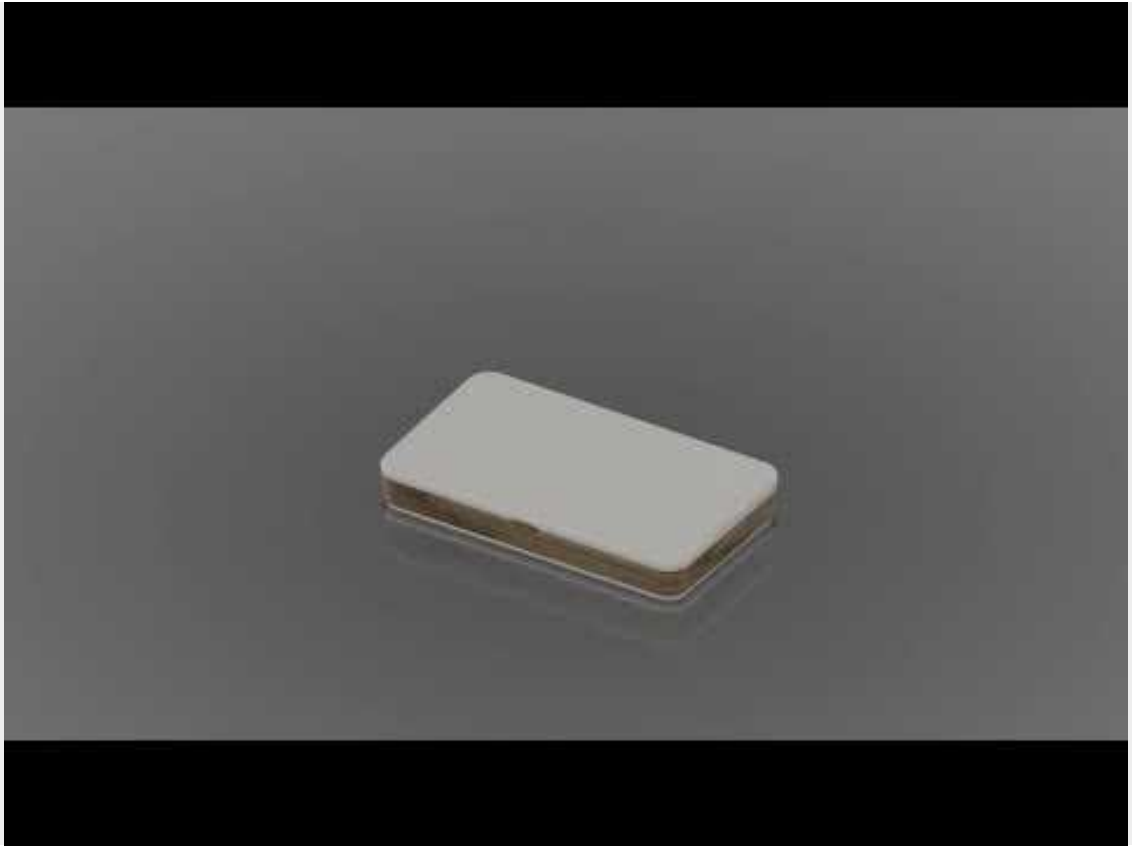
Coordinates with doctor on prescriptions, and finds herself stressed organizing complicated medication information

Secondary User's Needs List

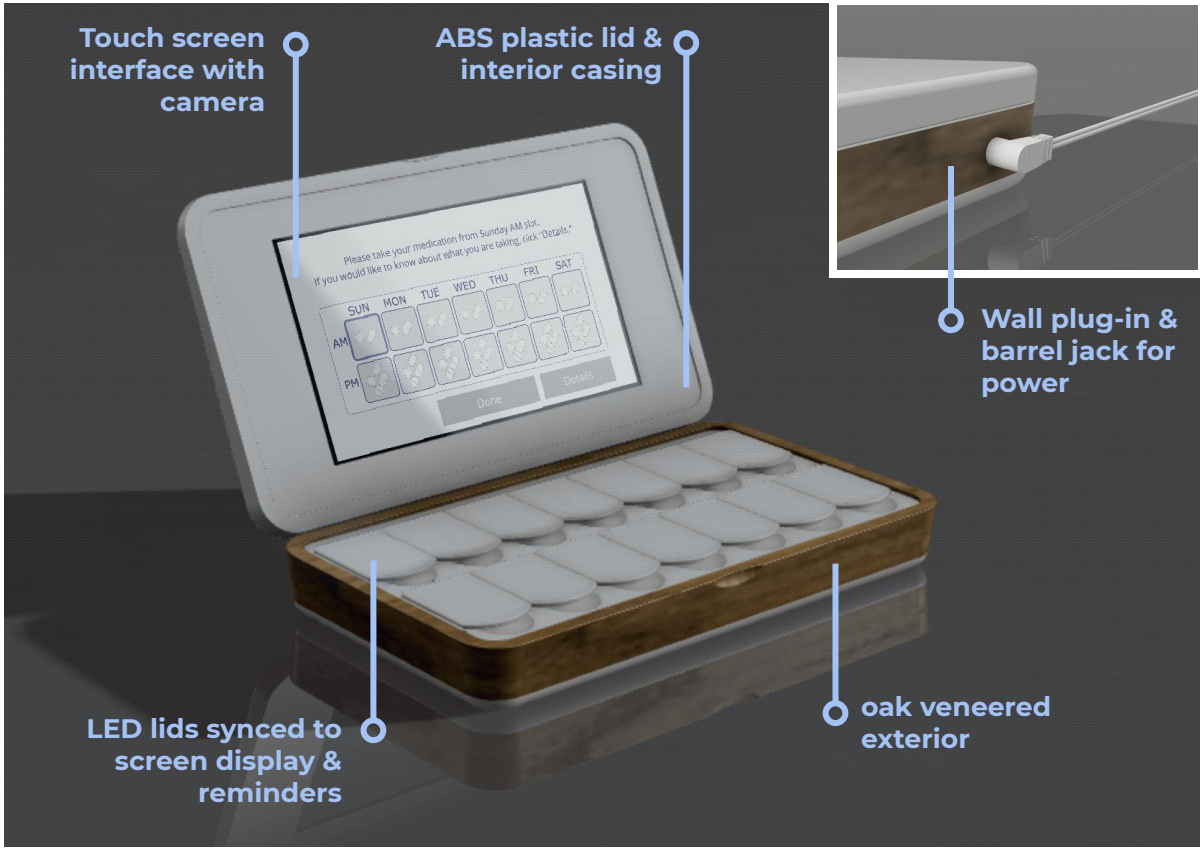
- To be able to **trust** seniors managing their own medication
- To have **reasonable access and knowledge** of seniors' medication list, changes, adherence and management
- To **know when to intervene or "nudge"** seniors
- To **know how to help** (for refills, doctor's visits, etc.)

Enabling Mindful
Medication Management

Product Rendering

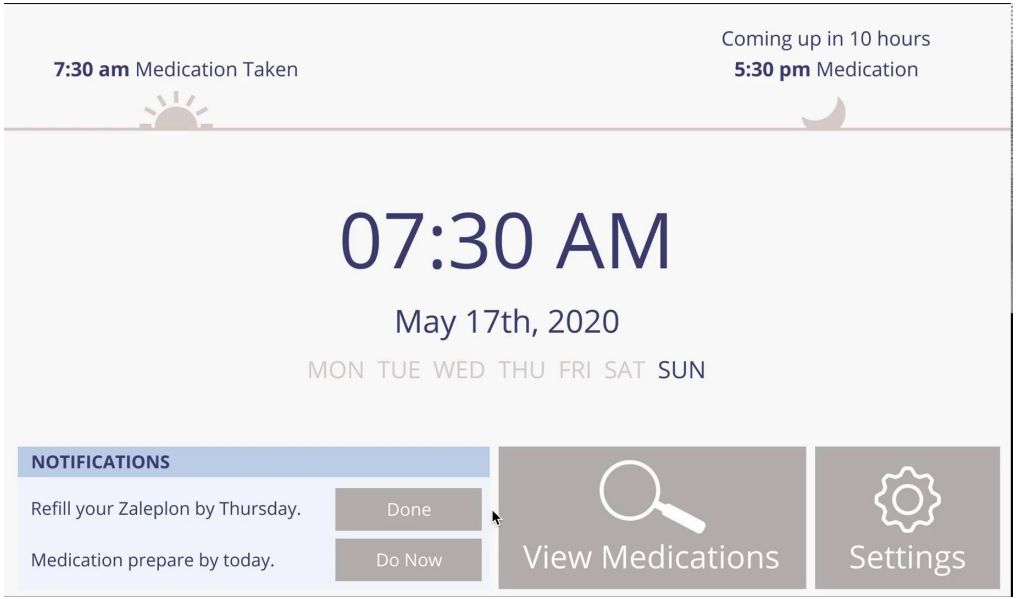


Product Overview



Product Demo — Reminder Notification

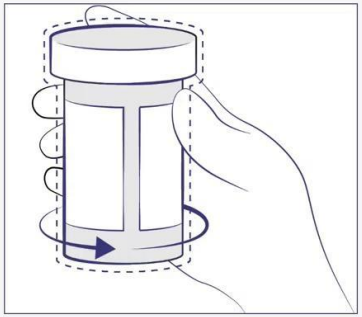
Demo — Taking Medication



Demo — Pill Bottle Scanning

Step **1** of 2

Rotate the pill bottle slowly to capture all the information.



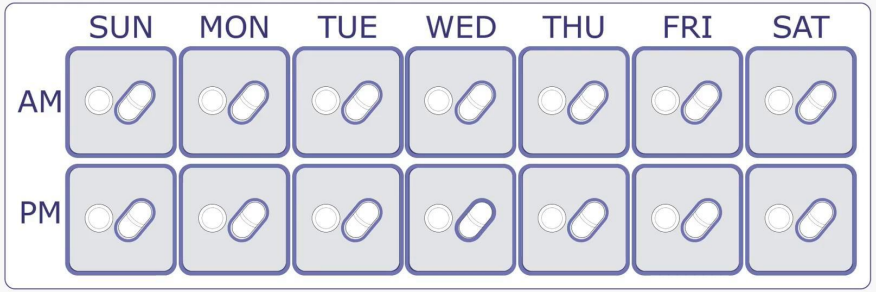
Main Screen

Next >

Product Demonstration

Step **3** of 5

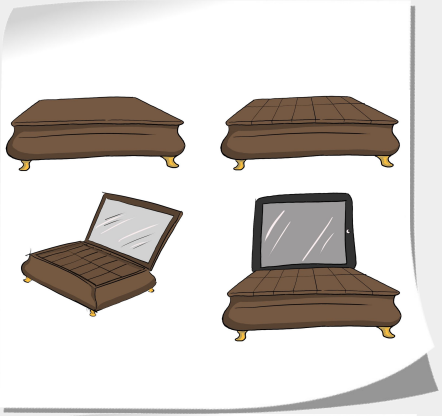
Place one pill from **Cetirizine** into
all the **AM** and **PM** medication slots.

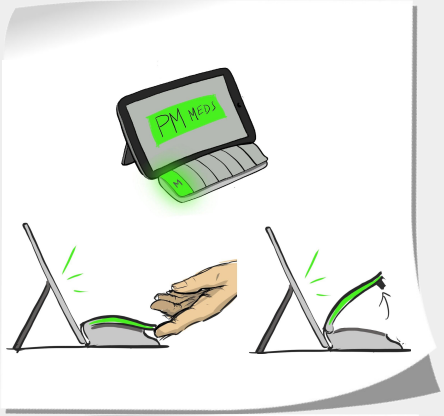


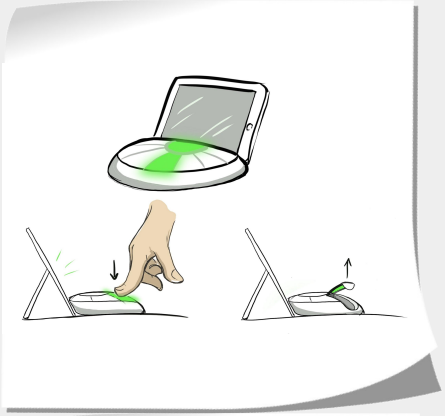
< Previous | Main Screen | Next >

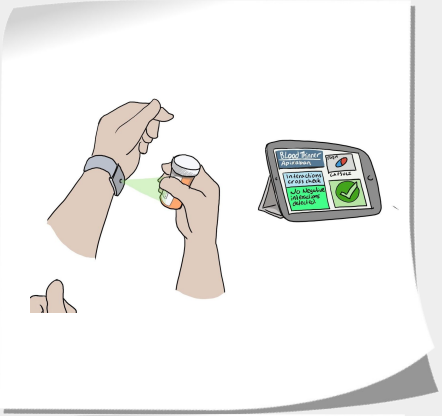
Product Development

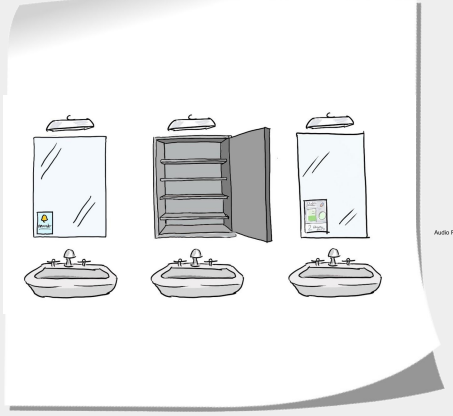
Concept Generation

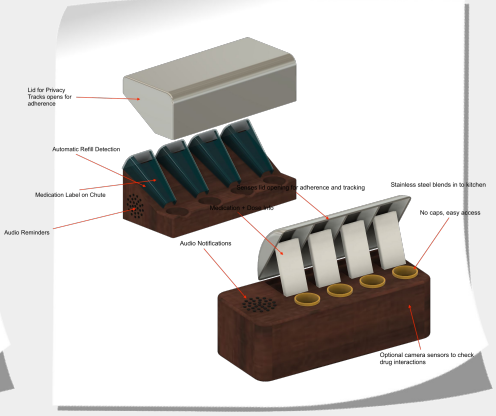






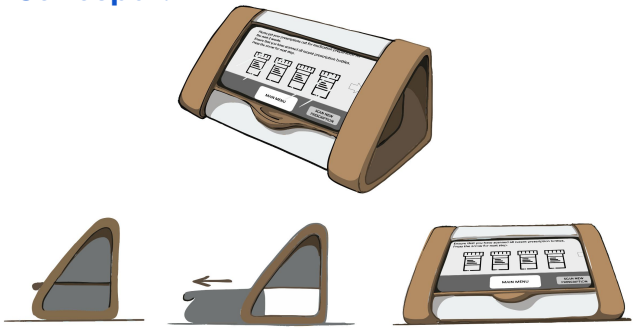




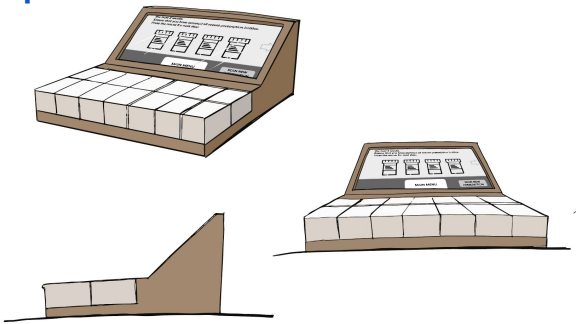


Form Factors

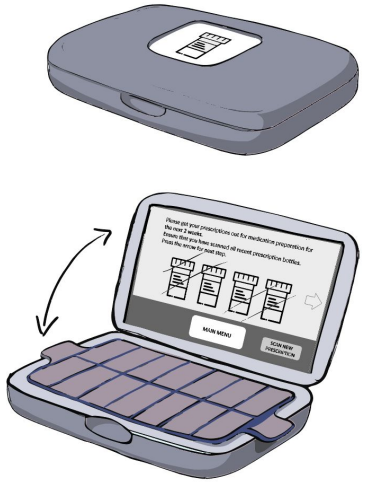
Concept 1.



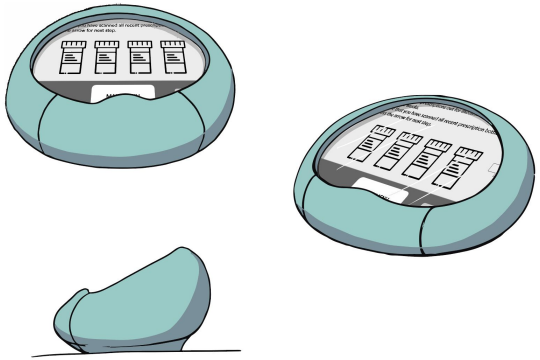
Concept 2.



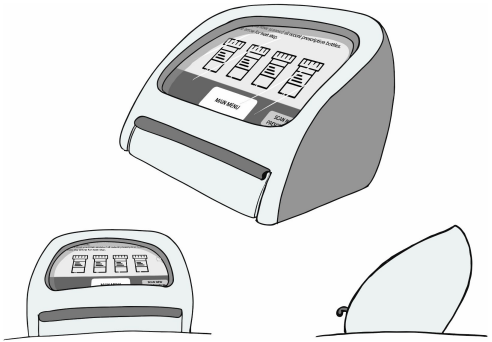
Concept 5.



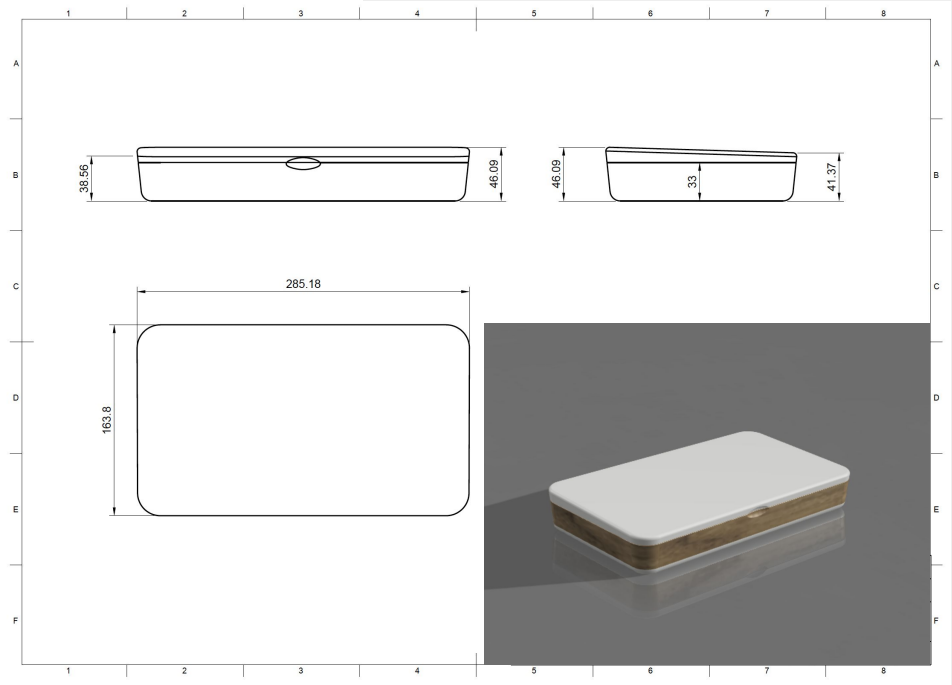
Concept 3.

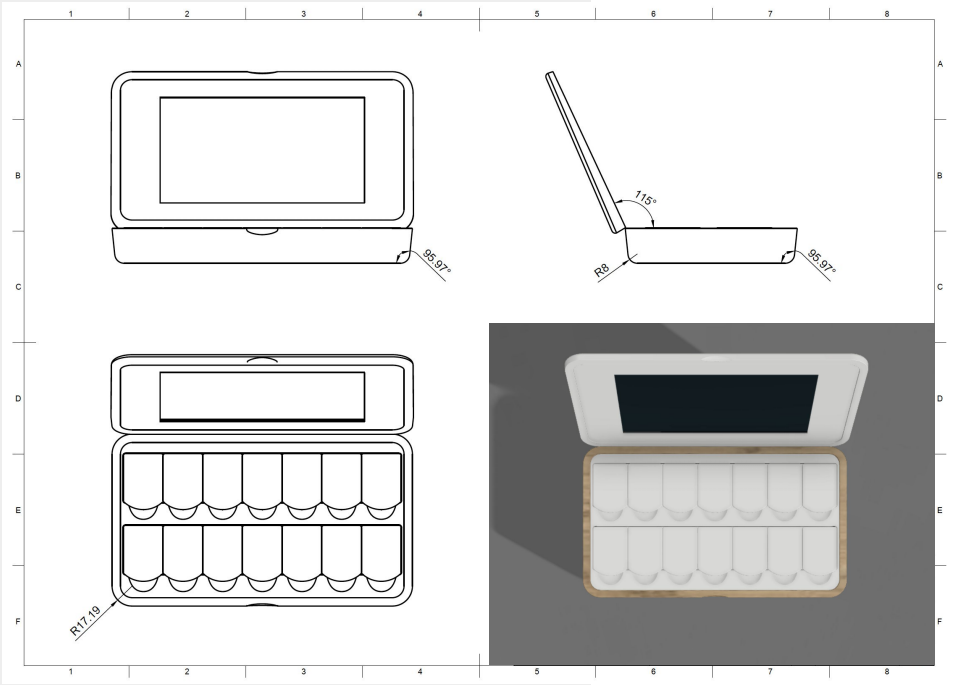


Concept 4.

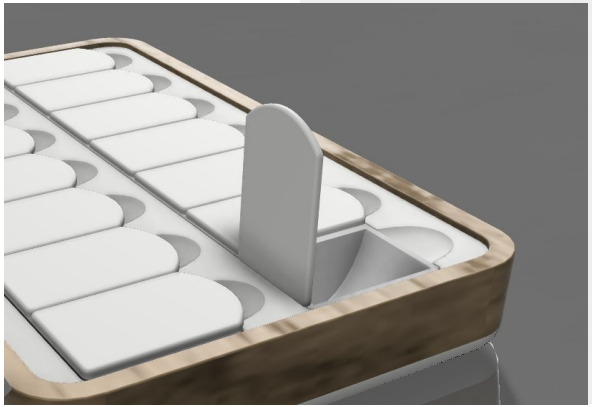


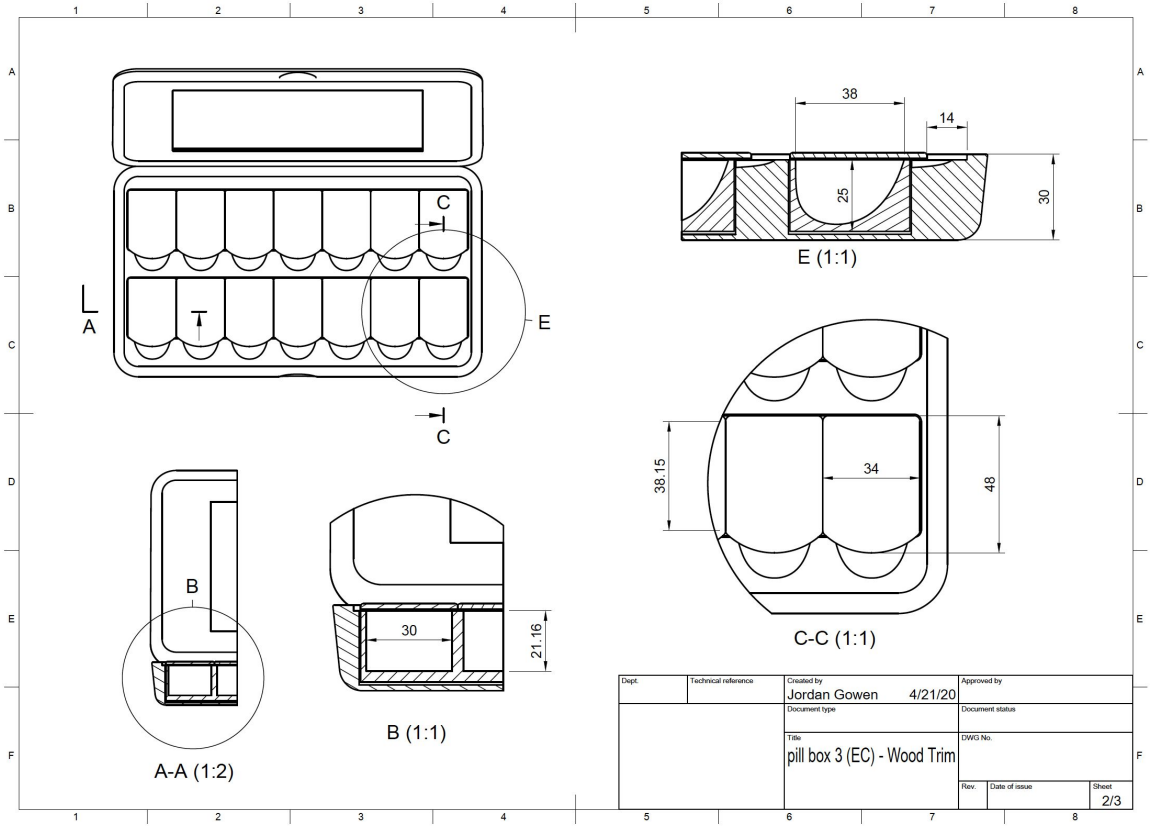
Considering Size





Compartment Details

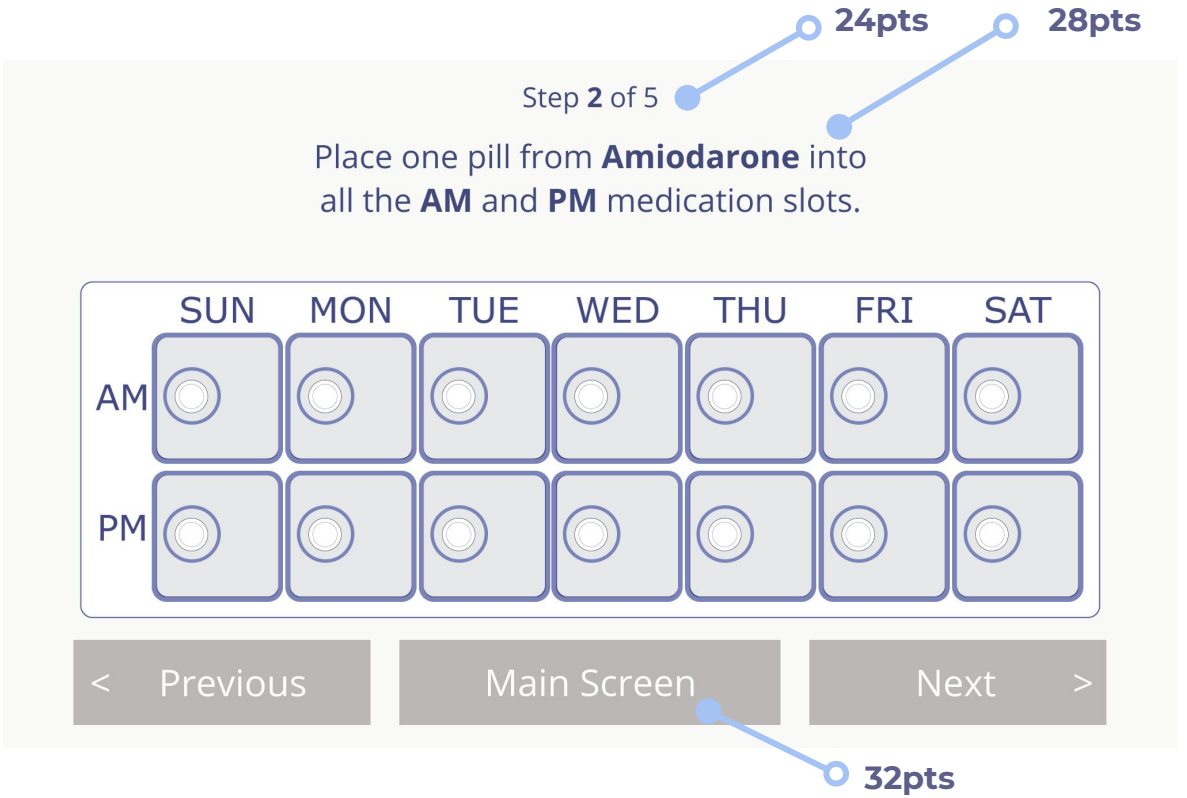




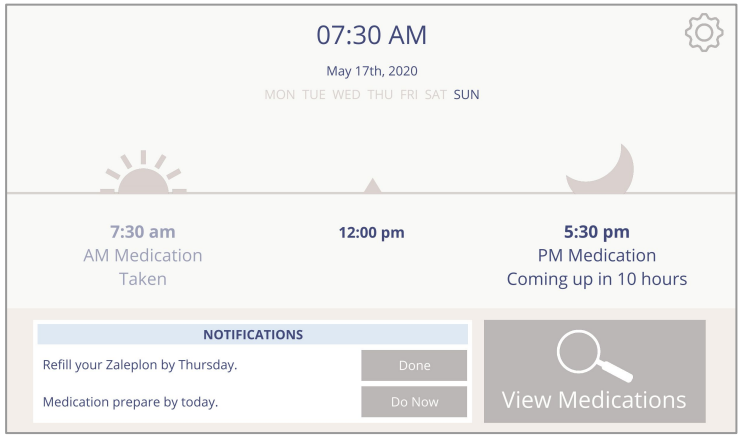
User Interface

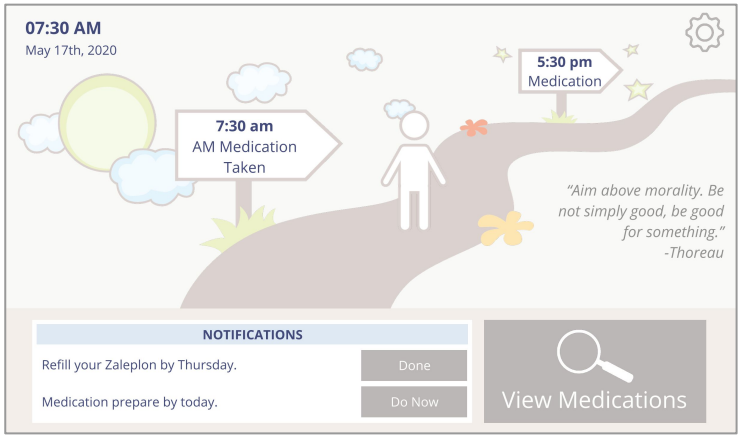
Usability

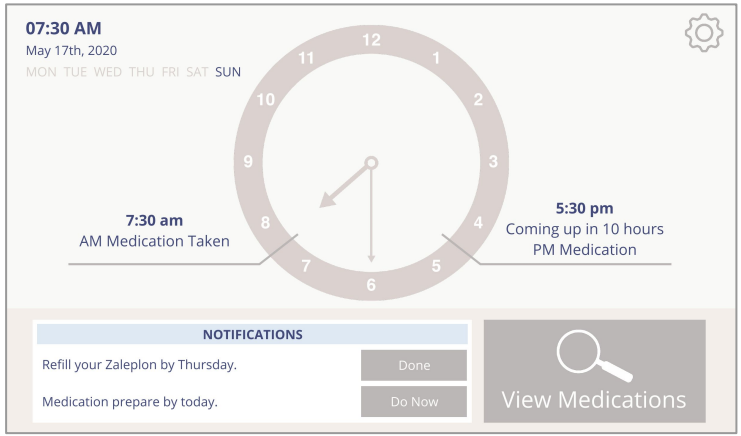
- Clickable buttons are placed on the lower side of each page
- Main Screen button is always on the lower middle
- Buttons are all identical colors
- Font reasonably sized above 16pts
- Break information or progressive disclosure
- Color alone should not be used to convey message
- Limited zoom and scroll interactions
- Minimize manual type input

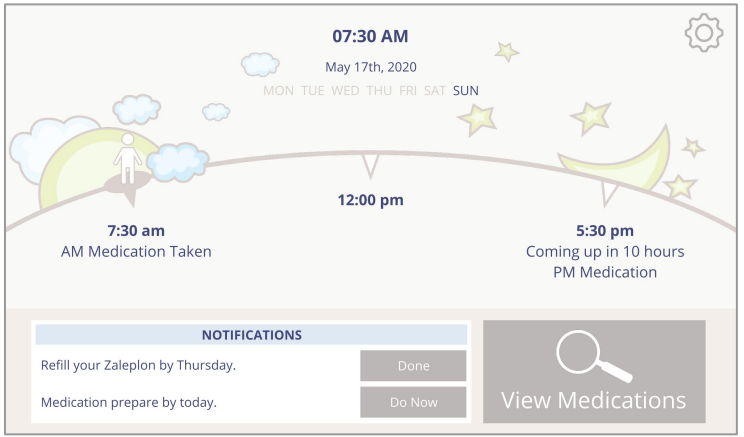


Personalized User Interface









Potential Users

POTENTIAL USERS FEEDBACK

Usability

- Overall pleasing and useful product

- Found UI/UX very easy to navigate between pages

- Displayed contents were comprehensible and relevant to the users

Features

- Scanning feature was favored

Suggestions

- Additional audible features for users who may need the extra guidance

- Blister pack compatibility

- Pill bottle storage consideration

Caregiver Interface

Your Allay Account

You are a caregiver to Meredith, your mom.

Name: Meredith S.

Age: 86

Medications: Currently on 4 medications

Pharmacies: Walgreens at Needham
CVS at Highland Corner

Health: Arthritis diagnosis since May 2020
Moderate to severe allergy symptoms depending on weather
Irregular heartbeat since Feb 2018
Insomnia since Oct 2018

Medication Management

You are viewing current medications for your mom Meredith updated as of 05/11/20.

Celecoxib

Medication Description: Nonsteroidal anti-inflammatory drug for arithitis pains.

Dosage: One pill at a time, once every day

Prescriber: Dr Geller

Duration left on prescription: 60 days

Taken since: May 2020

Side Effects: Nausea

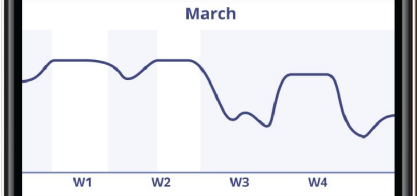
Looks Like:

Medication Adherence History

Overview

Below is Meredith's medication adherence graph. She is generally good, but could do better in terms of taking medication on time.

▼ This Month's Medication Adherence



▼ This Week's Medication

	MON	TUE	WED	THU	FRI	SAT	SUN
AM	✓	✓	✓	✓			
PM	△	△	△	✓			

△ = not on time (late)
✓ = taken on time

Upcoming To-Do's

Done

Refill Zaleplon by this Thursday ☐
Call pharmacy

Doctor's visit for Cetirizine prescription is needed for the next refill. ☐
Call Provider

Amiodarone refill is ready for pick up at Highland Corners CVS Pharmcy. ☐
Call Pharmacy
Call Mom

▶ View Next Upcoming To-Do's

▶ View Previous Checked To-Do's

Kara Kressy

ADULT CAREGIVER FEEDBACK

Overall

- Would have loved to use it when her mother was independently managing her pills

- Give peace of mind for caregivers

- High willingness to pay

Displayed Content

- Medication Details are fantastic and very useful to reference

UI/UX

- Visualization of adherence tracking is incredible

- Likes that user can show doctors adherence history and reduce friction during checkups

- Finds caregiver app feature to be very useful

John Rudnick

AGELAB RESEARCHER FEEDBACK

Form Factor
- Great that it is familiar for the elderly population.

- Aesthetically pleasing unlike other pill organizers products

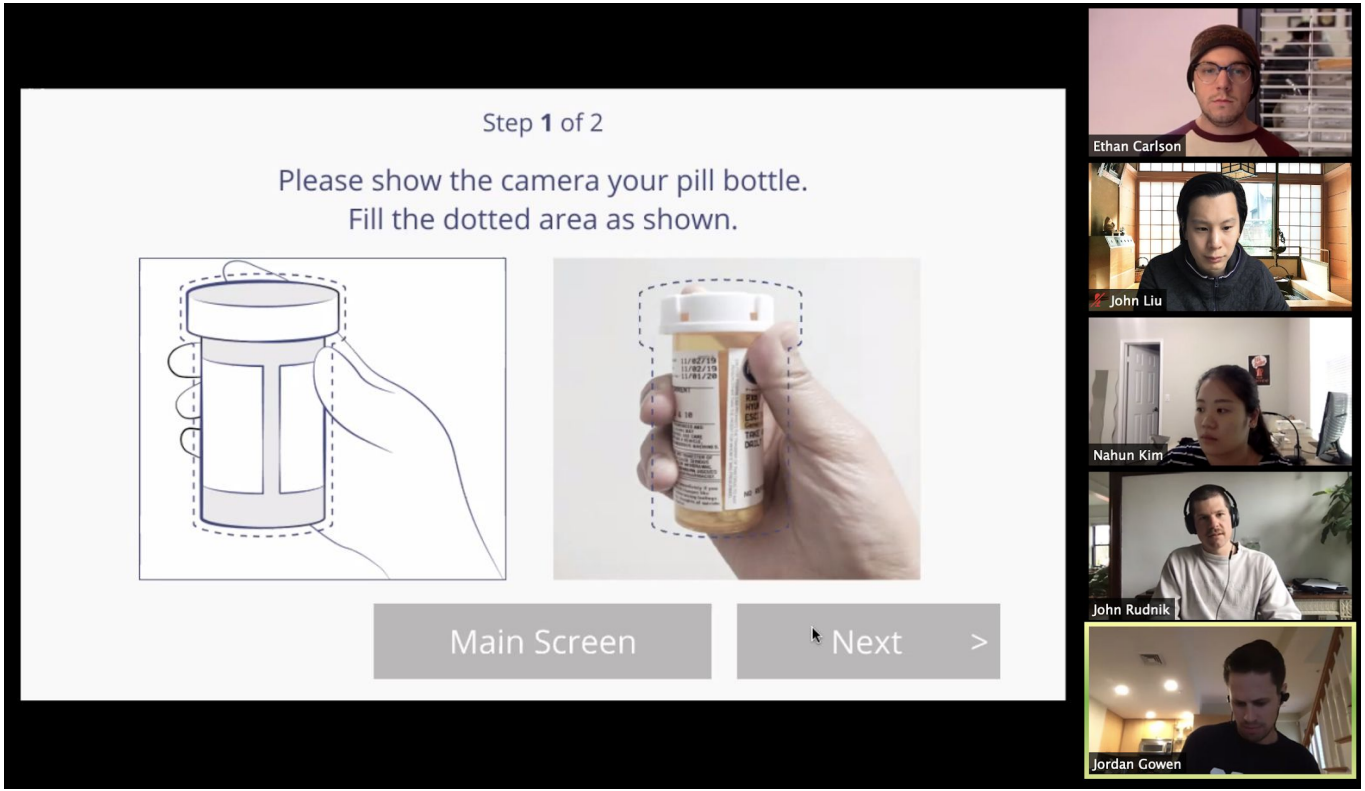
Notification
- Good use of ambient features, lighting & aural cues.

Features
- Scanning features is convenient.

Suggestions
- Slight concern on elder dexterity and use of upright touchscreen display.

- Maybe consider failure modes

- Organizer may need more slots than AM & PM.



Ashley Gagola

RETIREMENT COMM. DIRECTOR OF NURSING FEEDBACK

Technology Adoption

- Elderly use of electronics dependent on their cognitive and physical abilities

- Believes family member preparing medication could be a very compelling opportunity

Behavioral Change

- Give elderly users appropriate independence & decision-making authority over their daily habits

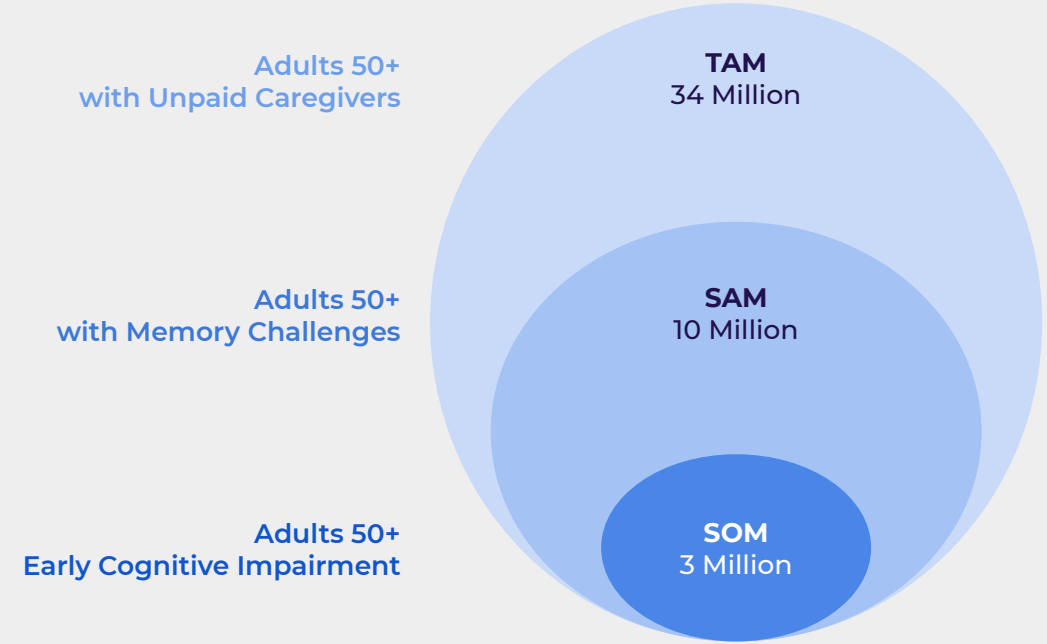
- Family members & doctors have the most influence over elderly actions and behavior change

Product & Business Viability

Opportunity Sizing

Medication Adherence Systems Market

2021 Estimate: ~$3.0B CAGR '16-'21: **17%**



Source: 2015 AARP Report on Caregivers, 2019 U.S. Census Bureau, BCC Market Research

Value Proposition

Allay simplifies Medication Management,
bringing you & your loved ones *Peace of Mind*.

$89	$10
Equipment Purchase	Monthly Fee

Adherence Tech Landscape

High

COST

Low

Low

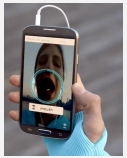
ACTIVATION

High

Pharmacy Delivery

Smart Pill Boxes

Connected Devices



Directly Observed Therapy

Ingestible Sensors

Medication Therapy Management

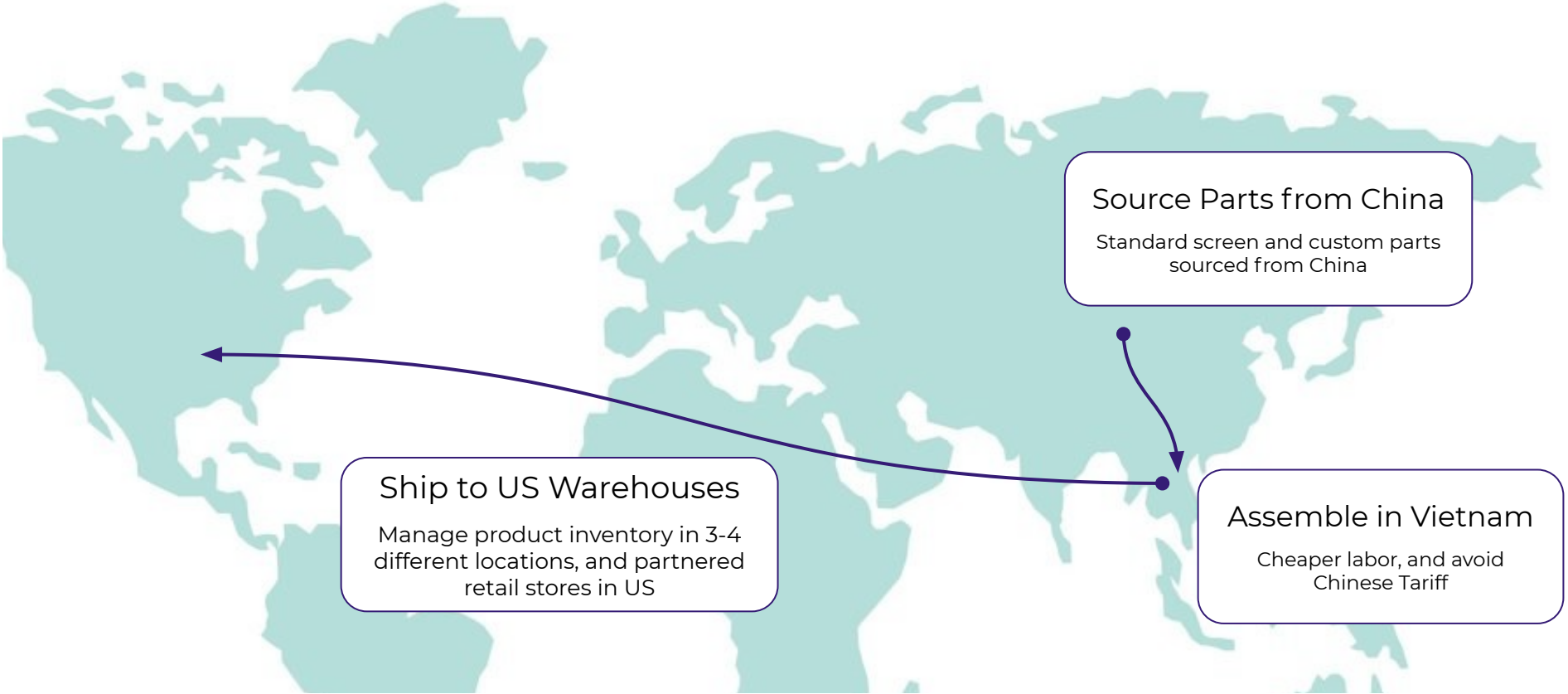
IVR

Reminder App

Smart Pill Caps

Opportunity Space

Manufacturing Strategy



Source Parts from China

Standard screen and custom parts sourced from China

Assemble in Vietnam

Cheaper labor, and avoid Chinese Tariff

Ship to US Warehouses

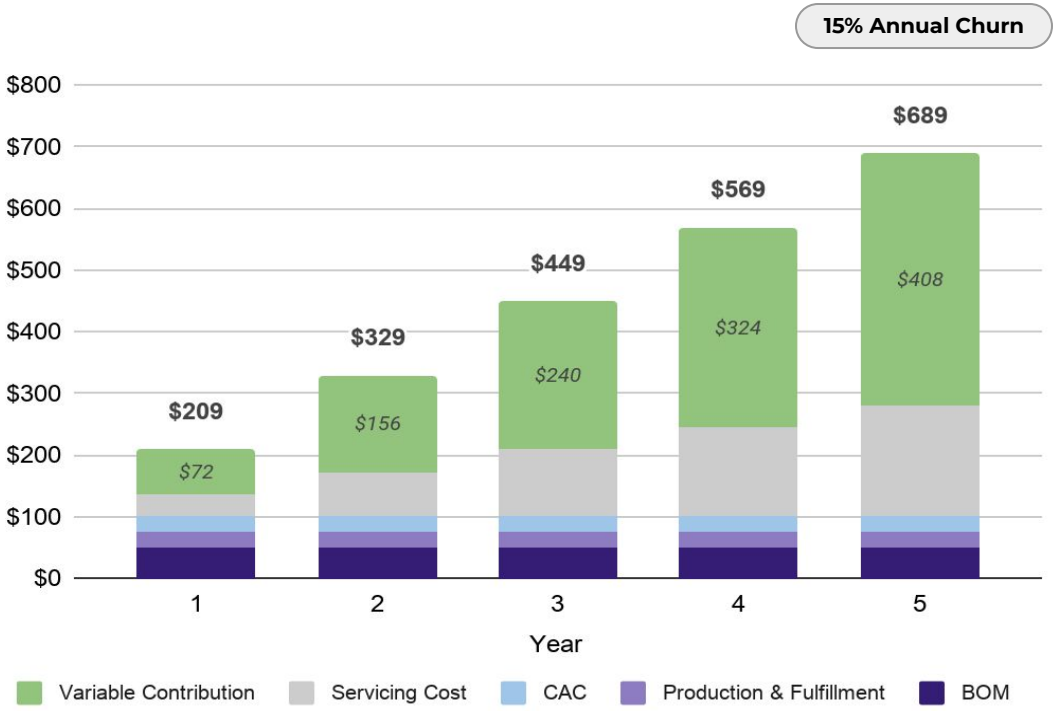
Manage product inventory in 3-4 different locations, and partnered retail stores in US

Unit Economics

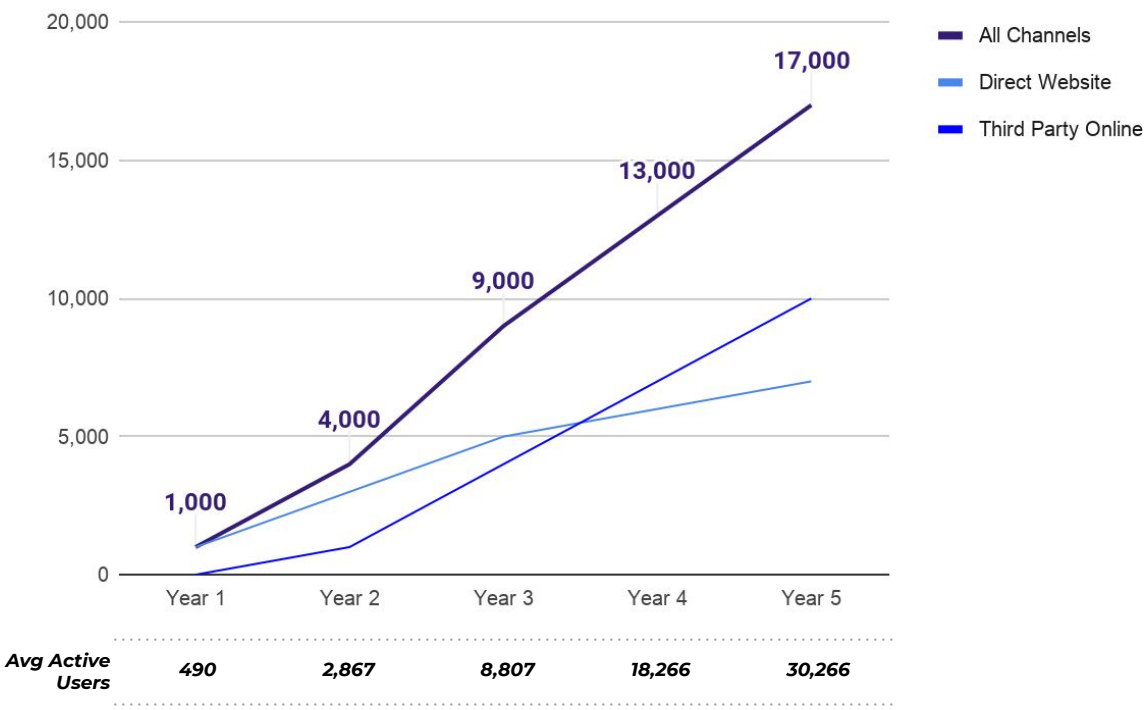
@ qty 10,000

Bill of Materials	**$50.08**
Electronic Parts	$42.91
Mechanical Parts	$7.15
Production & Fulfillment	**$25.86**
Logistics	$10.01
Manufacturing & Assembly	$8.35
Shipping & Fulfillment	$7.50
Servicing Cost (per year)	**$36.00**
Customer Acquisition Cost	**$25.00**

Customer Lifetime Value

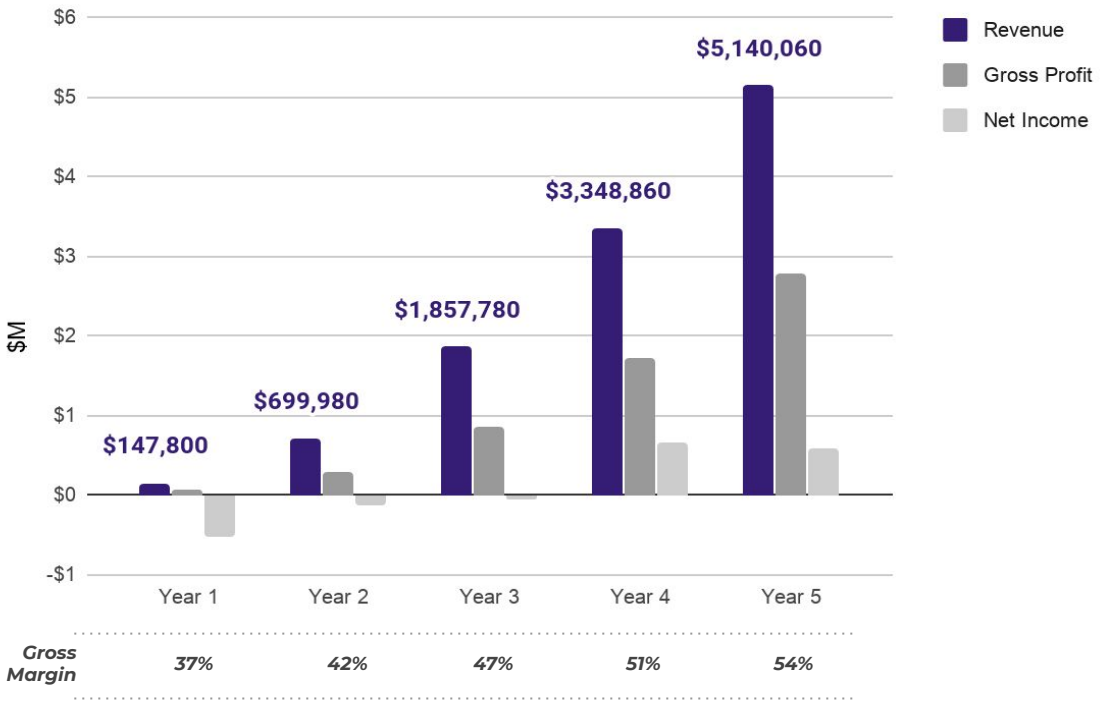


Sales Volume by Channel



	Year 1	Year 2	Year 3	Year 4	Year 5
Avg Active Users	***490***	***2,867***	***8,807***	***18,266***	***30,266***

Financial Projections



Marketing Strategy

SENIOR INTEREST GROUPS

SENIOR LIVING COMMUNITIES

HUDSON HILLS SENIOR LIVING

NON-PROFIT TECH ASSISTANCE

OATS Older Adults Technology Services

ELDERLY PARENT

ADULT CAREGIVERS

WORD OF MOUTH PROMOTIONS

Referral Benefit - Free Months

100% Guarantee or Return for Free

CAREGIVER COMMUNITIES

ACAP Adult Children of Aging Parents

PUBLIC AGENCIES

Massachusetts Councils On Aging

HOME CARE ASSOCIATIONS

hca

Product Roadmap

- Support > 2x / day medication intake
- LED indicators to provide additional visual cues
- Pharmacy integration & compatibility w/ blister packs
- Reports for health providers
- Accompanying user phone app
- Text message reminders
- Wearable integration for fall detection and reminders

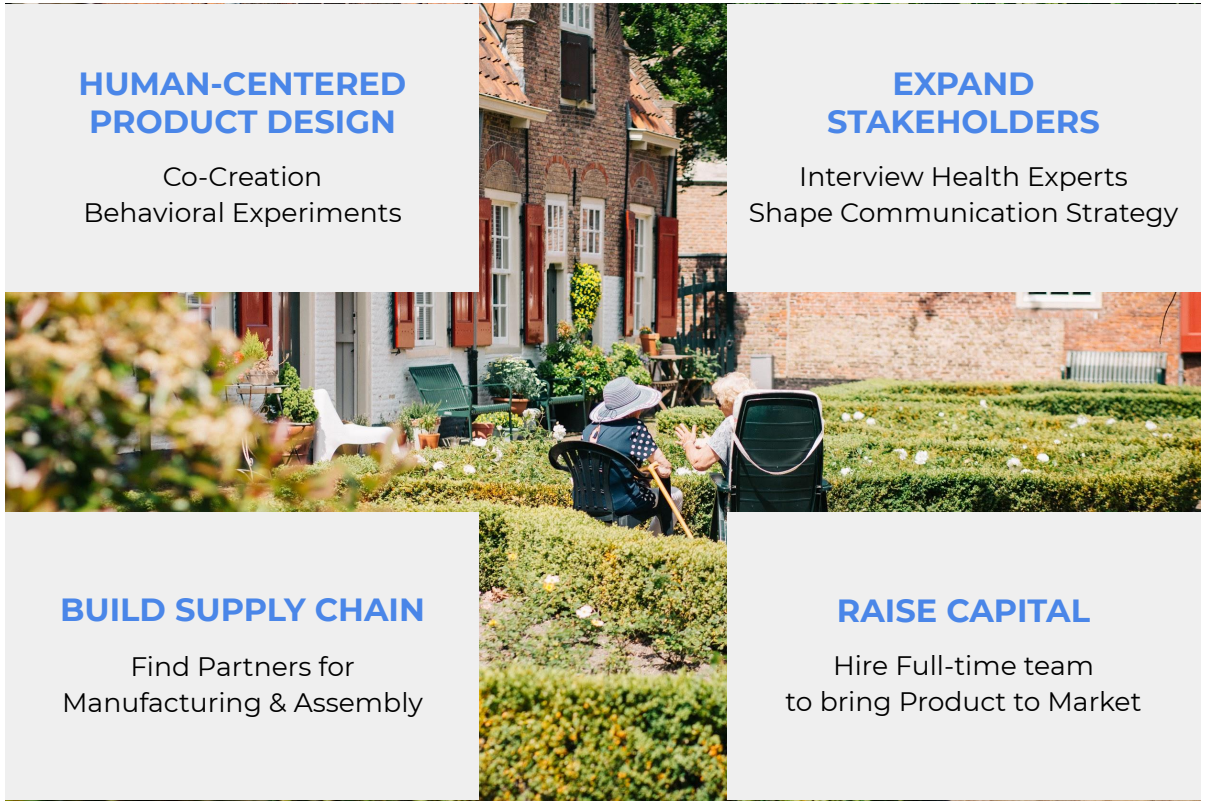
Next Steps

HUMAN-CENTERED PRODUCT DESIGN

Co-Creation
Behavioral Experiments

EXPAND STAKEHOLDERS

Interview Health Experts
Shape Communication Strategy



BUILD SUPPLY CHAIN

Find Partners for
Manufacturing & Assembly

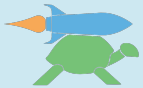
RAISE CAPITAL

Hire Full-time team
to bring Product to Market

Final Presentation
May 11st, 2020

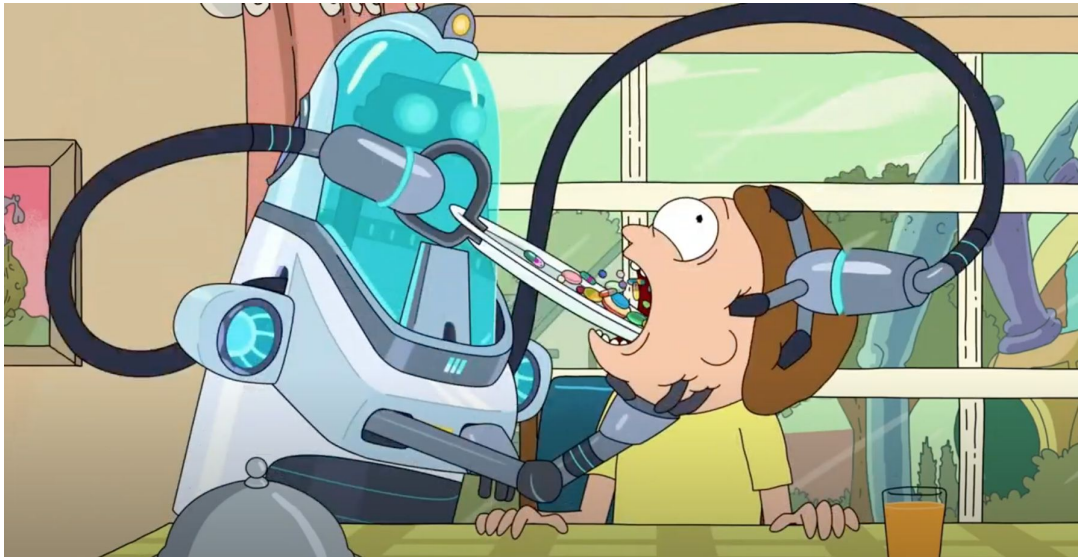
THANK YOU!

Q & A



ROCKET
TURTLE

Robots are Bad



Current Methods

MANUAL

HIGH TECH

FULL CONTROL
$$

LOSS OF CONTROL
$$$$

Product Architecture

Usability

Feature Sets

- Clear & Pleasant Reminder
- Easy to digest information display
- Scanning capability for logging and drug interaction
- Physical pill organization by daily dose

Adherence

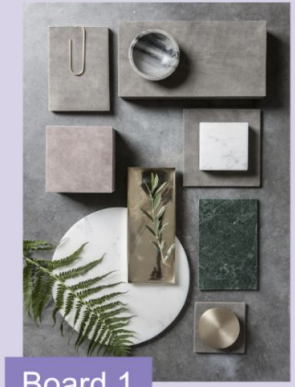
User Ratings /5 :

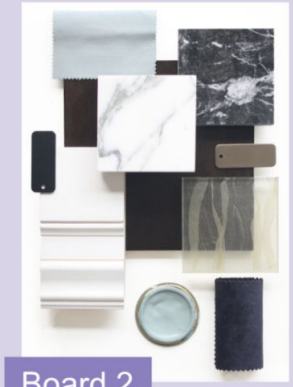
Drug Interaction Checker

Reminder System

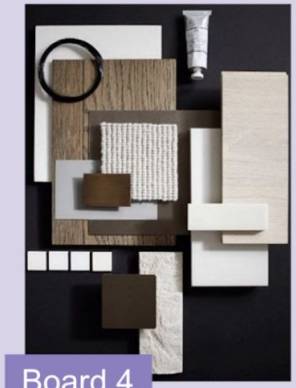
Dose Tracker

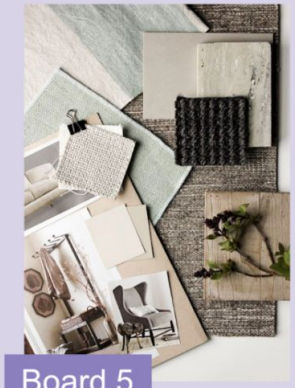
Product Aesthetics

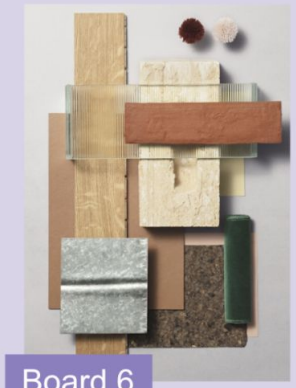

Board 1


Board 2

Board 3


Board 4

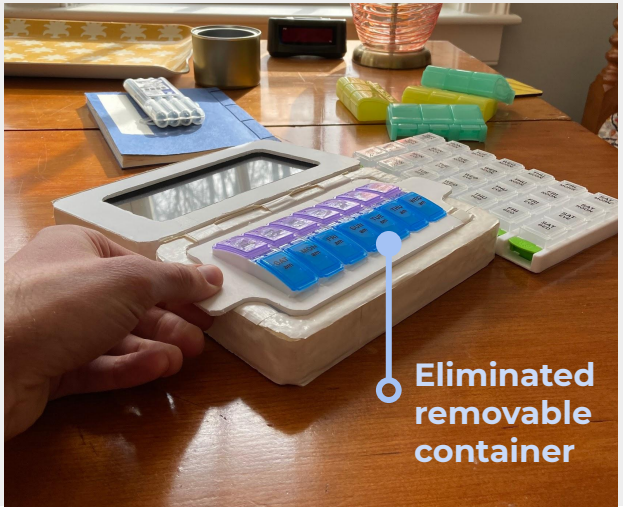

Board 5


Board 6

Physical Prototyping

Chosen screen size constrained our exterior dimensions

Pill compartments were too small



Eliminated removable container

Final size

User Interface Design

Font Use

- Sans Serif > Serif

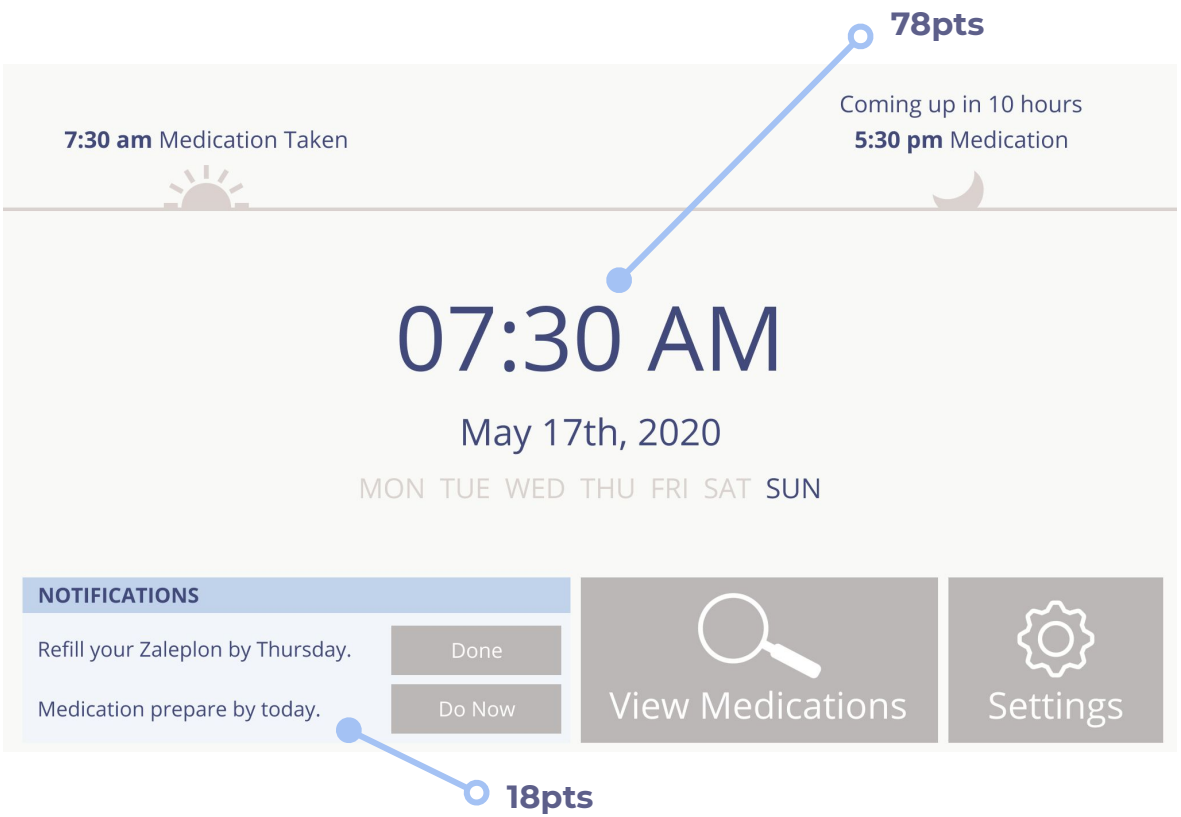
  Allay Medication Management

  Allay Medication Management

- Limit use of font number to 1

Text Size

- Min text size 18pt (0.25”)
- Body text font size 28pt (0.39”)
- Max text font size 78pt (1”)



User Interface Evolution

Allay's **interaction design will evolve** from using **heavy text to using simple icons** to convey information and directions.

Version 1	Version 2	Version 3	Version 4
Next Page	Next		

Brand Identity

Open Sans

Select styles | Glyphs | About | License | Pairir

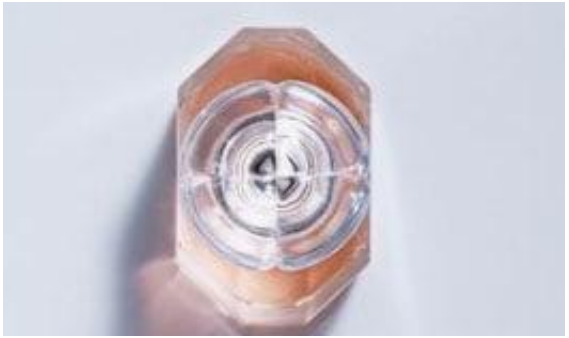
Regular 400

Allay Medication Management for Seniors

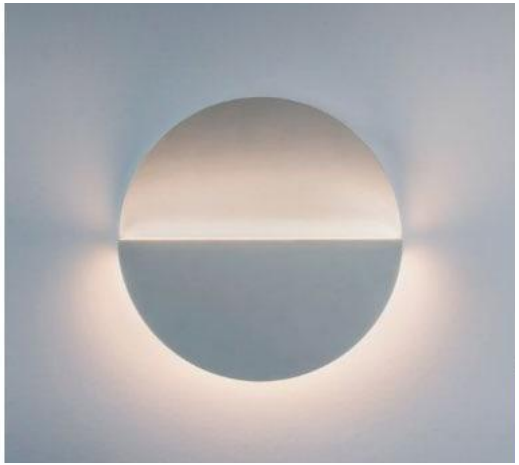
Bold 700

Allay Medication Management for Seniors

allay



#42487d	#c0d3ec	#7983bb	#eef2f9
#221f20	#ebe3da	#d9d2cf	#f4f3f2



Product Feedback

User Test Takeaway

- Overall positive feedback on UI/UX
- Scanning feature was favored
- Blister pack insert might work well for people who use blister pack
- Audible features might work better for some users
- Pill bottle storage consideration might be nice

Manufacturing Workflow

STEP 1

Quality check parts sourced from China.

STEP 2

Adhere veneer to exterior of injection molded base (1 min) → Fix electronics in lid casing (1 min) → Attach lid face-plate (1 min)

Fix electronics, p/c board into base, and run wires to base (1 min) → Set pill compartment into bottom casing (1 min) → Attach lid to base (1 min)

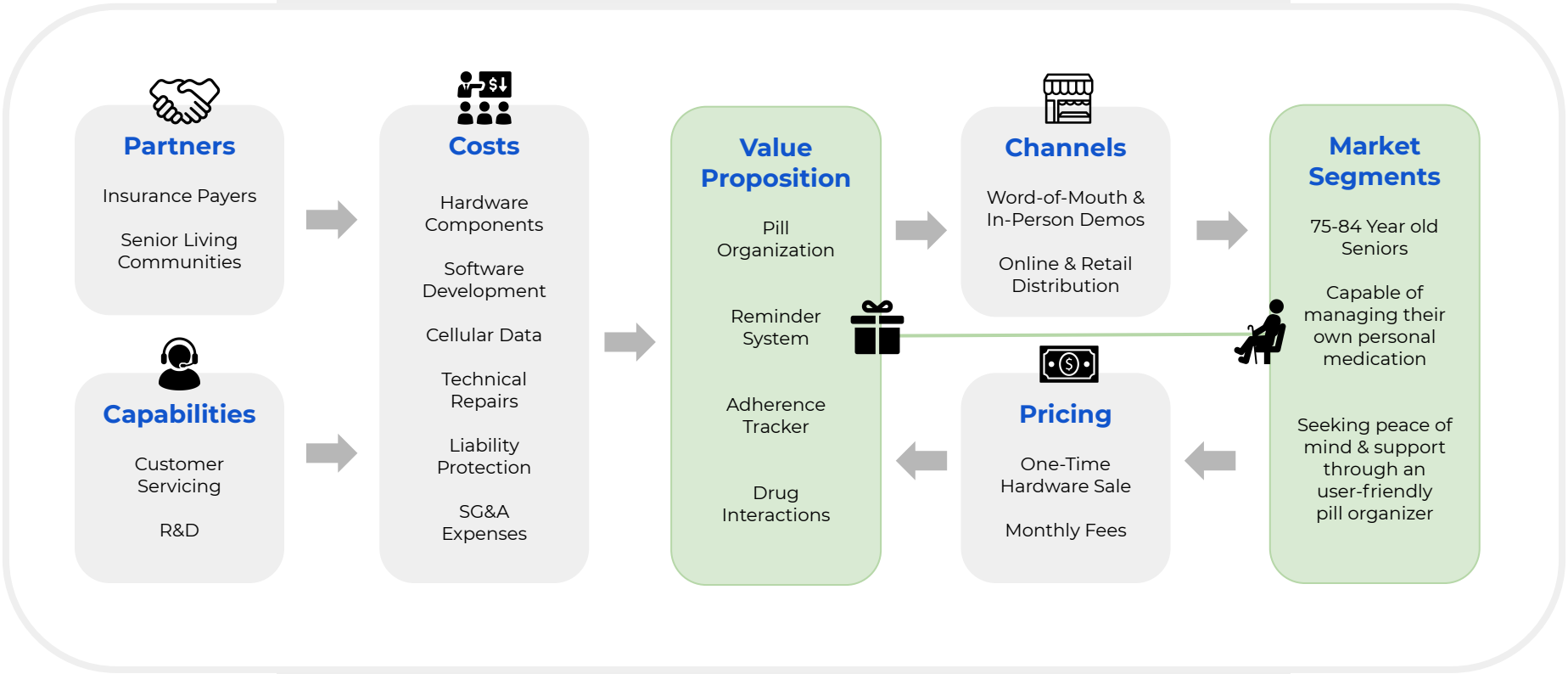
= 8 mins to produce 1 product

STEP 3

Quality check once every 15 products. (10 min)

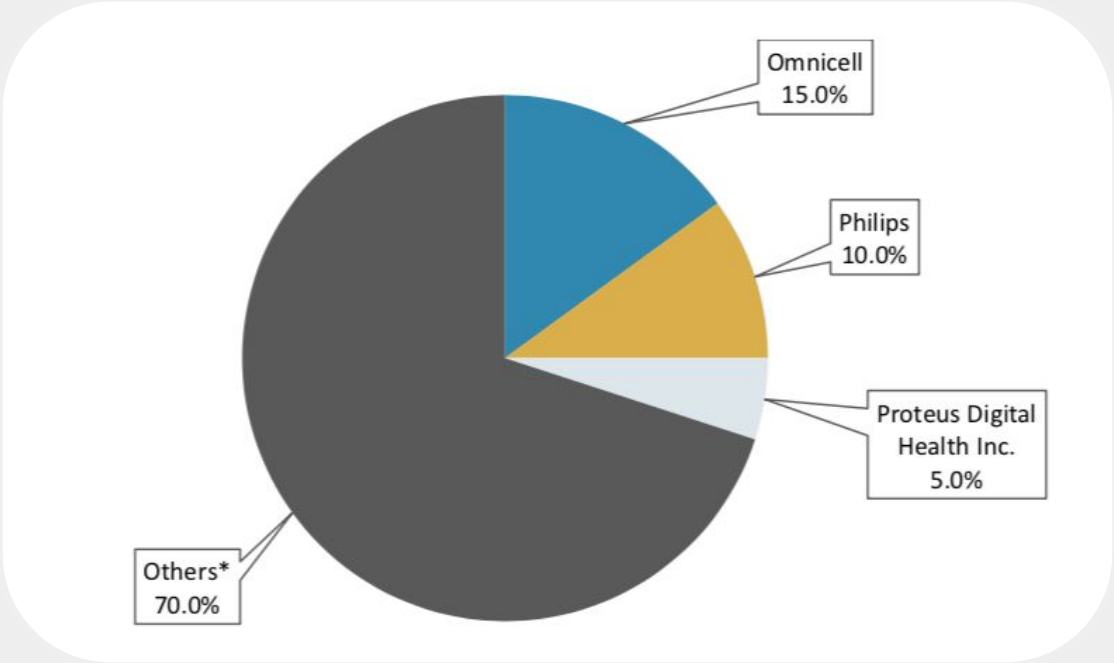
7 (workers) X 8 (hours) X 3 (dollars) = $168 to make 420 products/day

Business Model Summary



Competitor Market Share

Global Market for Medication Adherence



Product Comparison by Price

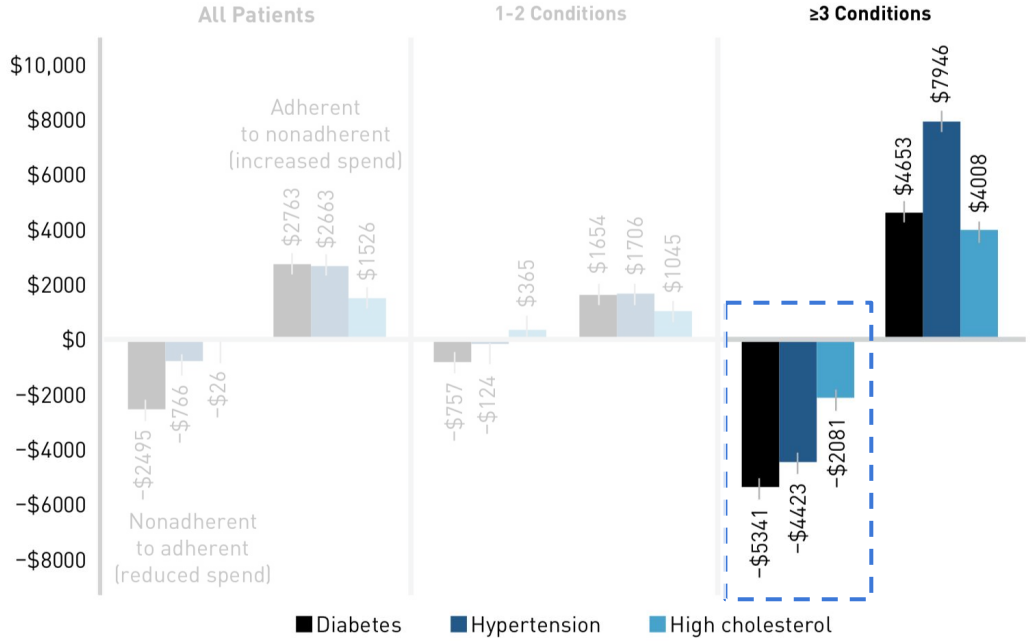
Name	Generic	Medcenter	Sagely	Allay	Maya	Pria	Pill Pack
Product Description	Non-Tech Organizer	Unbundled Organizer	Mobile App Organizer	Integrated Organizer	Integrated Organizer & Care	Integrated Organizer & Care	Online Pharmacy Direct Delivery
Target Customer	General User	Elderly User	General User	Elderly User	Elderly User Caregiver	Elderly User Caregiver	Premium
Business Model	One-Time Sale	One-Time Sale	One-Time Sale	Subscription	Subscription	Subscription	Freemium
Price	$10 - $30	$65 - $80	$35	$89 Upfront $10 / Mo.	$40 / Mo.	$700 Upfront $10 / Mo.	Copays

Product Comparison by Feature

Name	Generic	Medcenter	Sagely	Allay	Maya	Pria	Pill Pack
Pill Organization	✓	✓	✓	✓	✓	✓	✓
Reminder System		✓	✓	✓	✓	✓	
Adherence Tracker				✓	✓	✓	
Auto Data Input				✓		✓	
Drug Interactions				✓		✓	
Pre-sorted Pills					✓		✓
Pill Delivery							✓
Integrated Care					✓	✓	
Voice Interaction					✓	✓	

Benefits of Medication Adherence

2016 CVS study showed that chronic illnesses patients with 3 or more conditions **reduced medical spending by $2,000-$5,500** when converting from **non-adherent to adherent**.



***Source**: Association Among Change in Medical Costs, Level of Comorbidity, and Change in Adherence Behavior*

Key Stakeholders

PATIENT
Elderly User with Chronic Illness

Role: Prescription drug user
Incentive: Maintain good health

PAYERS
Aetna, Cigna, Medicare

Role: Provide insurance coverage
Incentive: Minimize reimbursements

PHARMACY
Walgreens, Rite Aid, CVS

Role: Last mile Distribution
Incentive: Refill rates

PHARMACY BENEFITS MANAGER
Caremark, Express Scripts

Role: Maintain formularies
Incentive: Manufacturer rebates

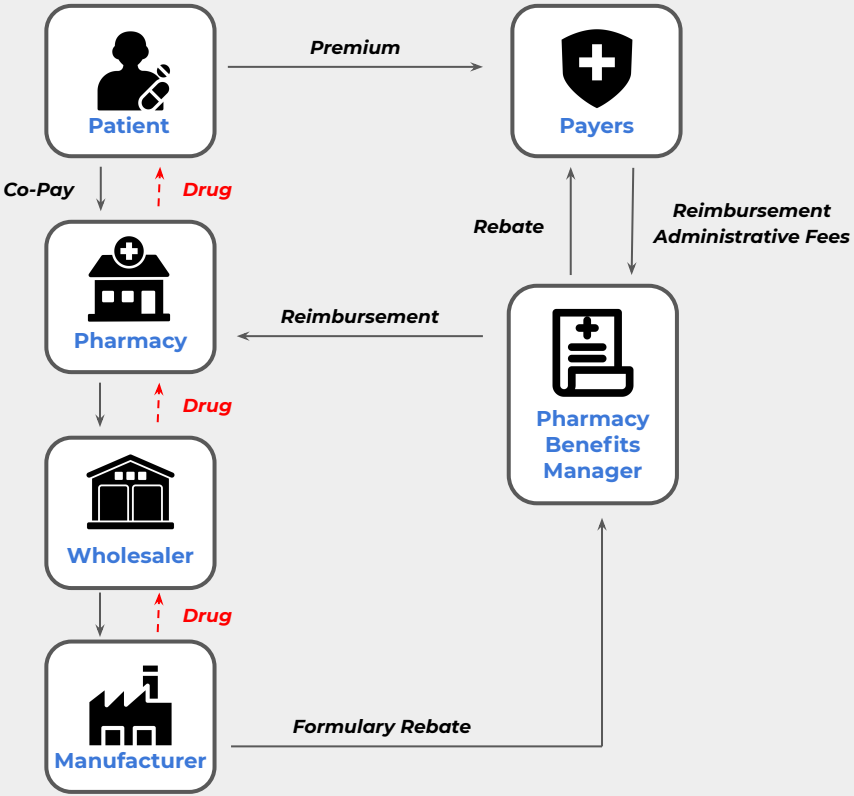
WHOLESALER
McKesson, Cardinal Health

Role: Distribute drugs
Incentive: Delivery points & high volumes

DRUG MANUFACTURER
Genetech, Pfizer, Sanofi

Role: Develop drugs
Incentive: Effective treatment

Prescription Drug Supply Chain



"We would look for YOY data to demonstrate any changes in the group vs the control study group. Usually done internally. Also good to have peer reviewed literature that might have been submitted."

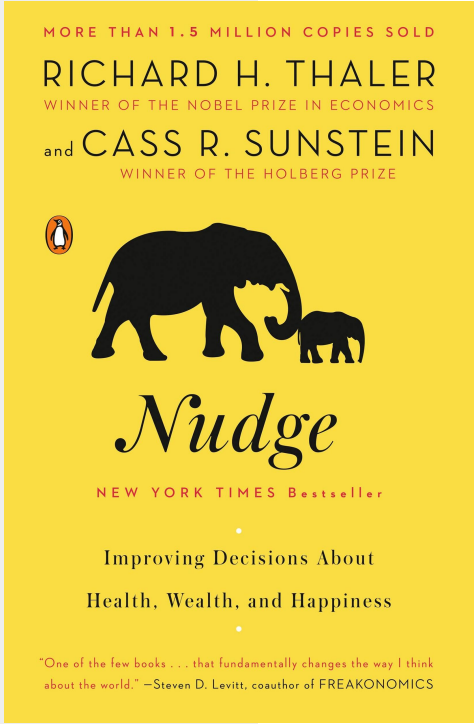
Lori Collins, CVS Payor Relations

2015-2019 ENCOURAGE Trial

For the study, **researchers identified 186 adults** from Intermountain Healthcare cardiovascular clinics who had a statin prescription and were also enrolled in Intermountain SelectHealth insurance.

Nudges were personalized using machine learning techniques based on the patient's psychographic profile (e.g., their perspectives, impressions, and opinions about healthcare) and their health status and needs.

Researchers found that **patients who received nudges were more likely to take their medications and had a higher percentage of the proportion of days covered (80%)**, meaning that they had better adherence to their prescribed statins.



Business Strategy

Product Development	**Partner with Senior Facility for co-creation with early adopters**	
Approach	**TOP-DOWN** Complex Care	**BOTTOMS-UP** Mass Market
Go to Market	Partner with Researchers to prove adherence in clinical trials	Launch by selling direct to Elderly & Caregivers
	Partner with Payers to determine insurance saving and run pilot	Expand distribution through senior living facilities
	Distribute product through Payer benefit plans and Providers	Enter broader customer base through Retail & Providers

Detailed Financial Projections

P&L	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Sales Volume	**1,000**	**4,000**	**9,000**	**13,000**	**17,000**	**44,000**
Direct Sales	1,000	3,000	5,000	6,000	7,000	22,000
Online	0	1,000	4,000	7,000	10,000	22,000
Avg Active Users	*490*	*2,867*	*8,807*	*18,266*	*30,226*	
Revenue	**148**	**700**	**1,858**	**3,349**	**5,140**	**11,194**
Gross Profit	55	296	865	1,715	2,775	5,707
Gross Margin	*37%*	*42%*	*47%*	*51%*	*54%*	*51%*
OpEx	596	429	935	1,047	1,222	4,230
Net Income	**(541)**	**(133)**	**(70)**	**668**	**593**	**517**

Cost of Goods - Electronics BOM

@ qty 10,000

Electronics Total: $42.91

8” TFT Screen w/ Capacitive Touch	**$19.00**
4G-LTE NB-IOT Cellular Module	**$13.00**
AMD Cortex MCU	**$6.34**
Switches, Indicator Lights, Passives	**$2.00**
CMOS Camera	**$1.64**
200x100mm PCB	**$0.95**

Cost of Goods - Mechanical BOM

@ qty 10,000

Mechanical Total: $7.15

Off-White ABS Base	**$1.38**
Premium Oak Wood Veneer	**$2.69**
Off White ABS Pill Containers	**$1.08**
Hinge	**$0.91**
Off-White ABS Lid	**$0.65**
Off-White ABS Lid Insert	**$0.33**
Magnetic Clasp	**$0.11**

Cost of Goods - Manufacturing & Assembly

@ qty 10,000

M&A Total: $18.35

Manufacturer Margin	**$5.01**
Freight	**$4.00**
Third Party Logistics	**$3.50**
Scrap Rate	**$2.50**
Duties	**$2.50**
Assembly Labor	**$0.85**

@ qty 10,000

COS Total: $32.50

Cost of Customer Acquisition	**$25.00**
Shipping and Fulfillment	**$7.50**