Rxpectations

Evaluate risks. Report adverse events. Stay up to date on medicine safety. Participate in more informed healthcare decisions.

Picture Source: https://www.flickr.com/photos/epsos/8116279888

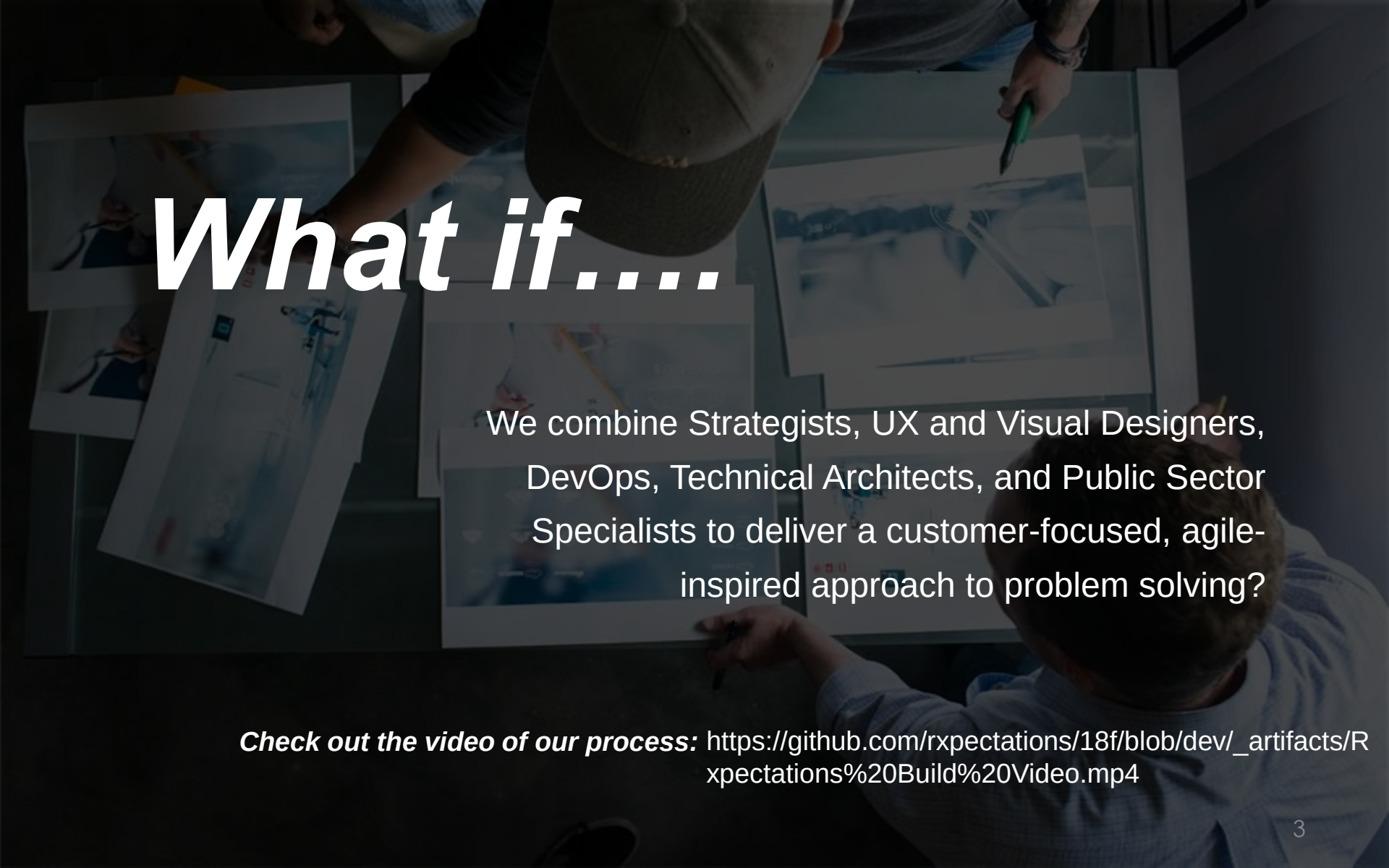
18F **is a newly formed organization within the General Services Administration (GSA).**

Their mission is to transform the way the government buys and builds Information Technology, with an emphasis on public-facing digital services.

Our mission is to design and build an impactful, user-centric digital service that is focused on the interaction between government and the people and businesses it serves.*

*The task is to submit a working prototype using OpenFDA data (http://open.fda.gov) and its Application Programming Interface (API) which demonstrates our agile delivery capabilities.

Picture Source: https://www.flickr.com/photos/nostri-imago/3063021398



What if....

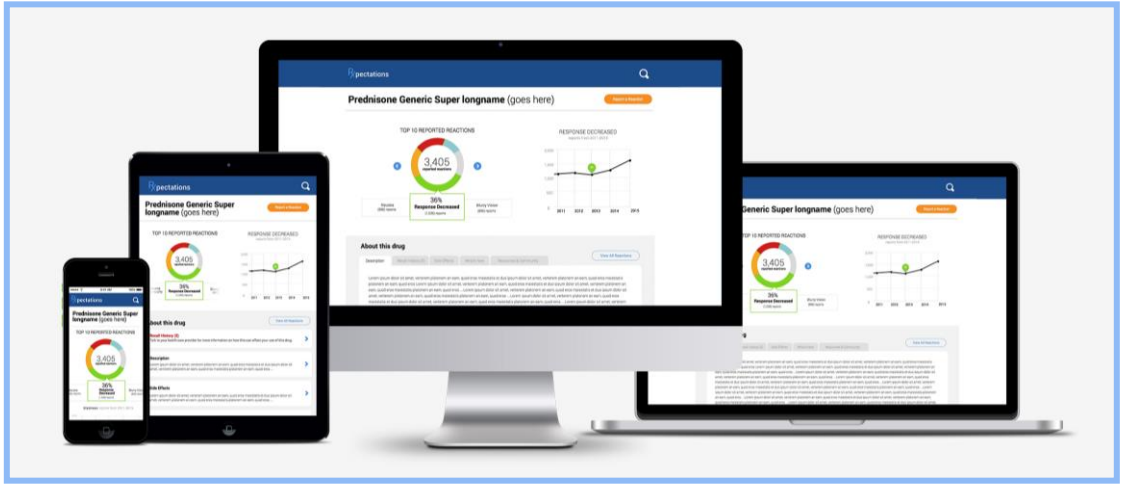
We combine Strategists, UX and Visual Designers, DevOps, Technical Architects, and Public Sector Specialists to deliver a customer-focused, agile-inspired approach to problem solving?

Check out the video of our process: https://github.com/rxpectations/18f/blob/dev/_artifacts/Rxpectations%20Build%20Video.mp4

Excellence in execution
From strategy to viable product using agile delivery

Rxpectations

A platform for the information and tools patients and caregivers need to participate in more informed healthcare decisions.



EVALUATE RISKS

Chart the most commonly occurring adverse events by prescription or over-the-counter drugs.

REPORT EVENT

Report the occurrence of an adverse event associated with a regulated drug directly to the FDA.

STAY UP-TO-DATE

View news on drugs in clinical trials as well as new drugs that have been recently approved by the FDA.

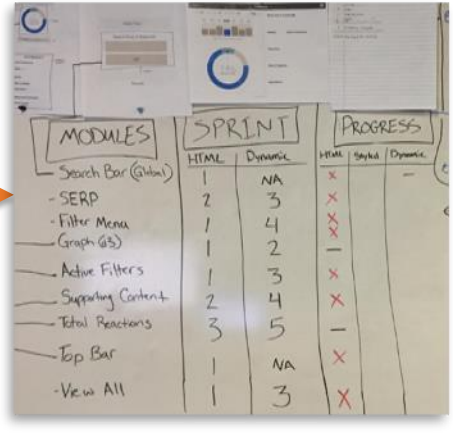
Progression through design and development. What scalable success looks like.

Ideation and Discovery

Brainstorm ideas that focus on the needs of the end user and how to solve for them.

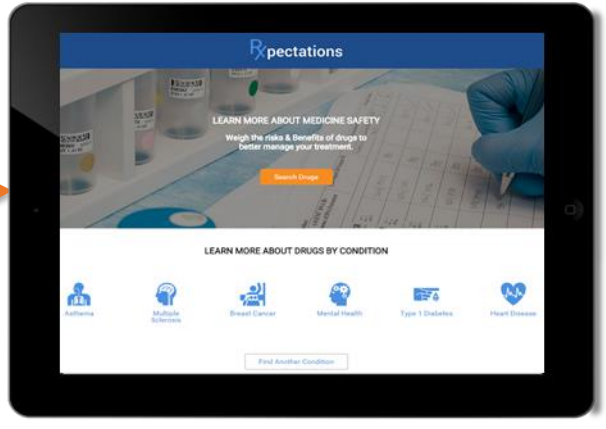
Plan and Sprint

Focus on how to deliver the highest business value in the shortest time.



Prototype and Test

Iterate development for rapid response to change. Conduct ongoing testing with users and refine the code.



Our customer-focused, agile-inspired process

Quickly prototype and arrive at a tangible interpretation of the vision

View our prototype
http://rxpectations.herokuapp.com/

GET INSPIRED

Identify target audience

Explore trends impacting the landscape

Brainstorm unconstrained ideas

Bundle themes and prioritize concepts

START WITH PEOPLE

Empathize with the user

Use human-centered design principles

Consider the end-to-end experience

Keep it simple

SOLVE FOR THE CORE

Storyboard and sketch

Create multiple designs

Define the right technology stack

Settle on the direction and build

DON'T STOP ITERATING

Prioritize high value items

Aim for short release cycles

Test, test, test (with users and across code)

Continue to innovate!

Icon Source: http://www.flaticon.com/

Digital Service Plays[1]

Our direction throughout the design and development process

U.S. Digital Services Playbook

1. Understand what people need
2. Address the whole experience, from start to finish
3. Make it simple and intuitive
4. Build the service using agile and iterative practices
5. Structure budgets and contracts to support delivery
6. Bring in experienced teams
7. Assign one leader and hold that person responsible
8. Choose a modern technology stack
9. Deploy in a flexible hosting environment
10. Automate testing and deployments
11. Manage security and privacy through reusable processes
12. Use data to drive decisions
13. Default to open

We used plays outlined in “The Digital Services Playbook” in tandem with our firm’s methodology to pull on a wealth of best practices to build an effective product using agile methods

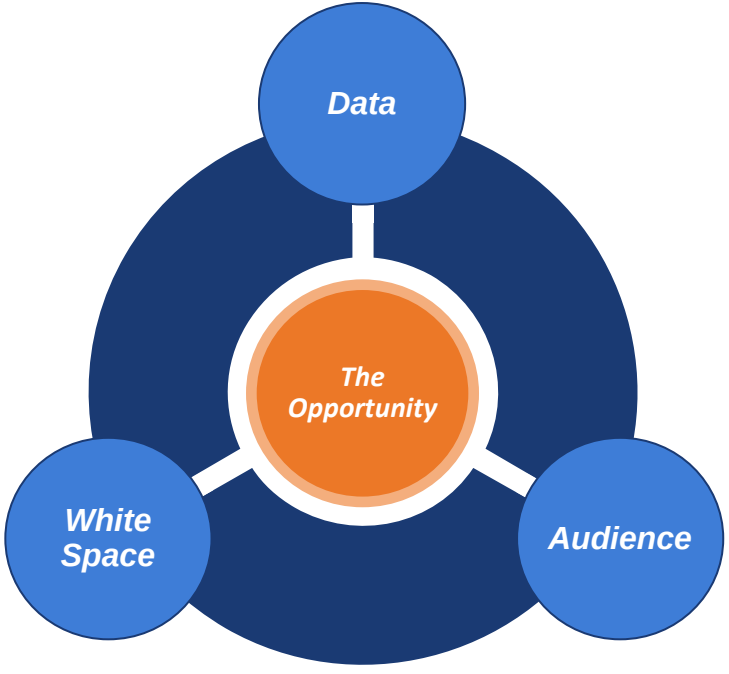
1- Digital Service Plays: https://playbook.cio.gov/

GET INSPIRED

Frame the challenge. Clarify the need you're seeking to solve.

Icon Source: http://www.flaticon.com/

Framing the challenge
Where we started to narrow down the potential product landscape



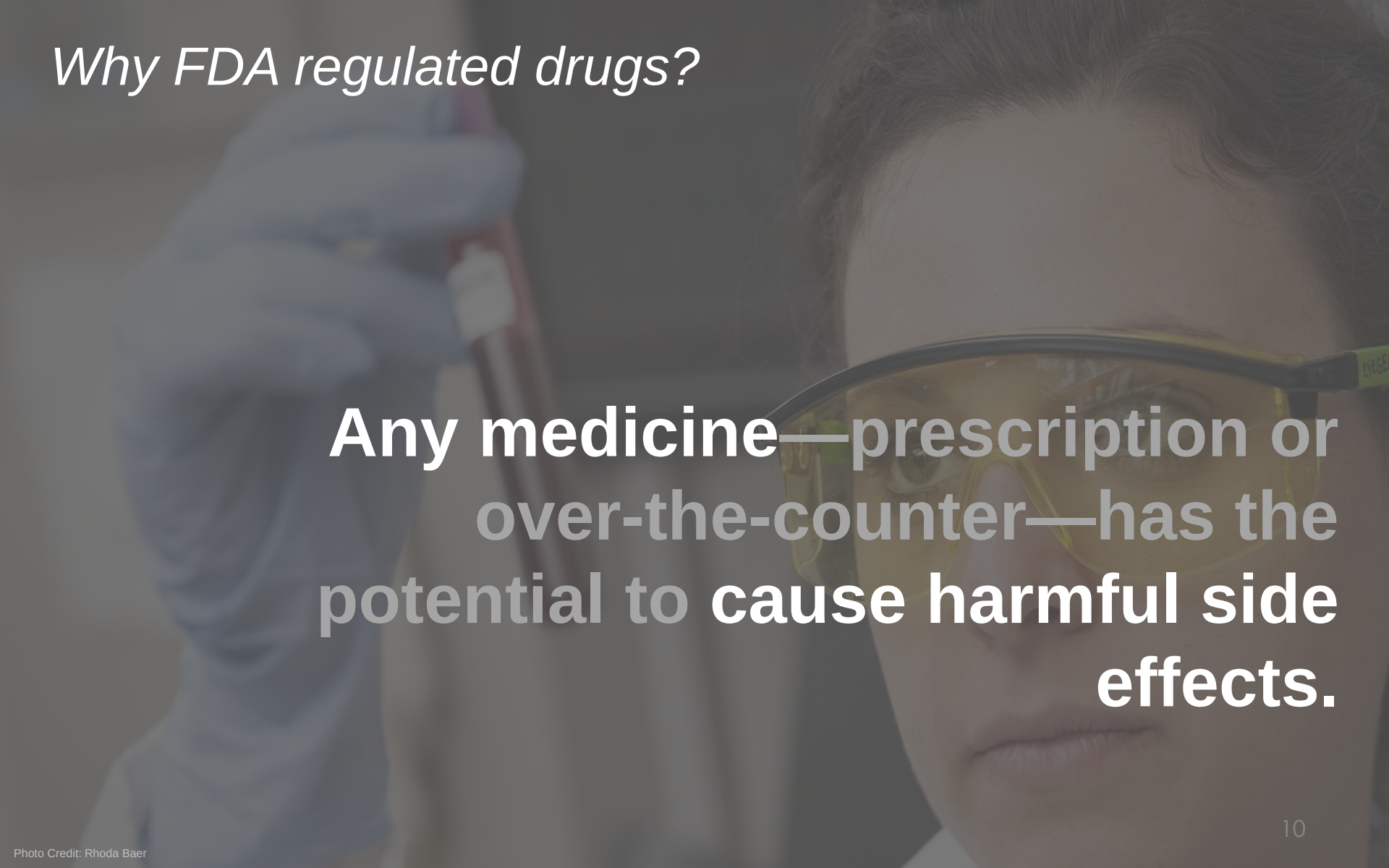
UNDERSTAND THE DATA
Drugs: Adverse events, Labeling, Enforcement reports
Devices: Adverse events, Enforcement reports
Food: Enforcement reports

CONSIDER THE AUDIENCE
Consumers | Researchers | Healthcare Providers | Patients
Caregivers | Companies | Advocacy Groups

FIND THE WHITESPACE
Personalized Medicine
Drug side effects
Organics
Drug Supply Chain
Counterfeit drugs
Farm-to-table
Minimally invasive surgery
Increase prescription and OTC drug usage

THE OPPORTUNITY: Patients want to know more about the medicines they take, the potential side effects, and become more empowered in healthcare decisions.

Why FDA regulated drugs?



Any medicine—prescription or over-the-counter—has the potential to cause harmful side effects.

Photo Credit: Rhoda Baer

But is this really an issue to worry about?

82% TAKE REGULATED DRUGS

of American adults take at least one medication[1]

29% TAKE MULTIPLE DRUGS

of Americans takes five or more medications [1]

6.7% ER VISITS LEADING TO HOSPITALIZATION

of ER visits leading to hospitalization are related to adverse drug events[1]

770,000+ INJURIES AND DEATHS

are injured or die each in hospitals from adverse drug events[2]

9.7% CAUSE PERMANENT DISABILITY

of adverse drug events caused permanent disability[1]

140,000+ ER VISITS FROM COMMON PRESCRIPTIONS

emergency department visits per year for adverse drug events resulting from antibiotics[3]

1-http://www.cdc.gov/MedicationSafety/basics.html
2-http://archive.ahrq.gov/research/findings/factsheets/errors-safety/aderia/ade.html
3-http://www.cdc.gov/MedicationSafety/program_focus_activities.html

Photo Credit: Rhoda Baer

Exploring the Opportunity

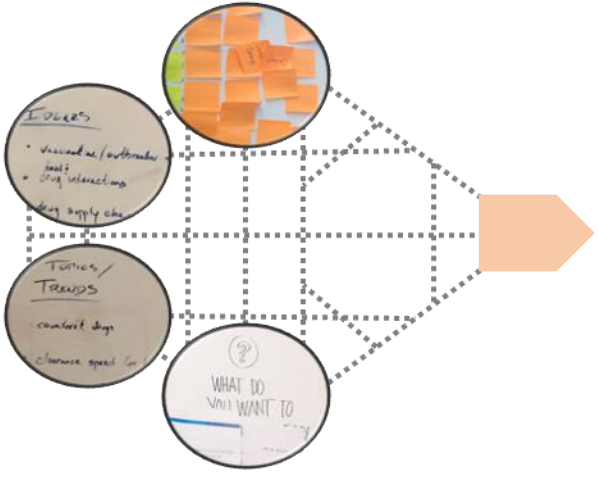
How do we solve for the needs we uncovered? What *is* our concept?

THE OPPORTUNITY: Patients want to know more about the medicines they take, the potential side effects, and become more empowered in healthcare decisions.

From opportunity to tangible concept:

1. CAST A WIDE NET TO UNCOVER NEW NEEDS

Brainstormed without being limited to constraints: *what do people want to know, what are other connections, where can we find other information?*

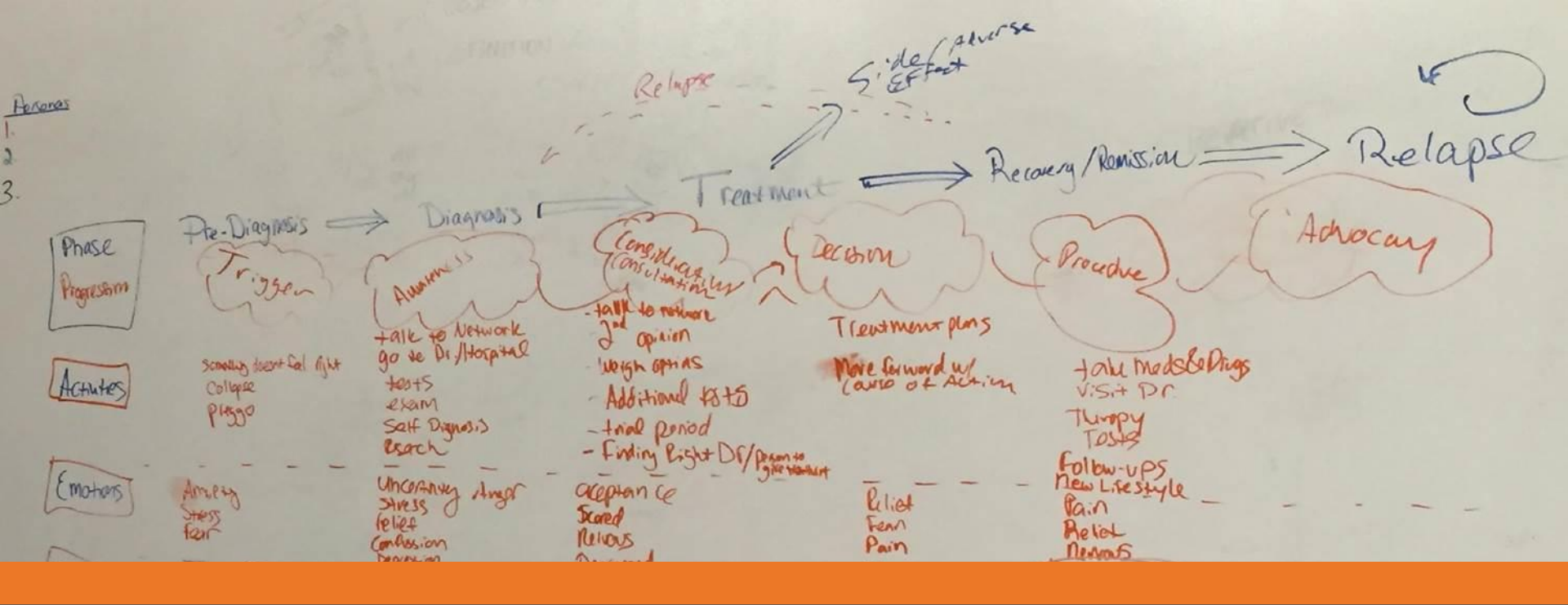


2. SPOT THEMES AND PATTERNS

Pieced together ideas to synthesize top concepts: *drug updates, adverse events, recalls, news, side effects, information.*

3. MOVE FROM IDEAS TO TANGIBLE SOLUTIONS

Combined the best elements of thinking to create our vision: *A more personalized and user-friendly approach to drug safety.*



Start with People

Human-centered Design. A repeatable approach to innovating for the target audience.

Icon Source: http://www.flaticon.com/

Who are we designing for?
Where can we have the most impact?

Target Audience

Prescription and OTC drug users

Key Segments

1.

NEW PATIENTS
Patients recently diagnosed and/or experiencing a new need for drugs.

2.

EXISTING PATIENTS
Patients previously and/or currently undergoing treatment or using drugs to manage symptoms.

3.

CAREGIVERS
Those caring or concerned for a new/existing patients taking drugs.

Human-centered Design

Our repeatable approach to creating innovative solutions

Our team mantras:

Empathize with the target audience to address needs from an end user's perspective to build a unified design vision.

Stay open-minded—the initial problem identified may not be the actual problem that should be solved.

Multi-Disciplinary Design Teams

Blended different skill sets. We mixed it up to deliver the right combination of expertise. A standard team delivers a standard solution.

Journey Maps

Discovered the audience's emotional and material needs. Gathered insights to design seamless and connected experiences.

Personas

Built a narrative about the goals of "real" people. Avoided averages-there is no "average" person. Based stories on people's primary motivation.

User Stories

Described the what, not the how. We used epics and stories to define the roles, actions, and outcomes. As a (role), I want to (something), so that (benefit).

Active User Involvement

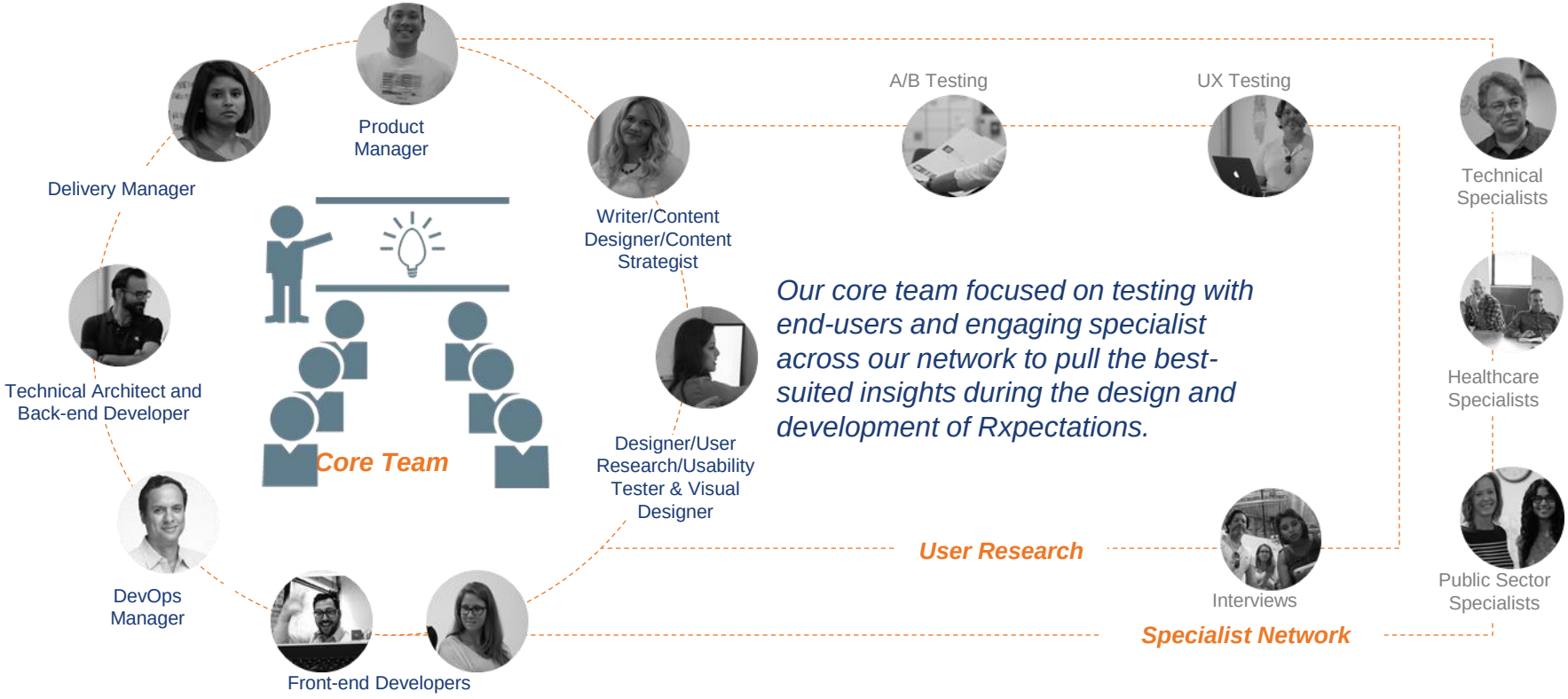
Learned throughout design and development. Involved end users when solving for their needs. Tested concepts early and often.

Icon Source: http://www.flaticon.com/

Skilled, multi-disciplinary teams

The right team doesn't see the world in silos, but simply seeks answers to complex questions

Curated the right team to provide the right insight at the right time.



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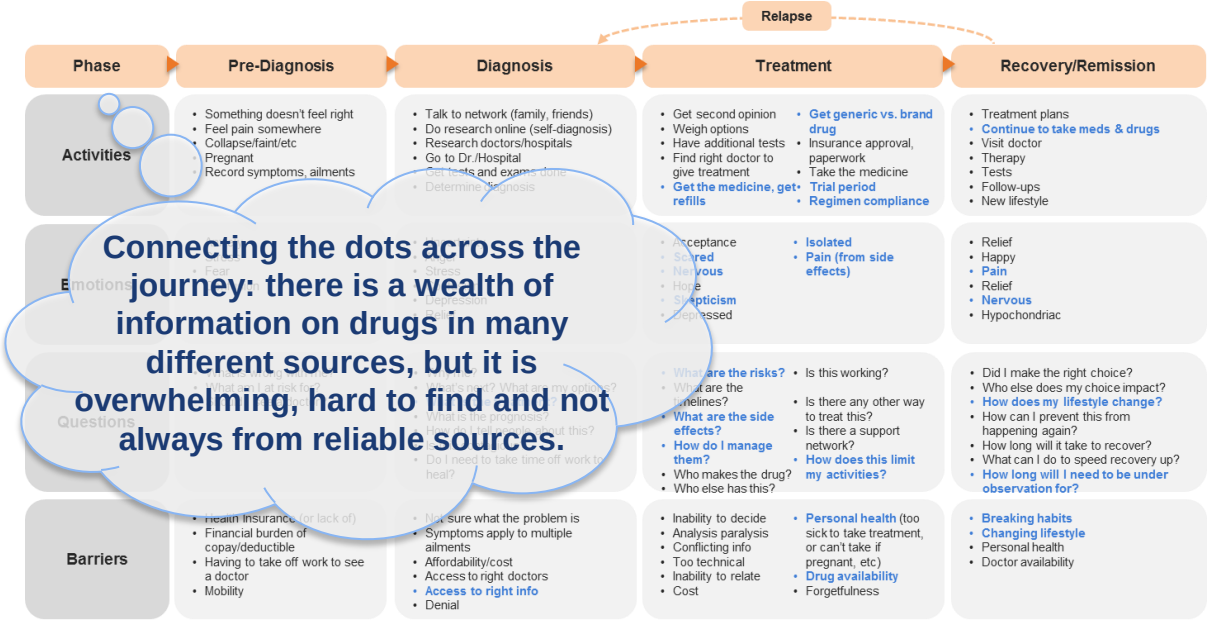
The patient experience as a journey

We uncovered the need for a simplified way to review adverse events associated with medicine

We used Journey Maps to tell the **story from a customer's perspective.** This powerful way of peeling back behavioral layers to focus on the intricacies of **feelings, questions and needs** allowed us connect our solution to end-user frustrations.

The Patient Journey (see appendix for full size version)



With a deeper understanding of end users' behavioral and motivational attributes, the team focused in on problematic areas of the customer journey: **diagnosis, treatment and recovery/remission.**

Here, users expressed anger, confusion, fear, uncertainty and other emotions around the medicines they were taking or planned to take.

Many asked, "Is there an easier way for me to understand the risks?"

Patient Personas

Created immediate insight into pain points, as well as areas of opportunity for improvement

Our process for developing personas:

1. Created a story-based persona to make patients feel like true individuals with wants and needs that can be acted upon
2. Conveyed details in narratives through consolidated information and descriptive insights. Helped to build out who each persona truly is and what they need
3. Identified motivations, expectations, and goals. These insights help drive product decisions and functionality to align with each persona's day-to-day activities associated with the product

Meet Sally. A Liver transplant patient

Sally is a 55 year old female who is taking prednisone as an auto immune inhibitor after her liver transplant. Her condition is chronic, and managing her treatment is key to her quality of life.

A few years back, Pharmacia Corporation announced a recall of its 500 count bottles of DELTASONE (prednisone tablets). Reports indicated that bottles labeled as 10 mg, actually contained 5mg.

This recall made Sally very uneasy--prednisone is her body's anti-rejection medication. Dosage errors can potentially increase her risks to side effects.

"As a liver transplant patient, I want to learn more about the drugs I take so that I can better manage my treatment"

Meet Joel. He has severe allergies

Joel suffers from severe seasonal allergies. To prepare for an early spring season, he is working with his doctor on a new treatment plan to manage his symptoms. Corticosteroids are used to treat severe symptoms caused by allergic reactions. They are considered the most effective treatment.

The use of oral corticosteroids is generally associated with fairly significant side effects. Pill form (such as prednisone) is reserved for severe cases such as Joel's. Although powerful, these drugs potentially have serious side effects, which forces patients to think about tradeoffs.

"As an allergy sufferer, I want to better understand drug risks & benefit of what I take, so that I can make a more informed decision"

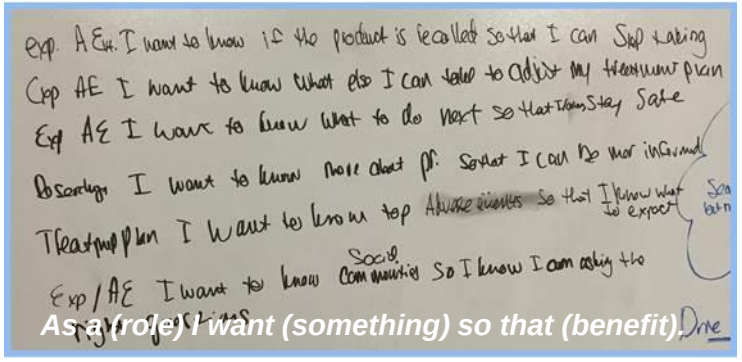
User stories informed requirements

High-level definition with enough information to show value and estimate effort to implement

Design for a purpose. What do users want to accomplish?

Our approach:

- Think about who a certain feature is built for and why
- Have conversations with members of the target audience
- Work through empathy-building exercises (journey maps, personas) and build on the learnings



Stories were written from various user perspectives (depth) to accomplish a variety of tasks (breadth).

DEVELOPING OUR MINIMALLY-VIABLE PRODUCT: EPIC TO USER STORY

#spoonie: A person living with chronic illness that identifies with Christine Miserandino's Spoon Theory. (e.g. liver transplant patient managing treatment to fend off rejection)

"As a #spoonie, I want to better understand the adverse reactions of drugs I might need – so that I can bee more informed when talking with my doctors."

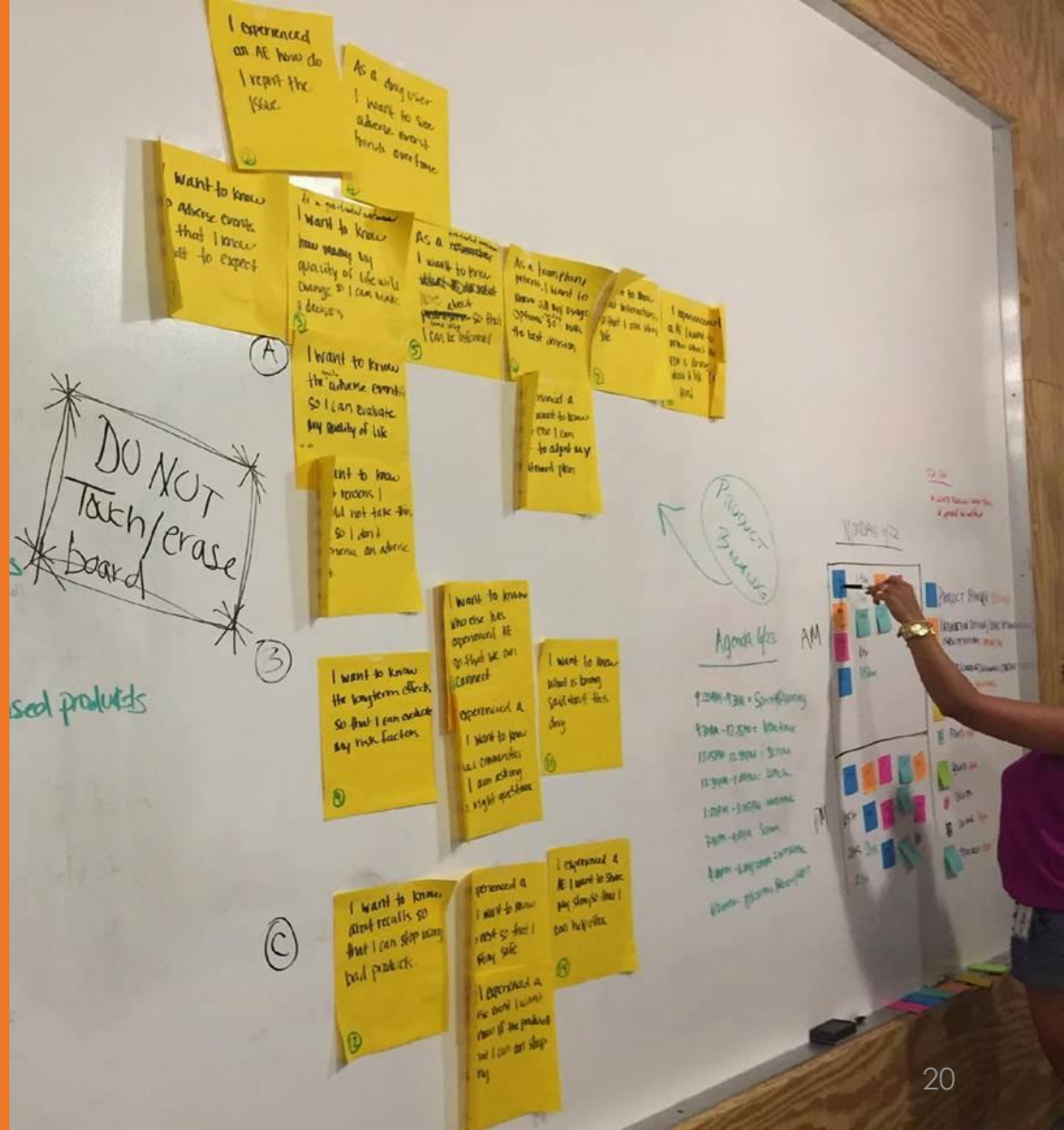
The **spoon theory** is a model used by some disabled people and people with chronic illness to describe their everyday living experience when their disability or illness results in a reduced amount of energy available for productive tasks.[1]

Landing Page / Intro > Drug Search > Drug Search Results > Drug Detail > Drug Meta

1- https://en.wikipedia.org/wiki/Spoon_theory

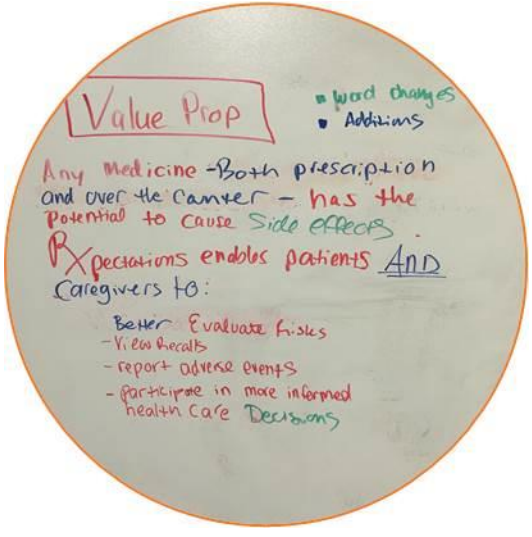
Solve for the Core Need

From concept to minimally viable product. What do we absolutely need to build to validate with customers?



Icon Source: http://www.flaticon.com/

Product Design



IT WILL BE

- Informative for the target audience
- Intuitive and inviting
- Clear and concise
- Designed and developed with the end user

IT WON'T BE

- An app for an app's sake
- Complex code without purpose
- A sleek design without substance

Value Proposition

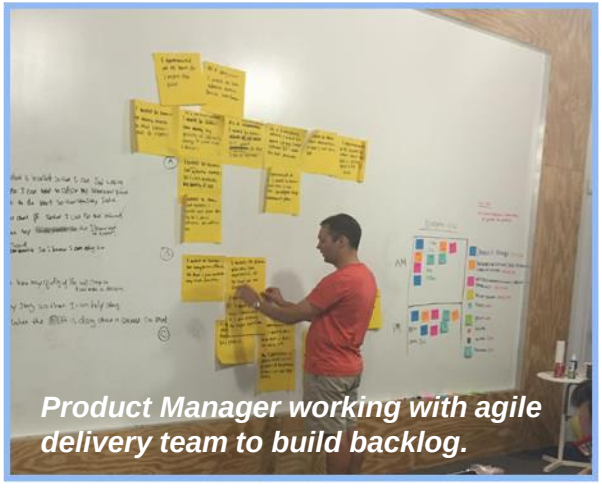
Enable patients and caregivers to: better evaluate risks, review recalls, report adverse events, and ultimately participate in more informed healthcare decisions.

Product features and backlog

We enabled the vision by sequencing user stories to deliver value fast

Defined parameters for prioritization based on business needs

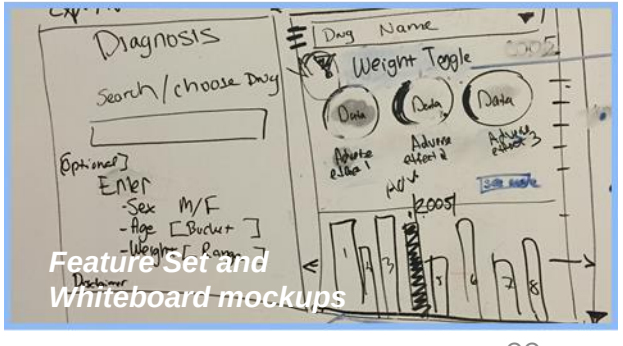
- Sorted user stories by themes, categorized needs and eliminated redundancy
- Clarified stories and requirements to be well-articulated and easily understood
- Prioritized the full set of user stories
- Facilitated active stakeholder involvement for faster access to information and decisions
- Continually reconciled list against feedback



Product Manager working with agile delivery team to build backlog.

Worked toward a minimally-viable product (MVP)

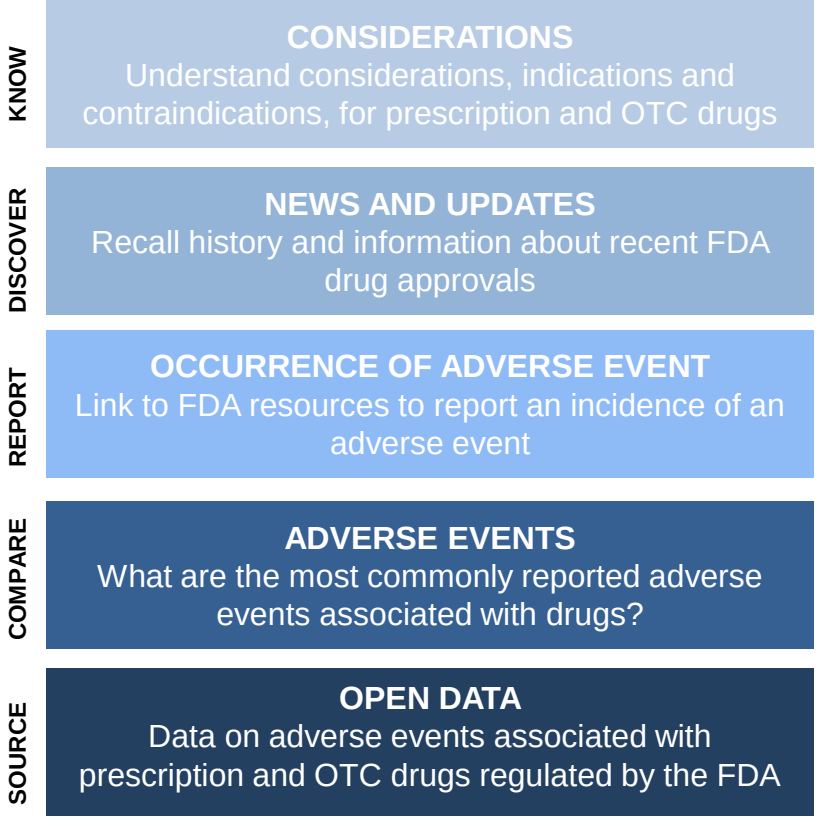
- Sketched out whiteboard prototypes to test ideas and generate relevant knowledge
- Exposed early versions of the product to target users and customers for feedback
- Collected insights to learn and incorporate into progressive sprint and release planning



Feature Set and Whiteboard mockups

Minimally-Viable Product (MVP)

Determined functionality to meet the baseline. How do we build on the foundation?



And think about the future…

This could also be scalable to include other public data to extend the experience to address other patient concerns.

For Example….

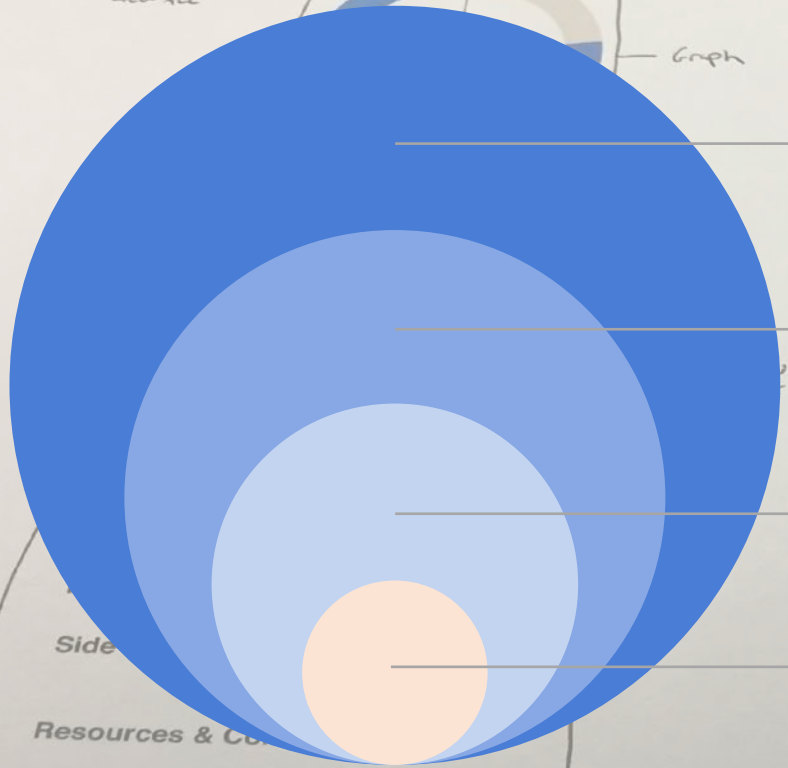
MEDICAL DEVICES

Expanding search options to include medical devices could address the needs of another segment who seek information to inform their treatment plan and options.

Planning and communication

We used an agile framework to sequence prototype deployment

Based on the prioritization of the product backlog and MVP model, the team identified functionality for the roadmap and built a plan for subsequent releases.



Roadmap — Team determined how to break it up into multiple projects and/or releases

Release — Team defined and planned the upcoming Release.

Sprint — Team planned and executed the current Sprint

Scrum — Team managed work daily

Right-sizing technology

We developed the stack to optimize the user experience

Web/Mobile Technology Stack and Toolsets

CORE TECHNOLOGIES

Development Frameworks (Language)

Kraken (NodeJS)

Language

JavaScript (NodeJS)

Client-side Languages

HTML5 | **JavaScript** | **CSS3**

Client-side Libraries

D3 (JavaScript) | **Stylus (CSS)**

Jeet (CSS) | **Nib (CSS)**

Cloud Hosting — **Heroku**

SUPPORTING TECHNOLOGIES

Development	***Test / Production***
Automated Testing — **Supertest**	*Analytics* — **Google Analytics**
Text Editor / IDE — **Sublime**	*Application Monitoring* — **New Relic**
Continuous Integration	**Jenkins**
Source Control	**Git**

The Experience
Focused on digital presence and responsive website design

User Experience

Designed the digital channel for the customer with ease of use in mind.

- ✓ Provide confident navigation
- ✓ Offer interactive functionality
- ✓ Decrease time to complete core tasks

Design

Created a customer-first design by creating a seamless customer experience.

- ✓ Mobile-first & responsive design
- ✓ Flexible functionality
- ✓ Clean and simple layout

Content

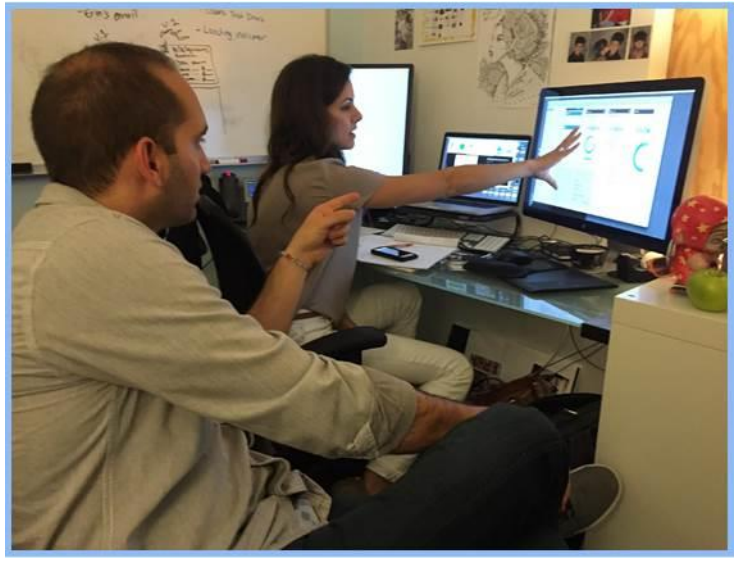
Captivated the customer through engaging and differentiated content.

- ✓ Prioritize content by importance
- ✓ Create clear content and convey with images
- ✓ Personalize content for the customer

User Testing

Refined concept and design to create a unified vision across the product team and user

Hallway Testing: Get initial gut-check on design



Probing Questions:

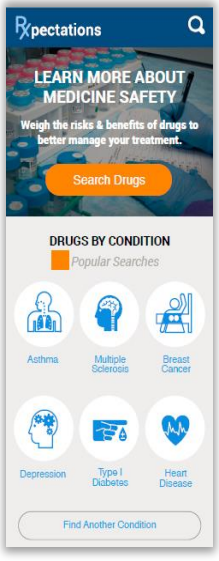
What do you like about this concept?

What are your concerns?

How do we need to evolve or change this concept to ensure it is feasible?

What product goal should we prioritize for near-term development?

A/B: Remove subjectivity. Determine direction based on connection to the user



Probing Questions

What do you think the purpose of this [a/b] is?

Compare the two designs, what do you like? What do you dislike?

What would you pull from one design to incorporate in the other?

If you had to select one design, which would it be?

Mobile-first, human-centered design

Created a responsive and engaging experience across devices

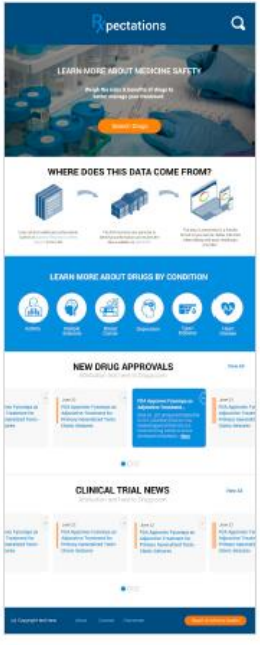
Landing Pages: Targeted Breakpoints

iPhone 5

320 x 568

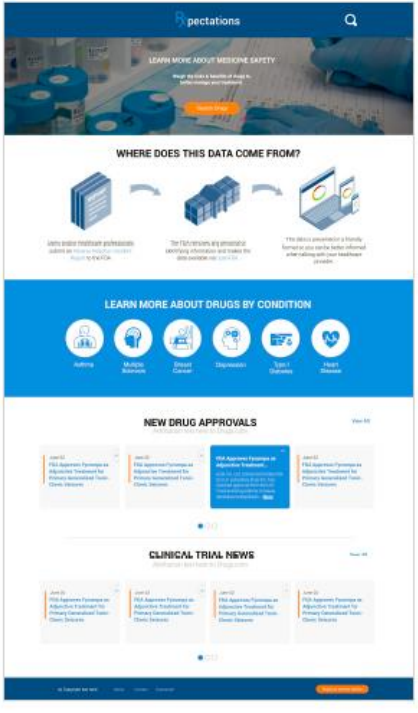
iPad Portrait

768 x 1024



Desktop HD

1440 x 1024



Highlights

- Differentiated user experience
- Highly visible call-to-action for users who are skimming the text to invite them to explore
- Feed from informative sources on drug updates
- Design considered 508 compliance[1]
- Style guide and design toolkit for consistency

Detailed annotations and style guide in artifact collection

1- 508 compliance considered during design. Check towards meeting all compliance goals underway

Initial prototype gave life to the vision and planning

Exposed early bugs, issues, and was the spring board for ongoing iterations

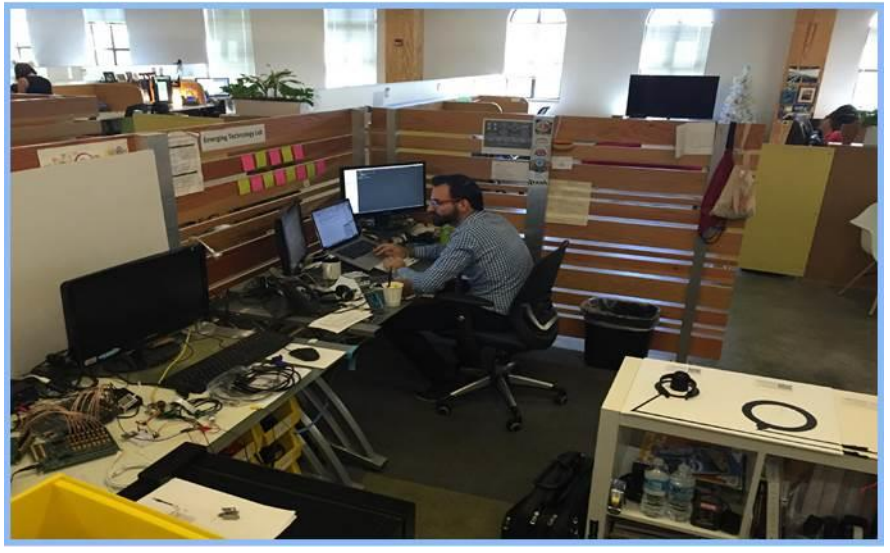
A 150 page functional spec is good, but a functional prototype tested with users is better – and faster

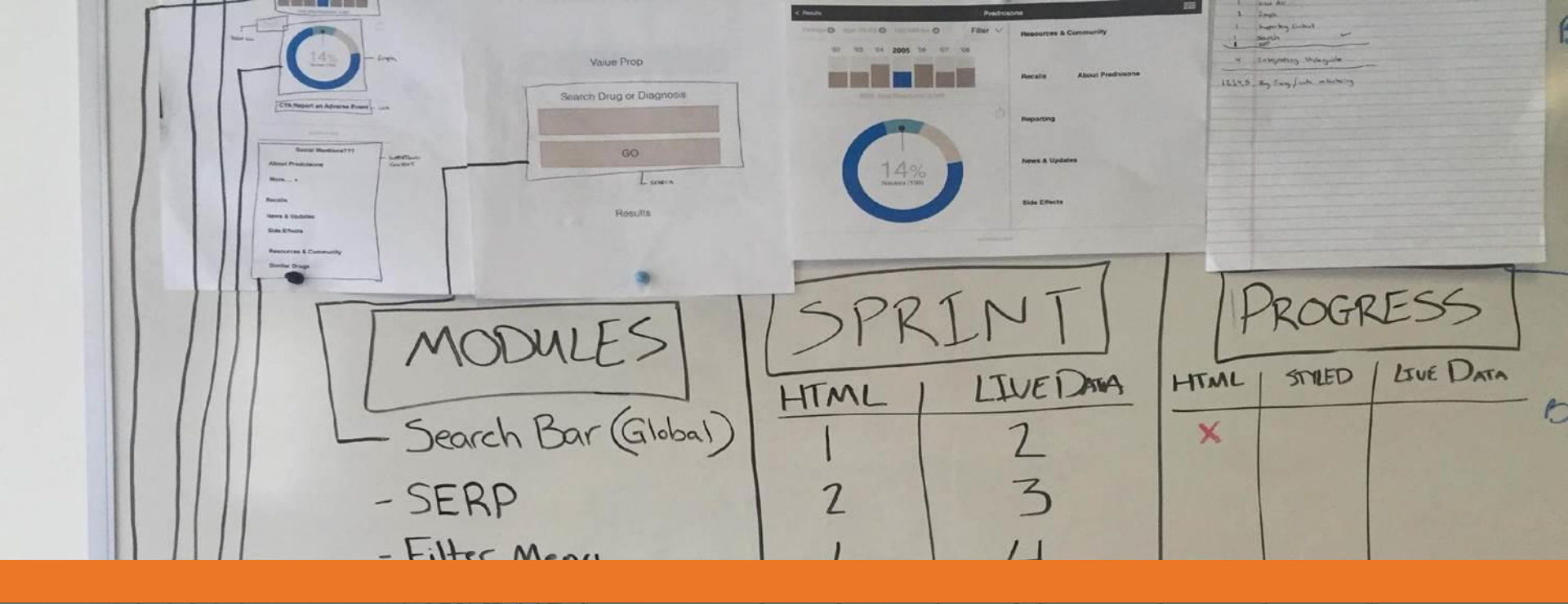
- Conducted initial testing based on pre-defined cases and initial feature set outlined in the MVP
- Outputs from testing informed decisions around future features, next steps and product impact

Recalibrating user stories from the initial prototype provided a baseline to gauge progress

- Measured the amount of work the team was able to complete in the first iteration
- Calculated the amount of work left to complete; provided valuable input into sprint planning

Iterative Approach (Code over Text)





Don’t Stop Iterating

Rapid release and ongoing testing. Build the right thing, and build the thing right.

Icon Source: http://www.flaticon.com/

Usability testing validated design

Provided insight into user challenges at a more granular level of detail

We conducted exploratory usability tests to better understand how users navigated the Rxpectations site. Our observations focused on the user's experience in regard to functionality, design, content and flow.

Participants

- ***Patients currently taking OTC and prescription drugs***
- ***Health care specialists with pharma experience***
- ***Public Sector specialists with FDA and CDC experience***

Findings

The purpose of the site is clear

When landing on the site, users knew the purpose and the type of information available.

The design is appealing

The information was well presented with a clean design and engaging interactive charts.

Charts raised questions

The year over year data was not clear. Participants did not understand the connection to the doughnut chart.

Intuitive search helps, but could be more predictive

The text drop down helps, but it can be inconsistent. The enter command did not work intuitively.

"I thought typing and hitting enter would work, but it didn't, unfortunately. Didn't realize I had to click on a menu."

A more seamless experience

Usability findings guided updates to visual design and interactive charts

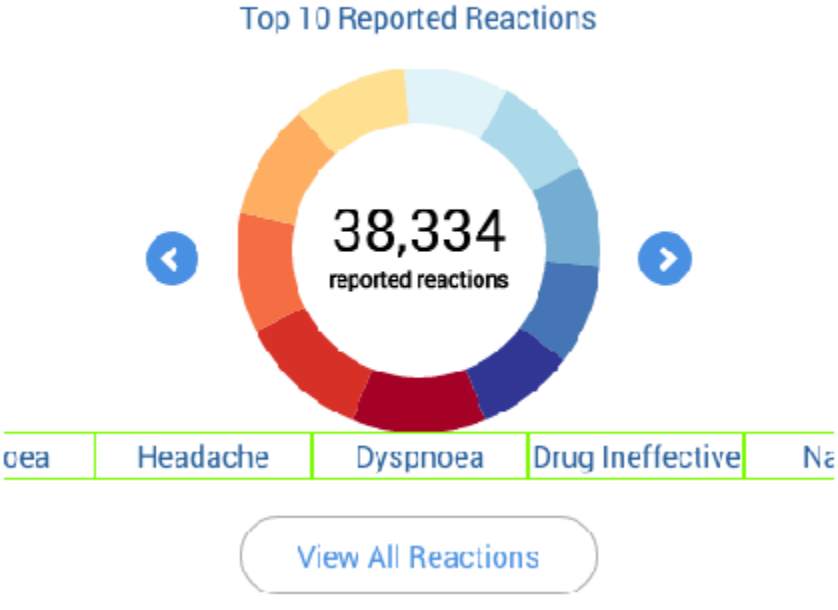
From

- **Numbers without relative context**
- **Unclear connections from adverse event banner and pie chart**

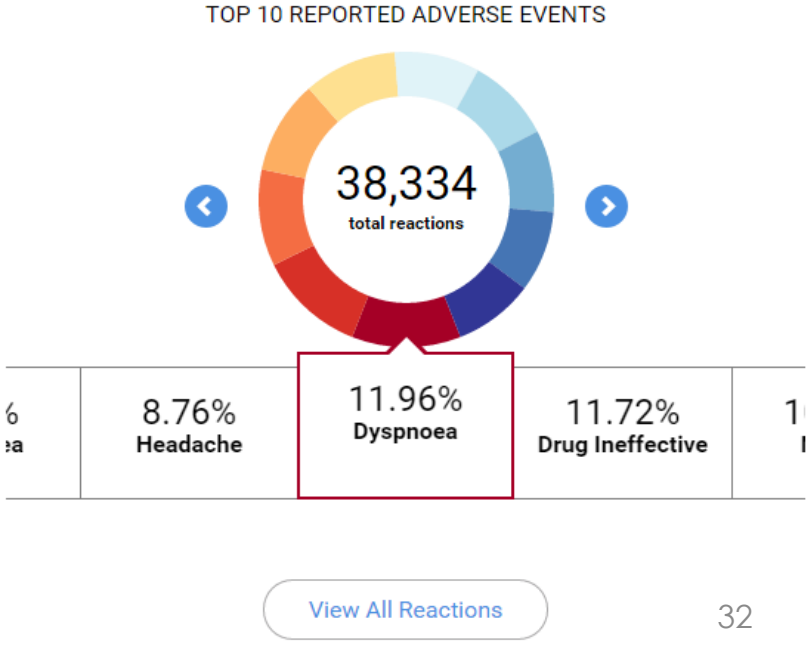
To

- **Percentages can be compared more easily**
- **Arrows and corresponding colors to draw connections between chart and adverse event**

Prednisone



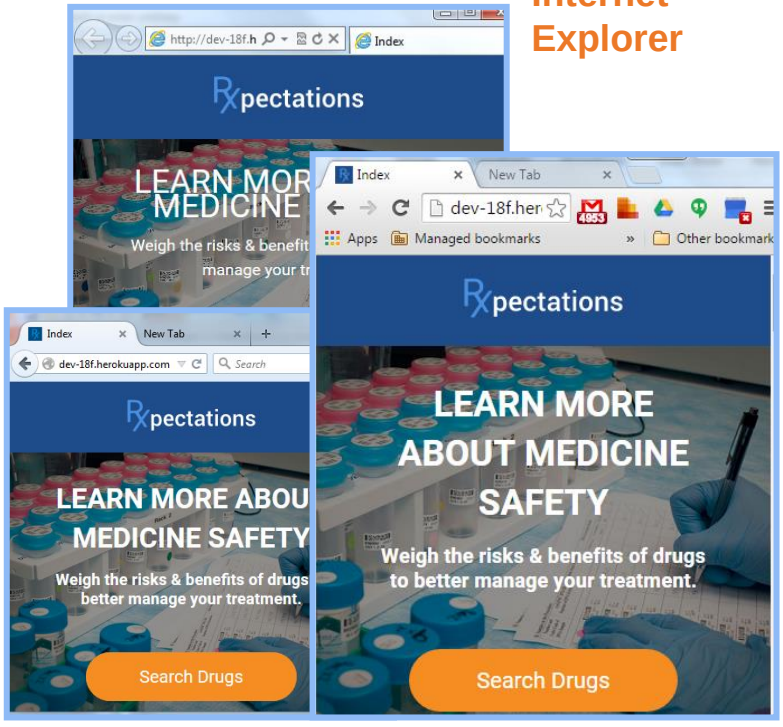
Prednisone



Testing responsiveness
Checked across various devices, screen sizes and browsers

We used various devices and browsers to test the responsive design of the Rxpectations website. The goal was to ensure that the site displayed content on different devices without sacrificing user experience.

Our device testing wall allows us to quickly see how websites look on various devices and screen sizes.



Compatible with all major browsers (Chrome, Firefox, Internet Explorer and Safari) at least two major versions behind current.[1]

1- As of July 7th, 2015

As the design evolved so did the code base

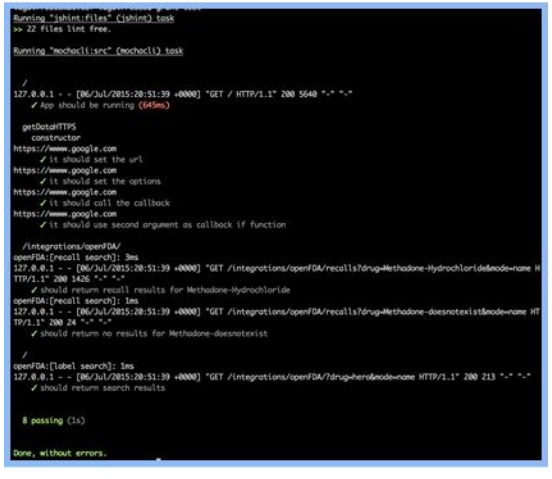
Conducted quality checks and automated analysis of overall performance

Ongoing Development

- Rapidly developed new code to support functionality
- Continued to iterate on and mature existing code

Automated Testing

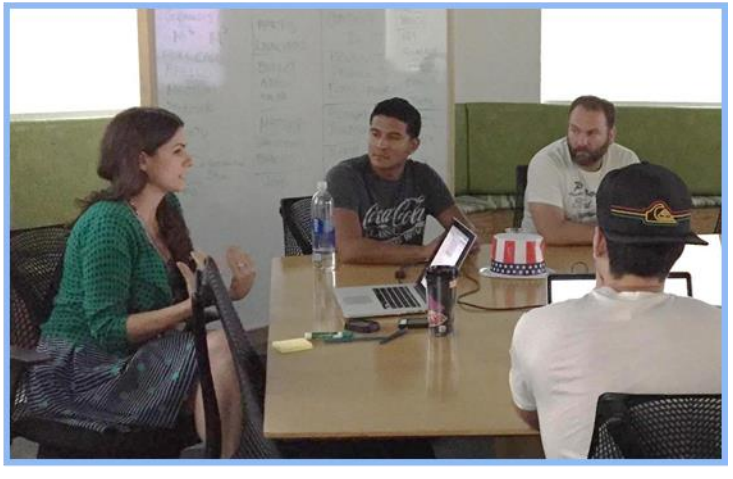
- Developed automated tests for functionality
- Wrote unit tests
- Tracked application monitoring in New Relic
- Reviewed baseline analytics in Google



Automated testing runs on every build of the project

Three levels of testing rigor

1. Unit tests
2. Expert reviews
3. Peer reviews



Reviews are built into our process and are formally conducted across projects each week

Roadmap

Alpha

High Level Features

- Graphically displayed top adverse event by drug
- Display Historical Recalls by Drug
- New drug approvals
- Report an adverse drug event (ADE)
- Social Community Engagement

Beta

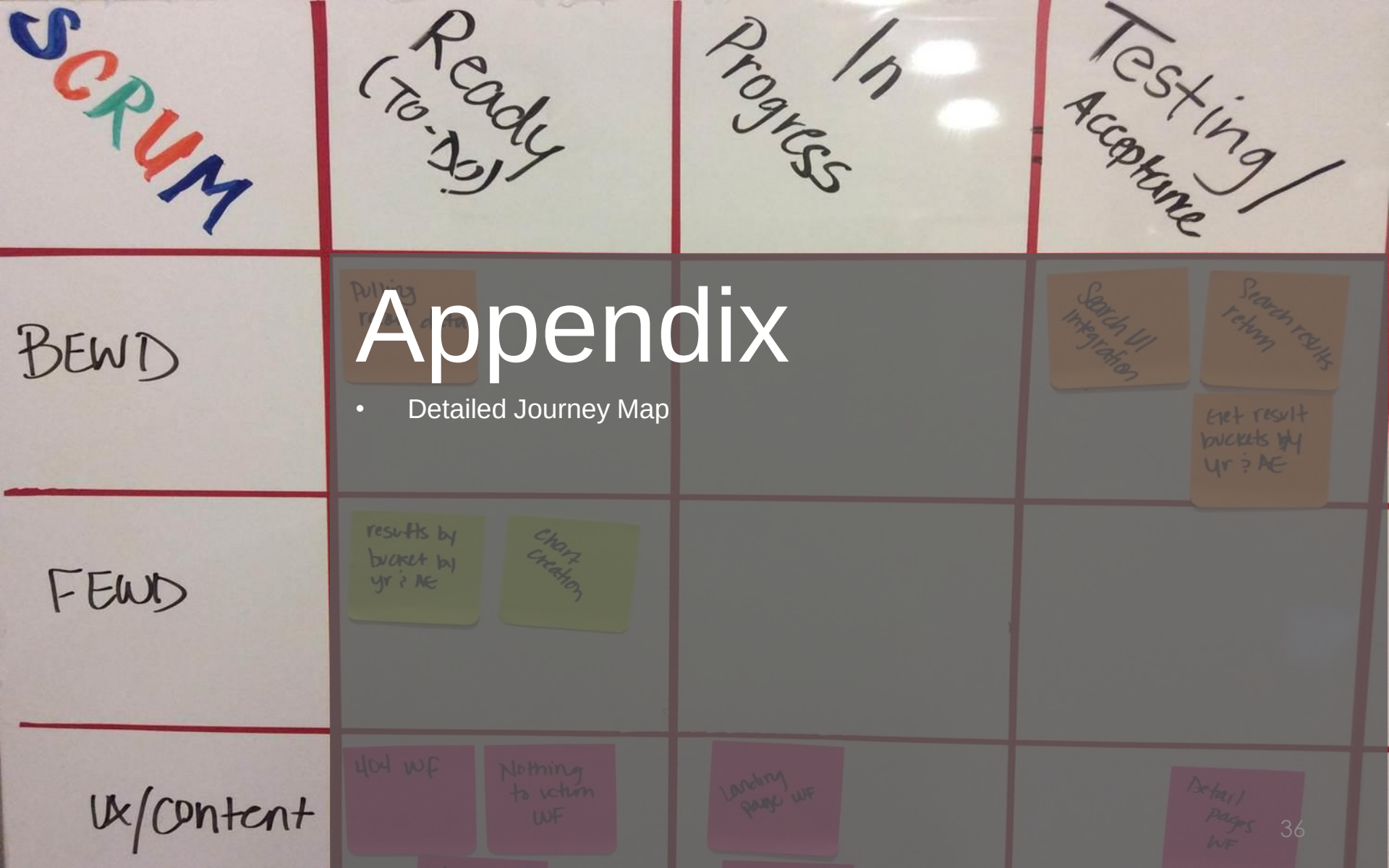
High Level Features

- Integration with social channels
- Resigned reporting feature for ADEs (without redirect)
- Consumer report feedback
- Compare multiple drugs and the interactions
- Prescription bar code scanning

Gamma

High Level Features

- Trending news by drug
- What are the medical experts saying
- Pill image recognition search



Appendix

- Detailed Journey Map

Detailed Customer Journey

Understand the motivations of patients and caregivers

Relapse

Phase	Pre-Diagnosis	Diagnosis	Treatment	Recovery/Remission
Activities	• Something doesn't feel right • Feel pain somewhere • Collapse/faint/etc • Pregnant • Record symptoms, ailments	• Talk to network (family, friends) • Do research online (self-diagnosis) • Research doctors/hospitals • Go to Dr./Hospital • Get tests and exams done • Determine diagnosis	• Get second opinion • Weigh options • Have additional tests • Find right doctor to give treatment • **Get the medicine, get refills** • **Get generic vs. brand drug** • Insurance approval, paperwork • Take the medicine • **Trial period** • **Regimen compliance**	• Treatment plans • **Continue to take meds & drugs** • Visit doctor • Therapy • Tests • Follow-ups • New lifestyle
Emotions	• Anxiety • Stress • Fear • Confusion	• Uncertainty • Anger • Stress • Confusion • Depression • Relief	• Acceptance • **Scared** • **Nervous** • Hope • **Skepticism** • Depressed • **Isolated** • **Pain (from side effects)**	• Relief • Happy • **Pain** • Relief • **Nervous** • Hypochondriac
Questions	• What is wrong with me? • What am I at risk for? • Should I see a doctor**?**	• Why me? • What's next? What are my options? • **What is the treatment?** • What is the prognosis? • How do I tell people about this? • Is this contagious? • Do I need to take time off work to heal?	• **What are the risks?** • What are the timelines? • **What are the side effects?** • **How do I manage them?** • Who makes the drug? • Who else has this? • Is this working? • Is there any other way to treat this? • Is there a support network? • **How does this limit my activities?**	• Did I make the right choice? • Who else does my choice impact? • **How does my lifestyle change?** • How can I prevent this from happening again? • How long will it take to recover? • What can I do to speed recovery up? • **How long will I need to be under observation for?**
Barriers	• Health Insurance (or lack of) • Financial burden of copay/deductible • Having to take off work to see a doctor • Mobility	• Not sure what the problem is • Symptoms apply to multiple ailments • Affordability/cost • Access to right doctors • **Access to right info** • Denial	• Inability to decide • Analysis paralysis • Conflicting info • Too technical • Inability to relate • Cost • **Personal health** (too sick to take treatment, or can't take if pregnant, etc) • **Drug availability** • Forgetfulness	• **Breaking habits** • **Changing lifestyle** • Personal health • Doctor availability