OLIVER WYMAN

CHHS
California Health & Human Services Agency

CALIFORNIA HEALTH & HUMAN SERVICES AGENCY
TECHNICAL APPROACH DOCUMENTATION AND DESIGN ASSETS

JUNE 2016

RFI #75001, ADPQ Vendor Pool Submission
Product Owner / Leader: Edmund Olson-Morgan

MARSH & McLENNAN COMPANIES

CONFIDENTIALITY

Our clients' industries are extremely competitive, and the maintenance of confidentiality with respect to our clients' plans and data is critical. Oliver Wyman rigorously applies internal confidentiality practices to protect the confidentiality of all client information.

Similarly, our industry is very competitive. We view our approaches and insights as proprietary and therefore look to our clients to protect our interests in our proposals, presentations, methodologies and analytical techniques. Under no circumstances should this material be shared with any third party without the prior written consent of Oliver Wyman.

Summary of technical approach documentation contents

This documentation supplements the README file provided in the repository with details on project organization, design assets, and development

Prototype link: https://protected-temple-25733.herokuapp.com/login

1 RFI submission requirements

ADPQ Vendor Pool Submission Requirements: Summary of solutions (1 of 3)

Solutions and corresponding documentation for each requirement outlined in Attachment B, Section 2 (Technical Approach)

	Technical requirement	Summary of solution	Section / Page Title	Page
-	Vendor must demonstrate that they followed the U.S. Digital Services Playbook by providing evidence in the repository	• Conducted thorough evaluation of plays; documented corresponding approaches and relevant answers to key questions from Playbook	1. RFI Submission Requirements – Evaluation of U.S. Digital Services Playbook	8-10
A	Assigned one leader and gave that person authority and responsibility and held that person accountable for the quality of the prototype submitted	• Assigned Edmund Olson-Morgan as the Leader and Product Manager; documented his responsibilities and expectations	2. Project Organization – Project team roles and responsibilities	13-14
B	Assembled a multidisciplinary and collaborative team that includes, at a minimum, five of the labor categories as identified in Attachment C - ADPQ Vendor Pool Labor Category Descriptions	• Assembled a collaborative, multidisciplinary team of five people across labor categories, including a Product Manager / Leader, Delivery Manager, Front End Web Developer, User Researcher, Back End Web Developer, and a DevOps Engineer. • Ensured regular collaboration via project management and communication tools • Documented roles and responsibilities and team profiles	2. Project Organization – Project team roles and responsibilities	13-19
C	Understood what people needed, by including people in the prototype development and design process	• People were included throughout the design and development process, via interviews, storyboarding, and usability testing • Feedback from these participants was incorporated into multiple iterations of the prototype	3. Human-centered design approach; 5. Iterations and Feedback	20-62 82-95
D	Used at least three “human-centered design” techniques or tools	• Techniques used: Interviews, secondary research, storyboarding, and usability testing; detailed documentation provided in Design Approach section.	3. Human-centered design approach; 3.1 Interviews; 3.2 Storyboarding; 3.3 Usability Testing	20-62

ADPQ Vendor Pool Submission Requirements: Summary of solutions (2 of 3)

Solutions and corresponding documentation for each requirement outlined in Attachment B, Section 2 (Technical Approach)

	Technical requirement	Summary of solution	Section / Page Title	Page
E	Created or used a design style guide and/or a pattern library	• Bootstrap was used as the library for the front-end framework to ensure a responsive and mobile-first design. • Bootswatch template used to match CHHS color scheme. • Style guide is at http://getbootstrap.com/ and final design specifications can be found in "core.css" in the repository.	3. Human-centered design approach – Design style guide	22
F	Performed usability tests with people - will incorporate the following usability testing requirements:	• Two usability testing sessions were held one week apart with four participants to evaluate users' ability to navigate the tool and understand the information presented. • Participants were given prompts to complete using the tool, while the team collected metrics and qualitative feedback.	3.4 Usability testing	55-62
G	Used an iterative approach, where feedback informed subsequent work or versions of the prototype	• Completed mockups and 2 additional iterations of the prototype before the final version, incorporating feedback from multiple usability testing sessions.	5. Iterations and feedback	82-95
H	Created a prototype that works on multiple devices, and presents a responsive design	• Front-end framework based on Bootstrap used to ensure responsive design that works on Web browser and phone • **Link**: https://protected-temple-25733.herokuapp.com/login	4. Agile development approach	63-81
I	Used at least five modern (see Note #2) and open-source technologies, regardless of architectural layer (frontend, backend, etc.)	• Docker, Jenkins, MongoDB, Node.js, Knockout	4.1 Open-source technologies	70-75
J	Deployed the prototype on an Infrastructure as a Service (IaaS) or Platform as Service (PaaS) provider, and indicated which provider they used.	• Heroku used as PaaS provider	4. Agile development approach	63-81
K	Developed automated unit tests for their code	• Mocha/Chai used for testing	4. Agile development approach	63-81

ADPQ Vendor Pool Submission Requirements: Summary of solutions (3 of 3)

Solutions and corresponding documentation for each requirement outlined in Attachment B, Section 2 (Technical Approach)

	Technical requirement	Summary of solution	Section / Page Title	Page
L	Setup or used a continuous integration system to automate the running of tests and continuously deployed their code to their IaaS or PaaS provider.	• Jenkins used for continuous integration	4.1 Open-source technologies – Jenkins	72
M	Setup or used configuration management	• Git used for configuration management	4. Agile development approach – Configuration management	69
N	Setup or used continuous monitoring	• New Relic used for continuous monitoring	4. Agile development approach	63-81
O	Deployed their software in a container (i.e., utilized operating-system-level virtualization)	• Docker used to create container	4. Agile development approach	63-81
P	Provided sufficient documentation to install and run their prototype on another machine	• README file in Git repository	README file in Git repository	N/A
Q	Prototype and underlying platforms used to create and run the prototype are openly licensed and free of charge	• Docker, Jenkins, MongoDB, Node.js, Knockout • This project is licensed under the terms of the GPL license • **Prototype link**: https://protected-temple-25733.herokuapp.com/login	4. Agile development approach	63-81

Final prototype features – Link: https://protected-temple-25733.herokuapp.com/login

The final prototype includes a home landing page and a care management page, driven by feedback from interviews, storyboarding, and usability testing

☐ Additional features

Page	Primary features	Assumptions / Rationale
Login	• First page that user views after entering URL; prompts user to login using an existing email account • Unrecognized usernames prompt an "invalid user" notification	• Login page is optimized for returning users to quickly sign in • New users will navigate to the "Create New Account" page • Per RFI, did not include an authentication mechanism; would add if tool is put into use, given PII data provided in profile
Create New Account	• New users enter name, email and zip code information to create and save a new account	• Zip code is saved in user profile as the default for search
Home	• Displays simplified views of the profile and inbox • Users can navigate to other pages via toolbar	• Home / landing page is needed for the user to preview and understand the tool's primary features after logging in
Profile	• Users can edit parent zip code and phone number details • Users can add foster children and other caretakers to the profile with basic contact information • Users can view case worker contact information	• One case worker is assigned to each birth parent / family • Encourages user to provide care notes on each child for the case worker's reference (assuming case workers can view) • Minimizes parent details given limited need to track these
Search	• Provides list of facilities within the user's entered zip code; users can filter results by open facilities only • Results are displayed in map and table with details on address and contact information	• User's zip code is the default for facilities search, but user has flexibility to search using other zip codes as needed • For simplicity, did not incorporate a HHS API app token in proof of concept; would add if high traffic is expected
Inbox	• Users can view the inbox and sent messages and delete selected messages	• User can only compose messages to the case worker (given purpose of tool and limited birth parent rights)
Care Management	• Includes example case plan requirements • Includes calendar of upcoming appointments with table of upcoming event names, dates and times	• Created additional page to illustrate learnings on foster care management from secondary research and interviews • User cannot edit details as requirements are assigned

Detailed documentation on the design process and rationale for each feature is provided in the **Design Approach** section; prior iterations provided in the **Iterations and Feedback** section

Evaluation of U.S. Digital Services Playbook (1 of 3)

The team reviewed the Playbook to identify best practices and determine corresponding approaches and techniques for the prototype

	Play	Approach	Answers to Key Questions
1	Understand what people need	• Conducted interviews and secondary research early in the project to understand the needs of parents and foster care workers • Prioritized tasks the user is trying to accomplish • Conducted 2 usability testing sessions of prototype iterations with real people, one week apart • Documented and shared findings	• Primary user: Birth parents of foster children • User needs: Establish and manage profile, view children's residential facilities, and communicate with case worker • Methods: Interviews, secondary (online) research, and usability testing • Findings on user needs and preferences are documented in the Design Approach section
2	Address the whole experience, from start to finish	• Created storyboards to map user flow and stories • During expert interviews, identified pain points with the current foster care management system • During usability testing sessions, identified points of confusion and defined/collected metrics to measure success	• Current foster care management processes are largely offline and facilitated in an ad hoc manner by foster care workers • User metrics: Successful task completion rate, # of critical errors, # of non-critical issues • Findings and metrics are documented in the Interviews and Usability Testing sections
3	Make it simple and intuitive	• Used Bootstrap as design style guide to ensure simple, flexible , responsive and consistent design • Included intuitive headings and toolbar to navigate through the tool and perform primary tasks • Ensuring user can save login to exit tool and return • Consistent use of U.S. English; formatted for laptop and mobile to maximize platforms / usage • Bootswatch template was used to better match the CHHS color scheme	• Primary tasks: Create and edit profile, search for facilities by zip code, and send/receive messages from case worker in inbox • Language: U.S. English • Contact for user help: Provide team contacts to user in website footer • Updated color scheme to blue to match CWS / CMS website and used horizontal toolbar to match navigation; visual design can be customized and streamlined as needed

Evaluation of U.S. Digital Services Playbook (2 of 3)

The team reviewed the Playbook to identify best practices and determine corresponding approaches and techniques for the prototype

	Play	Approach	Answers to Key Questions
4	Build the service using agile and iterative practices	• Created multiple iterations before finalizing MVP • Identified improvements during usability tests • Ensuring regular communication via instant messaging (Hipchat) and daily stand ups • Prioritized backlog of features and bugs via JIRA • Tracked version control and code reviews via Bitbucket/Github	• Time to ship MVP: Conducting three one-week sprint cycles to complete development and testing • Version control system: Git/Bitbucket; moving to Github for submission • Bugs/ticket tracking and feature backlog tool: JIRA • User feedback collected via usability testing (findings documented in Usability Testing section)
5	Secure budgets and contracts to support delivery	• N/A	• Per the ADPQ Vendor Pool Q&A, a budget does not need to be submitted.
6	Assign one leader and hold that person accountable	• Assigned Edmund Olson-Morgan as the Project Leader and Product Manager • Outlined project workplan	• Project Leader to lead the agile delivery team by assigning roles, defining workplan, and reviewing code and documentation ahead of submission • Project Leader's profile with experience is provided in the Project Organization section
7	Bring in experienced teams	• All team members have experience with designing mobile and web applications, modern development and operations, and automated testing frameworks	• Team member profiles with summaries of previous experiences are provided in the Project Organization section
8	Choose a modern technology stack	• Selected tools in modern application architecture to ensure services can scale easily • Using open-source technologies and building tool to be used on desktop and mobile hardware • Instructions to install and run prototype on another machine are provided in README	• Development stack and databases: Refer to Development Approach section for details • New team members should be able to start developing quickly after downloading required open-source technologies

Evaluation of U.S. Digital Services Playbook (3 of 3)

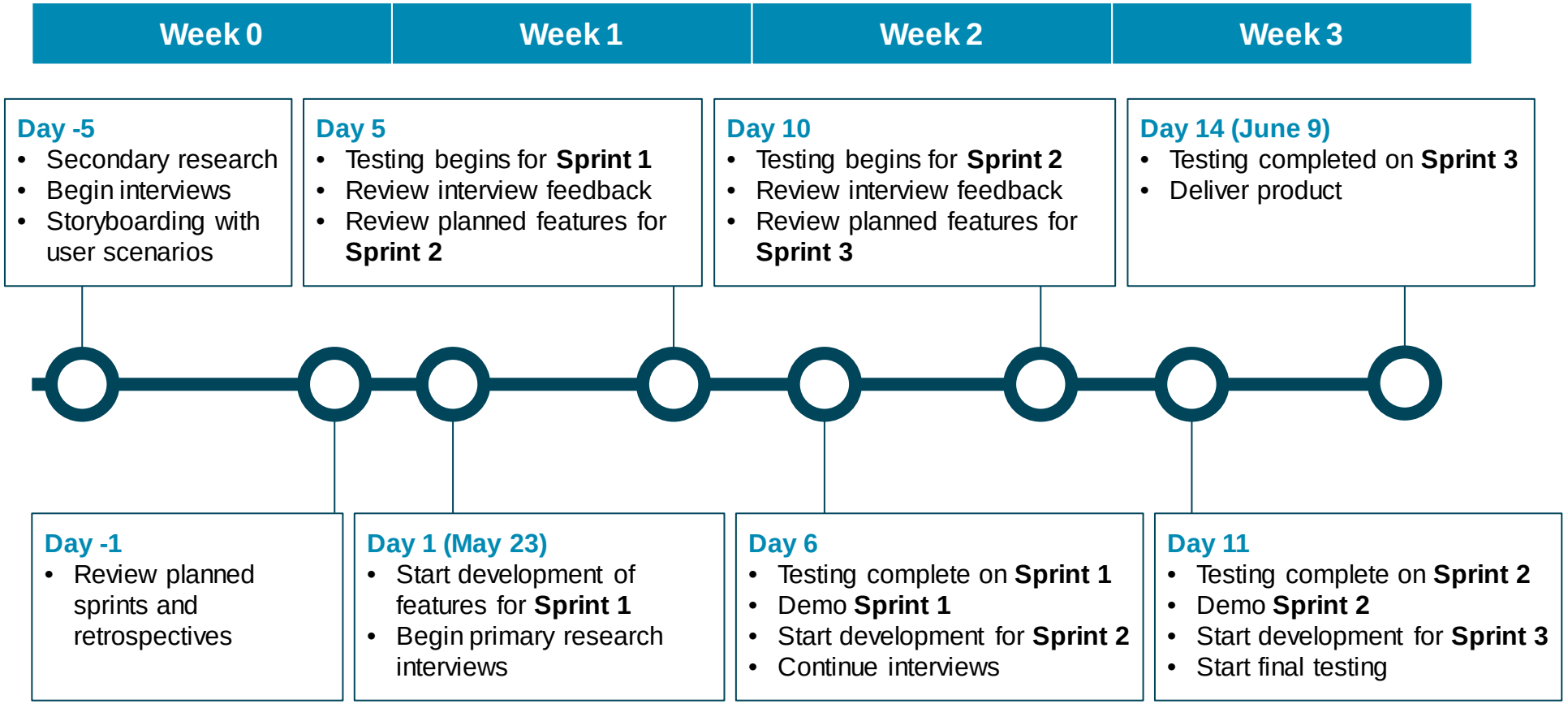
The team reviewed the Playbook to identify best practices and determine corresponding approaches and techniques for the prototype

	Play	Approach	Answers to Key Questions
9	Deploy in a flexible hosting environment	• Prototype is deployed on flexible infrastructure with resources provisioned in real-time via Heroku	• Service hosted on Heroku (Platform as a Service)
10	Automate testing and deployments	• Automated testing via Mocha/Chai • Integration testing via Jenkins • Load / performance tests and continuous monitoring via New Relic	• After a ticket is filed on JIRA, bug fixes can be built, tested, and deployed by other members of the team within 30 minutes to several hours depending on the complexity of the issue • Pull requests require at least 1 approval from another team member before approved
11	Manage security and privacy through reusable processes	• Users can add, edit or remove personal information in their profiles • Per the RFI, "prototype does not need to implement any authentication or authorization against an external directory or authentication mechanism"	• To establish and manage profiles, users will provide personal information including child information and contact information • Information provided in the tool will likely be shared with case workers
12	Use data to drive decisions	• Continuous monitoring of system performance via New Relic • N/A for prototype –building a complete tool would require monitoring of user behaviors and publishing metrics internally to determine how well the tool met user needs	• Continuous monitoring tool: New Relic • N/A for prototype
13	Default to open	• Source code published online via Github repository • Licensed under the terms of the GPL license • Prototype uses public facilities data from HHS API	• Users can provide feedback on bugs and issues in the Github repository or contact team members (emails provided in footer of the webpage)

2 Project organization

Project work plan

After assembling the team, the team developed the prototype design and conducted one-week sprint cycles for development



Project team roles and responsibilities

A multi-disciplinary and collaborative team across six ADPQ vendor pool labor categories was assembled to design and complete the prototype

1. **Product Manager (Project Leader): Edmund Olson-Morgan**
   Leads agile delivery team to deliver the prototype to meet user needs, gets stakeholder buy-in for product definition and delivery approach, and interprets user needs and feedback in order to make the correct product decisions.

2. **Delivery Manager: Connie Cheung**
   Works with Product Manager to define the project roadmap and lead the collaborative planning process, prioritizing work against team capacity; works closely with team to break down barriers and addressing detailed questions.

3. **User Researcher: Patricia Ho**
   Drives the human-centered design approach to improve user experience with the prototype; responsible for conducting user research and drawing insights to improve prototype design. Activities include interviews, secondary research, storyboarding, usability testing, and effective communication of findings in documentation.

4. **Front End Web Developers: Connie Cheung, Patricia Ho**
   Conducts front end development for user-facing interfaces using HTML, CSS, and JavaScript and agile methodologies; uses modern standards for strict mode compliance, frameworks and libraries; uses version control systems and open-source solutions.

5. **Back End Web Developers: Hugh Greenish, Adam Gardner**
   Prototypes and deploys backend web applications, including all aspects of server-side processing, data storage, and integration with frontend development, using agile methodologies.

6. **DevOps Engineer: James Yoneda**
   Deploys and configures services using infrastructure as a service providers, uses installation and configuration management tools, containerization technologies, and architecture for continuous integration and continuous monitoring.

Project team profiles: Edmund Olson-Morgan
Leader and Product Manager

Ed Olson-Morgan is a Principal based in Oliver Wyman's San Francisco office. He is responsible for the design, implementation and support of Oliver Wyman Labs platforms across industries, with a particular focus on rapid integration and flexible architecture. He also works extensively with Oliver Wyman's clients and consulting teams to design custom solutions that meet their needs.

Relevant experience:

- Deploying assortment optimization and forced allocation tools to a major US grocer
- Developing a loan restructuring tool for a European bank, including integration into the bank's systems
- Advising a US insurance broker on data integration across their organization to drive analytic products for clients
- Managing the integration of a full-spectrum retail tool suite, including data warehouse and integrations with operational systems, into a major US retailer

Previously, he spent seven years consulting to Oliver Wyman's retail clients:

- Leading a non-perishable operations initiative for a national US grocery chain, focusing on inventory reduction and improved product availability across multiple banners and formats
- Developing the real estate strategy for a national US specialty retailer, advising the client on portfolio optimization, market entry and exit and new format development
- Advising a leading UK retailer on upgrading their trading capabilities, including introducing a category review process and centers of excellence for price, promotions and ranging
- Helping a leading European retailer understand the impact of the global recession on their French and Spanish businesses and modify their pricing strategy accordingly

Ed holds an MA and MEng in Aerospace and Aerothermal Engineering from the University of Cambridge

Project team profiles: Connie Cheung
Delivery Manager and Front End Web Developer

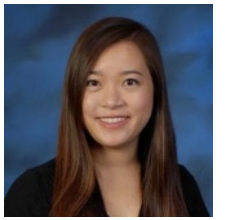
Connie Cheung is a Senior Consultant in Oliver Wyman Labs, San Francisco Office. Connie has 7 years of relevant experience in machine learning and algorithm development.

Relevant experience:

- She designed a Spark framework and web application for advanced analytics as part of a Finance and Risk project. Her work is the foundation of a scalable tool that significantly reduces analysis time from days to minutes.
- For a North American bank, Connie conducted quantitative analysis to measure the financial impact of a popular new initiative. She designed novel analysis and visualization methods that allowed the client to gain an intuition of their recent performance data, and adjust their breakage forecasts.
- She coordinated the development of a pilot recommendation tool to identify inefficiencies in capital resources and optimize profit for a US investment bank.
- For a APR grocer, she developed and embedded processes to automate the generation of promotion reporting tools. The adopted performance and forecasting reports have streamlined the client's promotional planning process, and identified previously unrealized opportunities in sales.
- Prior to OW, Connie managed the core machine learning algorithm development for a consumer medical device. She coordinated workflows across teams and streamlined the data collection, storage, and analysis process.

Connie graduated from UC Berkeley and UC San Francisco with a PhD in Bioengineering and BS (High Honors) in Computational Engineering Science.

Project team profiles: Patricia Ho
User Researcher and Front End Web Developer



Patricia Ho is a Consultant in the Core Consultant Group at Oliver Wyman's San Francisco Office.

Relevant experience:

- For a leading retail banking institution, built enhanced pro forma / financial statement tools (primarily in Excel; also used SQL and SAS) to model a new method of funds transfer pricing based on Federal Reserve capital requirements, for each of the client's 40 major business units. Worked with Treasury VPs and business unit leads on pricing methodology and evaluated model's sensitivity to assumptions
- For a leading US airline, stood up a new PMO called Integrated Delivery Planning (IDP), which oversees the delivery of projects across technology, commercial, and operational functions of the enterprise by managing dependencies and mitigating risks. Developed a comprehensive operating model and playbook for the IDP group, worked closely with program managers to analyze risks, and provided training to transition efforts to the client.
- For a US oil and gas company, conducted an internal diagnostic to optimize the b2b sales process. Performed data analysis in Excel on historical sales performance and measurement of the leads pipeline by customer segment, identified drivers of sales process issues via manager and expert interviews, and created solutions blueprint and thorough customer segmentation to improve sales approach.
- For a US health IT company, developed a new strategic framework, conducted a detailed market opportunity assessment, evaluated the client's current capabilities and gaps, and identified strategic options to pursue growth markets. Specific tasks:
  - Built a market sizing P&L model in Excel to estimate the financial impact of market opportunities
  - Analyzed sales performance and projected budget; created R&D roadmap and identified gaps in sales and marketing

Patricia has a Bachelor of Arts in Political Science with Honors from Stanford University.

Project team profiles: Adam Gardner
Back End Developer

Adam is a project manager and technical lead at OW Labs, with over five years of experience delivering value-driving software solutions to Oliver Wyman's clients. Adam's core expertise is in software engineering, product management, application design and development.

Relevant experience:

- For a retail client in the US, developer on an OW Labs team building a promotions management tool. Subsequently helped lay out OW Labs agile best practices for use in future software development projects.
- For a client in the UK, part of the scrum team for a pricing tool developed to manage multi-tier, multi-zone pricing guidelines for consumer packaged goods.
- For a South American airline client, helped lead an agile planning project kick-off for a revenue management tool. Working with the eventual development team, helped decide on a technical stack appropriate for product development, and guided the team through scoping, sprint planning, and feature estimation exercises.
- For a number of clients in the US, UK, and continental Europe, two years as product manager of a core Oliver Wyman Labs asset. Steered the development of the tool through engagements at clients in insurance, b2b industrial supply, and consumer retail. Ran an eight-person development scrum team distributed across the US and Europe. Coordinated design with a UI team, prioritized and scheduled feature development, supervised careful code review, and managed releases for various client and internal installations.
- For an American supermarket client, anchored a very small and flexible development team building a lightweight promotional analysis tool. Managed technical handover to support team at conclusion of the project.

Adam holds a bachelor's degree from Dartmouth College.

Project team profiles: Hugh Greenish
Back End Developer

Hugh Greenish is a Technical Lead in Oliver Wyman Labs, London Office. Hugh has over 10 years of relevant experience in software engineering and application development.

Relevant experience:

- He led the overhaul of promotion planning for a UK retailer. The end result included a dynamic web-based planning system and a comprehensive reporting tool. These changes have dramatically simplified the planning process, reducing paperwork and significantly reducing the timescales required for creating a new promotion
- For a major international wholesaler, Hugh designed and built a visualization tool capable of querying transaction-level data at high speed. The tool is now being used to provide strategic information to suppliers.
- He built a web-based reporting tool for a global drinks manufacturer, providing an iPad-compatible data-rich interface and allowing executives to do deed-dive investigation of their global sales data.
- Prior to OW, Hugh overhauled the web front-end of the BBC's live streaming service ahead of the London 2012 Olympic Games.
- Hugh also led the development of the BBC Introducing Uploader service for unsigned music acts.

Hugh holds an MA and an MSc in Natural Sciences from the University of Cambridge and an MSc in Software Engineering from Queen Mary, University of London.

Project team profiles: James Yoneda
Dev Ops Engineer

James Yoneda is a Technical Lead in Oliver Wyman Labs, Boston Office. He has been working with web applications for over 16 years.

Relevant experience:

- Created multiple prototypes and proof-of-concepts that have become full production tools at multiple clients.
- Helped build a reporting and pricing tool for a major distributor, including both exec-focused mobile-friendly UI and a more detailed desktop UI.
- Built devops platforms for modern development (containers, virtual machines, cross platform tools).
- Trained & mentored many developers and consultants, from all skill levels.
- Worked in JS/Node, Python, SQL, linux, windows, containers, and VMs; sometimes all on the same project.
- Helped create a disaster preparedness tool to train multi-national groups in response to large-scale disasters.
- Created a cataloging/visualization/discovery tool for an international engineering organization.

James holds a BS in Computer Engineering from the University of Rhode Island.

3 Human-centered design approach

Human-centered design approach: Design techniques

Based on best practices outlined in the U.S. Digital Services Playbook, the team prioritized four primary design techniques when creating the prototype

1

Interviews

Rationale:

- Gain insight into foster care management and parenting context
- Gather requirements directly from user to optimize experience with tool
- Compare multiple perspectives to inform decisions

2

Secondary research

Rationale:

- Understand existing solutions and recent innovations
- Identify features that are effective or ineffective for their intended purpose
- Gather quantitative data to supplement qualitative insights from interviews

3

Storyboarding

Rationale:

- Create user stories to visualize process from start to finish
- Mockup functionality and identify enhancements
- Identify areas to increase efficiency in each process

4

Usability testing

Rationale:

- Share initial versions of the prototype with several people
- Plan and conduct usability testing
- Gather feedback to inform subsequent work on the prototype
- Ensure suggestions are prioritized in the development process

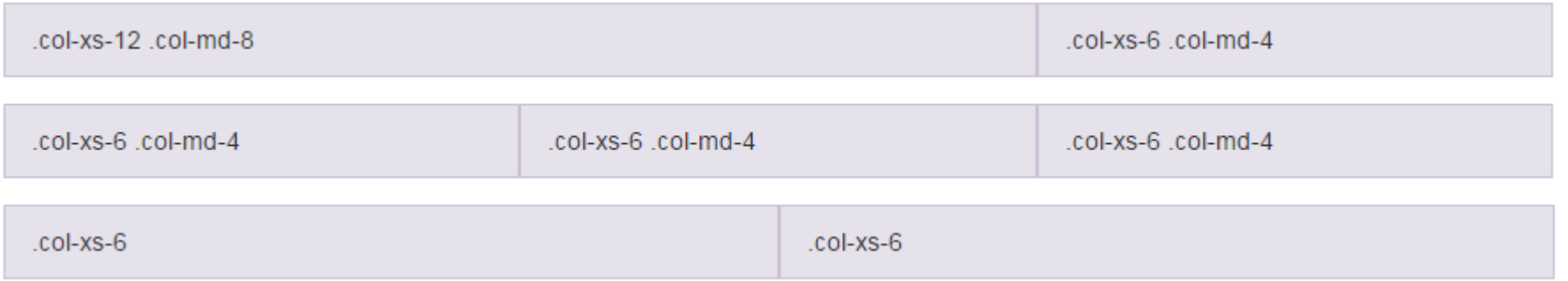
Design style guide

The team used an in-house set of design standards based on Bootstrap for its front-end framework and Bootswatch for the color scheme

Features used in prototype

- The Bootstrap **grid system** scales up to 12 columns in the page layout as the device or viewport size increases
  - The prototype typically uses 2-column and 3-column layouts
  - A full-width grid layout is established using a fluid container
  - To ensure the layout is mobile-first, columns in the grid system are "stacked on mobile devices and tablet devices (the extra small to small range) before becoming horizontal on desktop (medium) devices."
- Additional Bootstrap components used include: Forms, buttons, tables, panels with headings, glyphicons, navigation bar, input groups, list groups, badges, modals
- A Bootswatch template was then used to better match the CHHS color scheme

Example column layouts in the Bootswatch grid system



To view the comprehensive design specifications, please refer to "**core.css**" in the repository

1. http://getbootstrap.com/css/

3.1 Interviews

Interviewees and background information

The User Researcher interviewed two parents and a foster care social worker to include feedback from relevant people while designing the tool

Category	Interviewee	Interview Date	Relevance
Parent	Lisa A.	5/23	Interviewing parents as a proxy for birth parents of foster children
	Shelly H.	5/23	Interviewing parents as a proxy for birth parents of foster children
Expert	Erin T.	5/25	Interviewed California-based social worker with 9 years of experience to understand foster care management

Interview guide for parents

In place of interviewing actual users of the prototype (birth parents of foster kids), the team interviewed parents to understand their concerns and needs

Background: We are designing a prototype tool for foster care management for the California Health & Human Services Agency. The tool is to be used by biological parents of foster kids to establish and manage their profile, and view children's residential facilities, and communicate with their case workers.

Goals: We'd like to gain insight into parents' primary concerns and questions if faced with the situation of needing to rely on an online tool to manage their children's information and communicate with their children's care taker. Using these insights, we can improve our prototype design to best suit their needs.

Questions:

- What would you be most concerned about if your child was in the care of another person or organization?
  - What concerns would you have about your child's welfare in the short-term and the long-term?
  - If you were to create a plan for their care, what issues or concerns would you prioritize?
- How would you like to be able to interact with those responsible for your child's care?
  - How would you like the care taker to keep you informed on your child's well-being?
  - How often and for what reasons/decisions would you like to be consulted?
- Do you have any experience working with a day care, nanny, or other person taking care of your child for an extended period of time? If so, how did you communicate with them? What types of information did you share with them?

Parent interview #1: Key takeaways
Conducted interview with parents on 5/23 during design process

Key takeaways:

- Primary concern is for the child's safety and health; parents want as much information as possible about the care takers, including their past experience and performance.
- Communication should be as frequent as possible so the tool should be very easy to use and should provide a helpful mechanism by which parents can schedule calls with case workers.
- Parents also want to ensure that the child's lifestyle has as much stability and continuity as is possible in this type of situation.

Action items:

- Consider adding more background information on case workers with an option for other parents and older children to provide feedback via reviews
- Potentially add more details on the child's health, living situation (e.g. siblings), and regular activities

Parent interview #2: Key takeaways
Conducted interview with parents on 5/23 during design process

Key takeaways:

- In addition to child safety, parent considerations include various philosophies on child discipline, nutrition, education, and religious values.
- Parents to be consulted more or less frequently based on the child's age (younger children need more frequent contact and decision making)
- Additional pieces of information on children can include the child's likes/dislikes, personality (social/emotional concerns), and other factors beyond demographics and health.

Action items:

- Review pre-school questionnaire to identify additional sources of information, such as the parents' philosophies on education, discipline, religious values; the child's personality and disposition
  - Excerpts from questionnaire: "What is your family's philosophy towards early childhood education? What kind of educational environment do you with WMS to provide for your child? … Please tell us about your child's learning style, temperament, likes and dislikes, and anything else you would like us to know."
- Consider incorporating features from tools for separated families that allow for collaboration on care management and scheduling

Interview guide for experts

The team interviewed an experienced social worker to gain insight into the holistic foster care management process

Background: We are designing a prototype tool for foster care management for the California Health & Human Services Agency. The tool is to be used by biological parents of foster kids to establish and manage their profile, and view children's residential facilities, and communicate with their case workers.

Goals: We'd like to better understand the experiences of parents, foster kids, case workers, and any other people in foster care management so that we can improve our prototype design to best suit their needs. In particular, we want to understand their communication needs, the types of information that they need to track, and other major tools that they require.

Questions for prototype design:

- What is the birth parent's role in the foster child placement and care management process? (We understand that this can vary – what does a high level of involvement look like?)
- How often do birth parents generally communicate with the following people? What are the primary reasons for their communication (e.g. court dates, home visits)?
  - Case workers
  - Foster kids
  - Any other people involved in foster care (e.g. relatives)?
- During these meetings, what information is typically shared and tracked by parents or case workers?
- Is a case worker typically assigned to look after one specific foster kid for a long term period, or are meetings / assessments typically performed one time only?
  - Is it common for a foster kid to have multiple case workers? Is it common for a case worker to oversee multiple foster kids?
- Have you used any online foster care management tools in the past? If so, were these useful to you and why?

Expert interview #1: Key takeaways
Conducted interview with foster care expert on 5/25 during design process

Key takeaways:

- Communication:
  - The birth parent must submit a case plan that addresses all of the issues that caused the original foster care mandate, including drug and alcohol issues, therapy, and parenting classes
  - Usually all of the information about foster children is communicated verbally, or birth parents will share paperwork (mostly for lack of a standardized online system).
- Care management:
  - Care management differs significantly depending on whether the child is in-home or placed out-of-home, in terms of the child's health management and the need for a visitation schedule.
  - Care management also differs as the child gets older – when children are under 3 years of age, they are legally required to be reunified with birth parents within 6 months to a year, or else they are more likely to be placed in adoption.
- Social worker responsibilities:
  - Primary responsibilities include: Working with birth parents on case plans and plans for return, facilitating visitation schedule, overseeing child's health and other care management appointments, and managing placement if the child is not reunifying with their birth family.
  - The social worker has a large responsibility to act as the mediator between birth parents, foster parents, and any other care takers in the child's life – increasingly, social workers have facilitated group discussions that allows for more direct dialogue between parents.
  - One social worker is assigned to a family; in total, a social worker can often oversee 30 foster kids at a time.
- Existing tools for social workers merely provide a repository of information (with some data quality issues) and lack communication and other useful tools

Action items:

- Include only one case worker per account
- Include the option to add additional guardians
- Include a more detailed care management case plan as time allows

3.2 Secondary research

Learnings from secondary research on foster care management

The team also conducted online research to better understand the needs of foster care parents, foster kids, and case workers

Findings on care management and case planning

- Case plan required when child is placed in out-of-home care, receives any kind of in-home services to prevent placement, or has been placed in the legal custody of the State agency
- Parents and legal guardians shall have an opportunity to review the case plan, sign it whenever possible, and then receive a copy of the plan; whenever possible, parents and legal guardians shall participate in the development of the case plan.
- Required contents of a case plan include (not exhaustive):
  - Assessment of circumstances requiring child welfare intervention
  - Goals and planned services to meet goals
  - Schedule of social worker contacts with child and family
  - If placed out-of-home: Rationale for placement and frequency of contact between parents and child
  - Provisions for child's educational stability
- Example requirements by biological parents within a case plan:
  - Go through drug or alcohol rehab
  - Attend parenting classes or anger management classes
  - Find employment or suitable housing
  - Terminate an abusive relationship
  - Maintain sobriety for an amount of time
  - Receive counseling or psychological or other testing
- Permanency plans can include the following goals for placement: Reunification, adoption, guardianship, kinship care, or independent living

Source: Case Planning for Families Involved With Child Welfare Agencies, Achieving & Maintaining Permanency , Child Welfare Information Gateway; Foster Care Case Plan, Foster Club; Primary Care Tools, Healthy Foster Care America.

Secondary research on tool features: Overview

The working prototype must include four primary features to be used by foster parents

1 Login

Create account or access existing account

2 Profile

Establish and manage foster child profile

3 Search

View children's residential facilities in their zip code

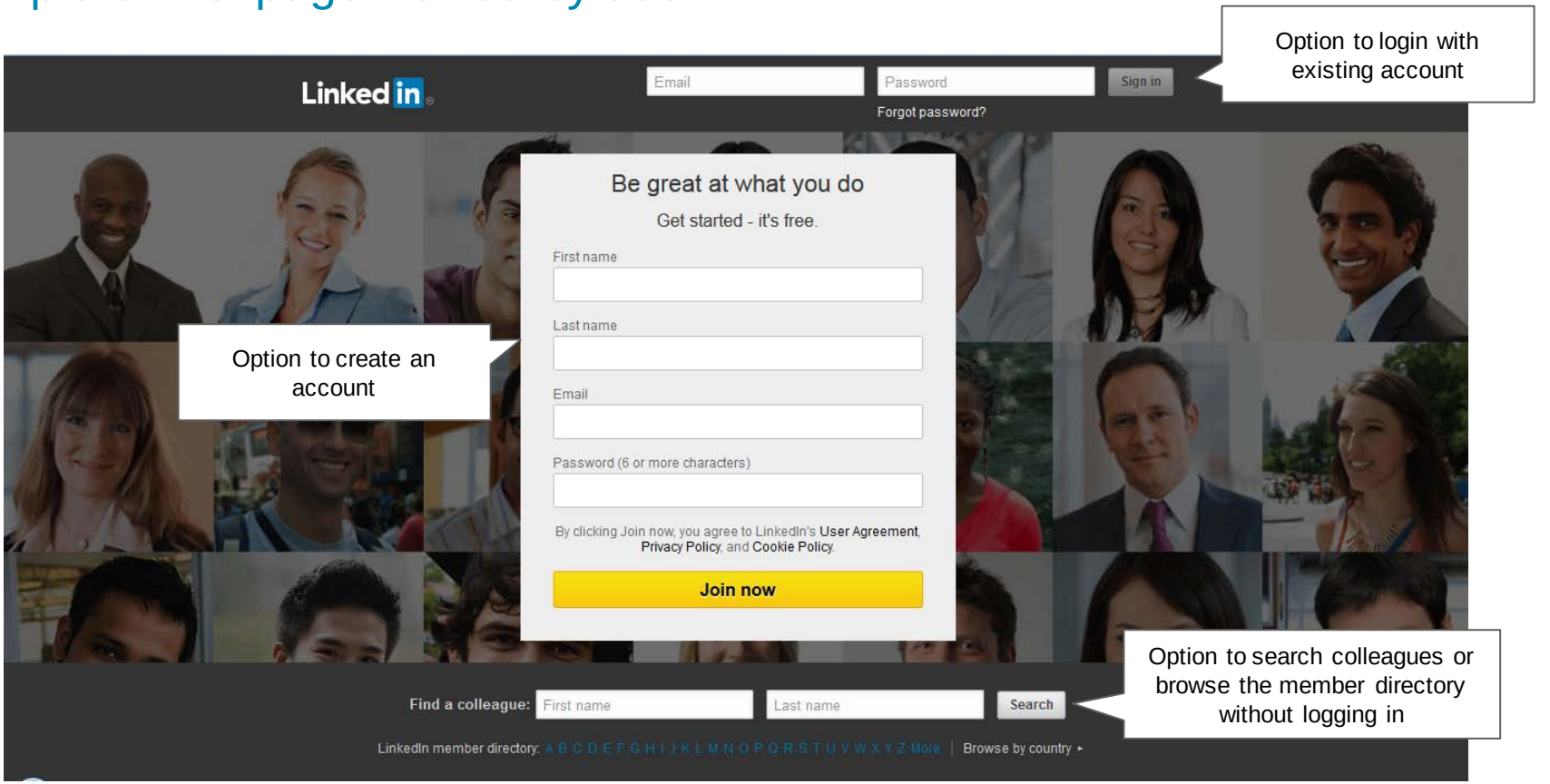
4 Inbox

Communicate with case worker via private inbox

The team conducted secondary research by reviewing and annotating examples of existing tools with these features before creating mockups for the prototype

Secondary research on feature #1: Login

Example of first page viewed by user



Key takeaways:

- Simple page design and user experience; to create an account, user provides 4 items; to login, user provides 2 items
- Users are encouraged to log in before accessing information, as the option to search and browse the LinkedIn member directory anonymously is less prominent and placed at the bottom of the page
- Links including background information on LinkedIn and other options to browse the LinkedIn directory are only visible after scrolling down further (not pictured)

Secondary research on feature #1: Login

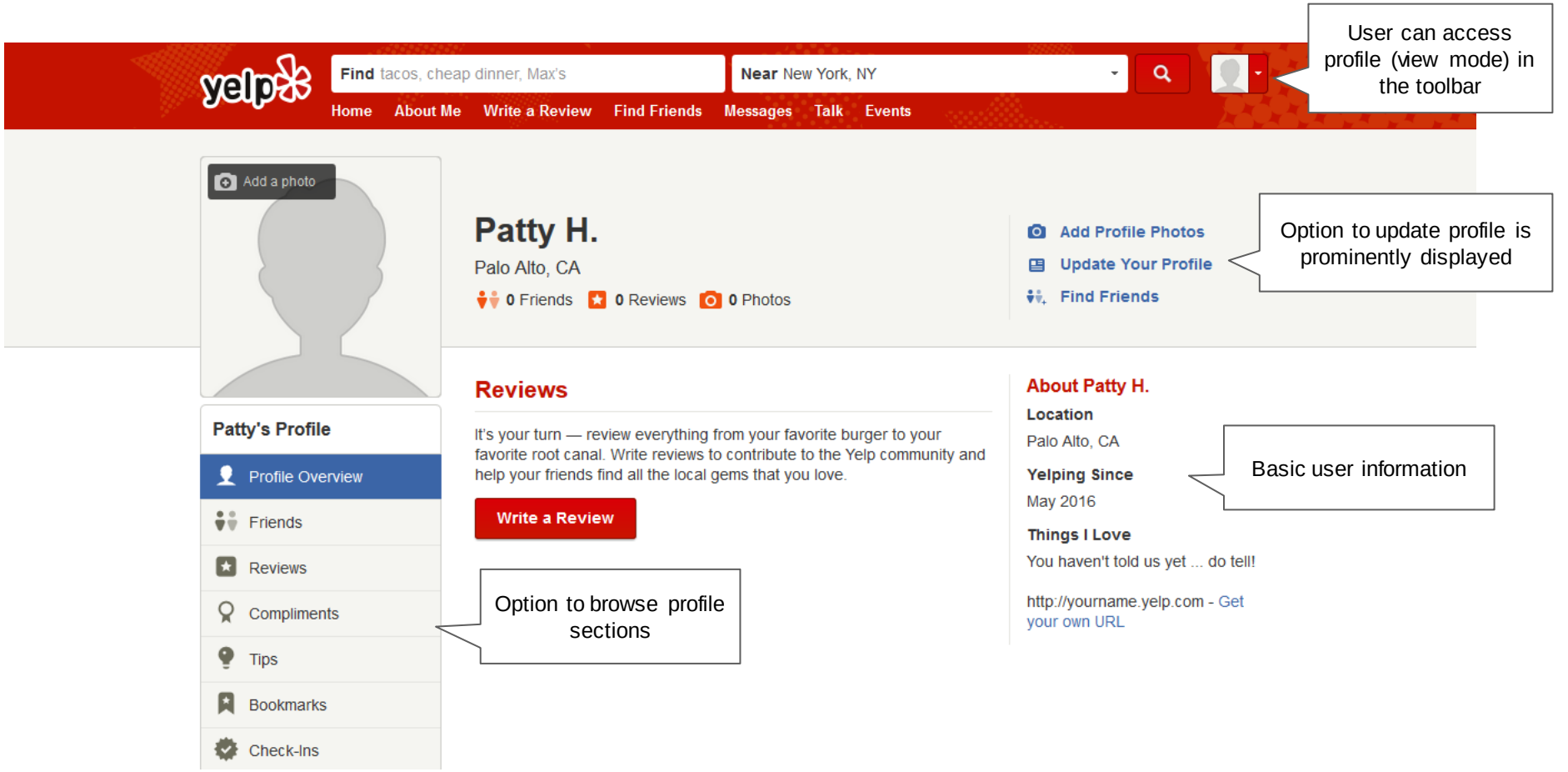
Example of incorrect account creation (account already exists)

Key takeaways:

- During the user's first attempt to create an account, this feature checks that the email address used to identify the user matches an existing email address in the database, in order to avoid creating duplicative accounts
- The user is quickly redirected to the log in option; alternatively, the user has the option to start over with the sign up process

Secondary research on feature #2: Profile

Example of a personal profile - view mode

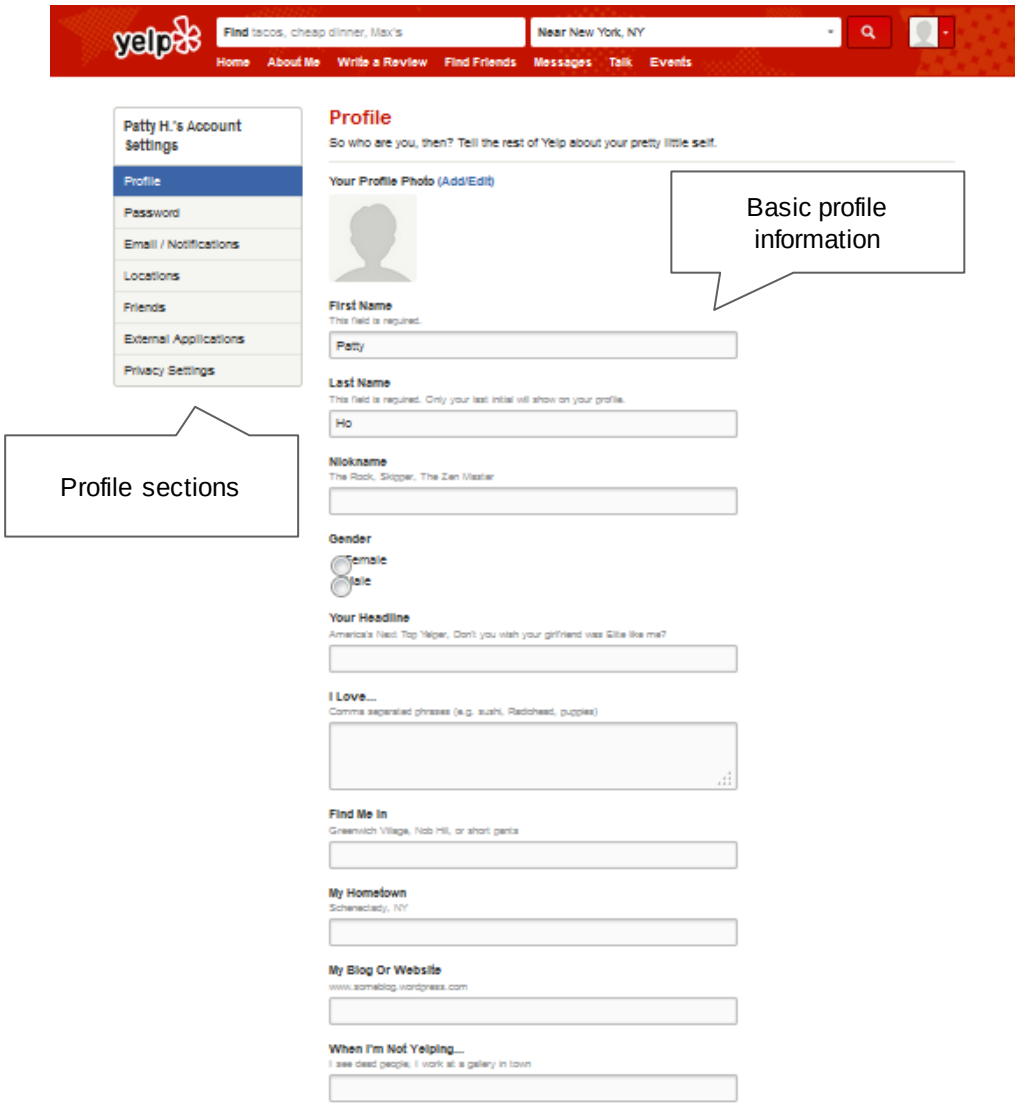


Key takeaways:

- In view mode, the personal profile displays all information provided by the user since creating the account, with placeholders for information that the user has not provided yet
- The profile information is divided into sections to keep each profile page simple and uncluttered

Secondary research on feature #2: Profile

Example of a personal profile - edit mode

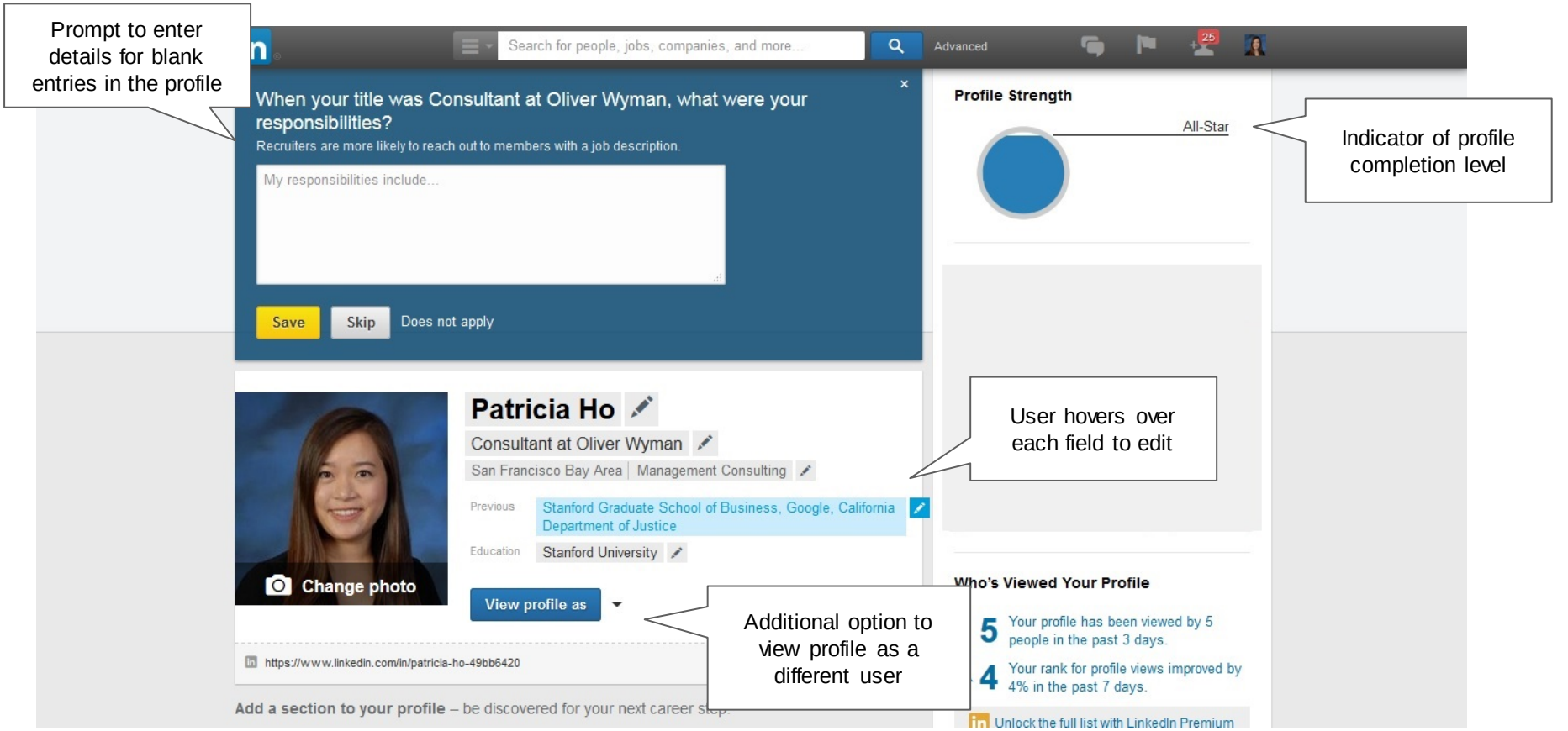


Key takeaways:

- In edit mode, the user provides basic profile information using simple text boxes for each field
- Any information already provided by the user is auto-populated and can be edited by the user
- The user can switch to different sections of the profile; each section is clean and uncluttered
- The user is not required to populate every field in the profile, which could be a limitation if profile data is meant to be collected and analyzed

Secondary research on feature #2: Profile

Example of a personal profile - combined view and edit mode

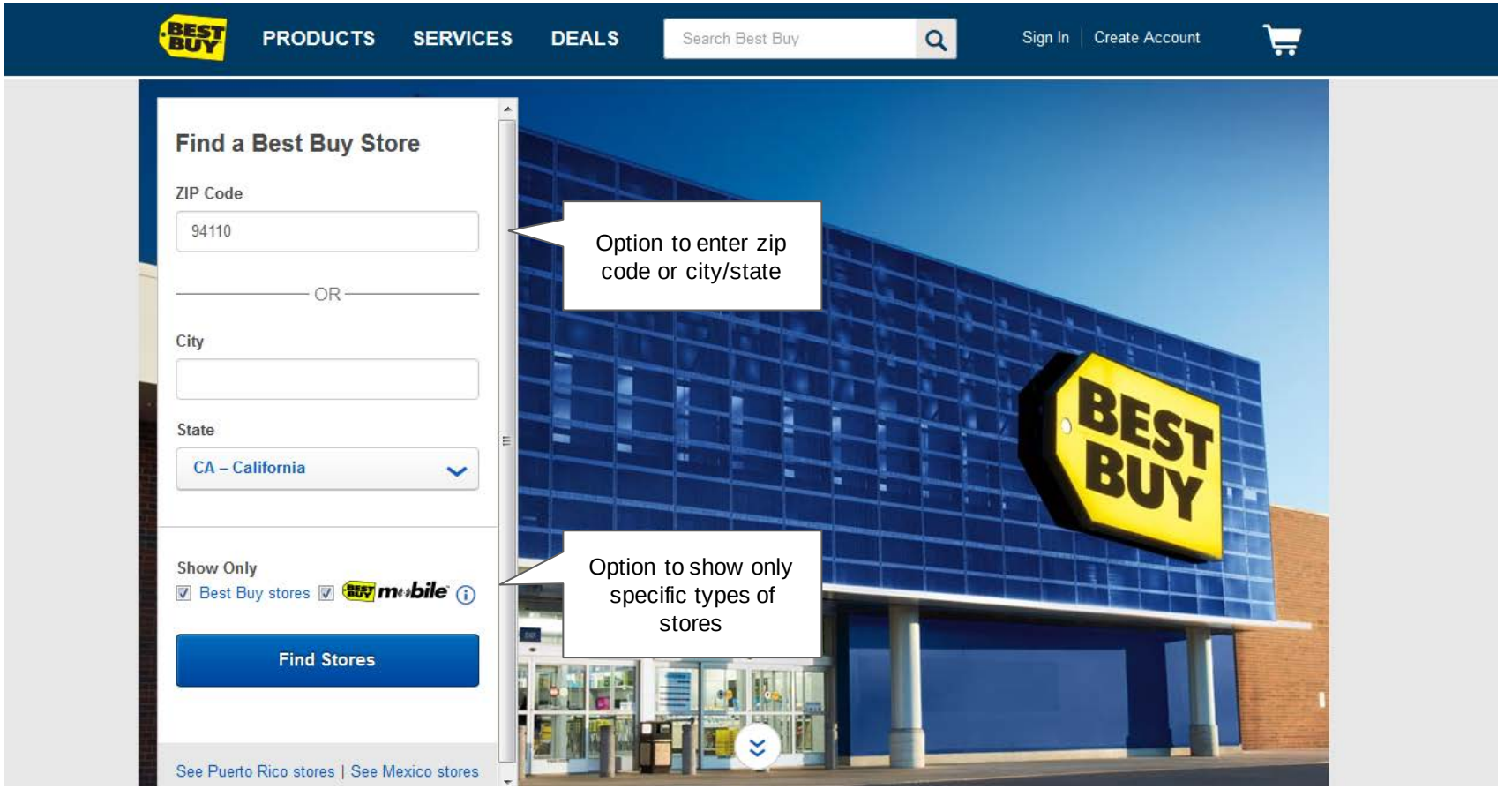


Key takeaways:

- The user can simultaneously view and edit the personal profile by hovering over each field with the mouse to edit
- The user is prompted to fill out additional details for currently blank entries via a pop up box at the top of the page for greater visibility

Secondary research on feature #3: Search

Example of a store locator tool by zip code

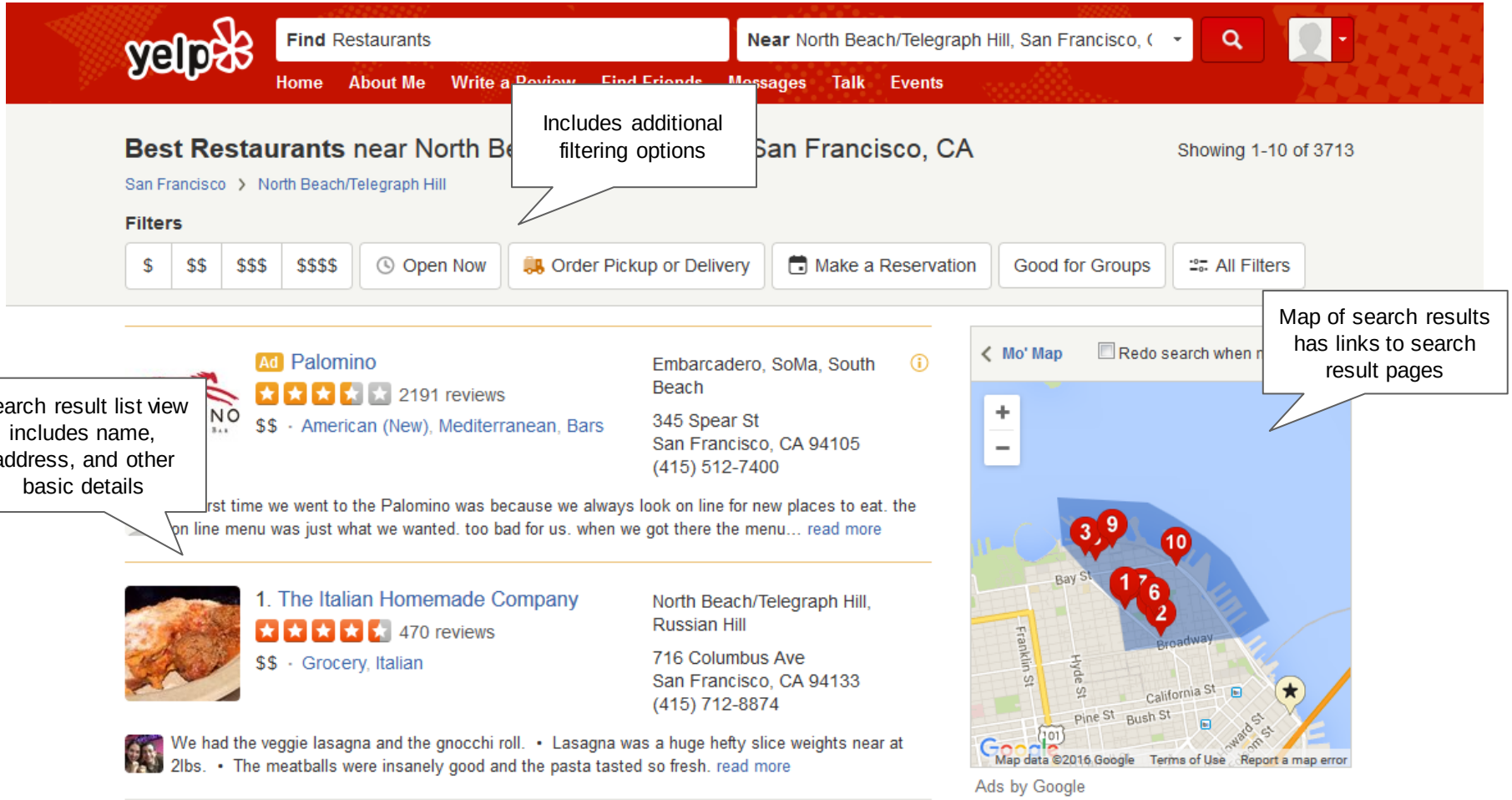


Key takeaways:

- The search tool includes two methods for searching (zip code or city) and a pre-filtering mechanism to show only the most relevant results to the user

Secondary research on feature #3: Search

Example of store locator search results

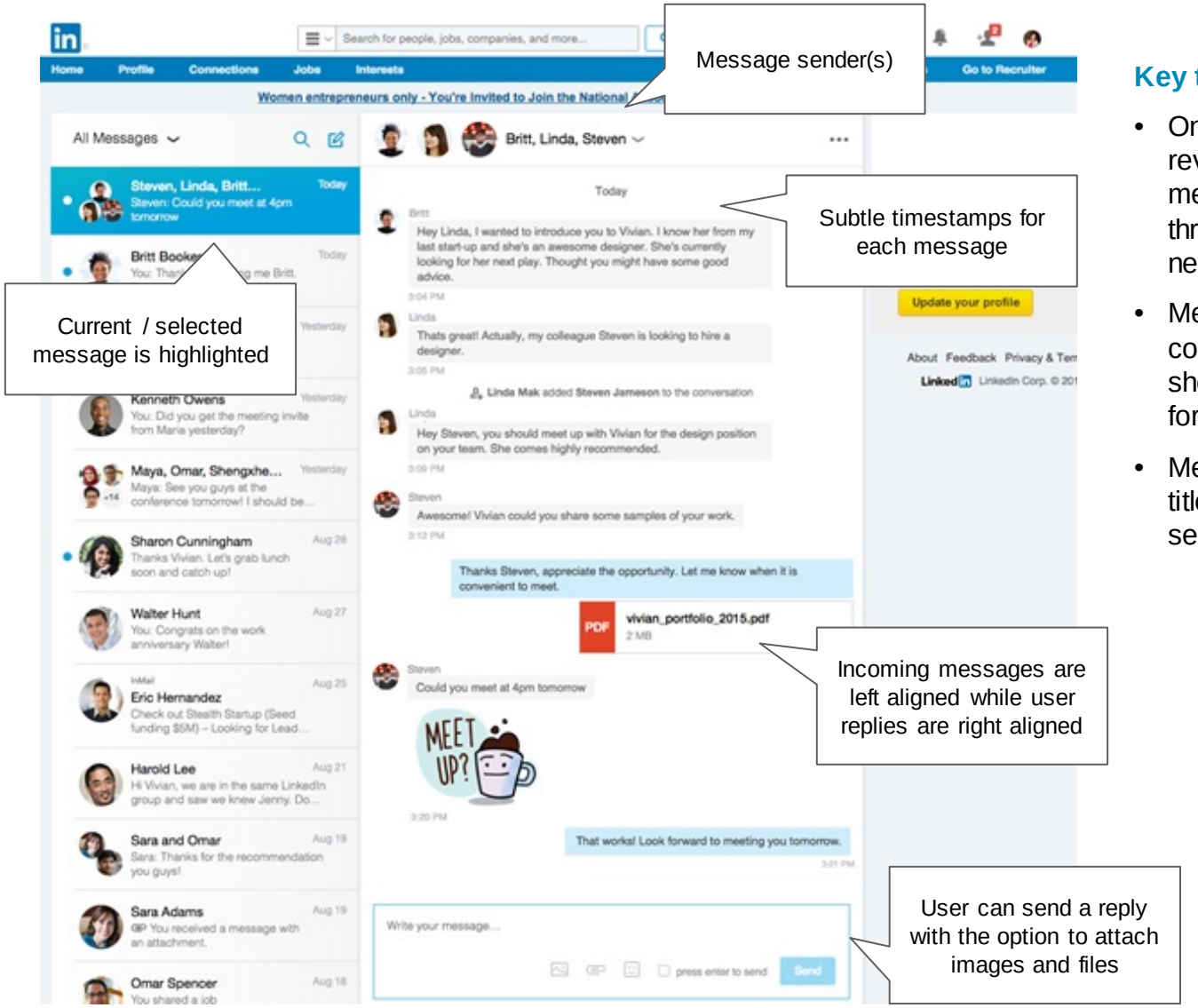


Key takeaways:

- The search results page includes both a list view and map view to help the user visualize the results
- Users can filter the list of results with additional criteria

Secondary research on feature #4: Inbox

Example of a one-page messaging tool



Key takeaways:

- On a single page, the user can review the inbox, compose a new message, or reply to an existing thread, without needing to open a new window
- Messages are sent instantly in a continuous thread emphasizing short replies as opposed to long-form emails
- Messages do not have subjects / titles and are instead grouped by sender(s)

Summary of learnings from secondary research on features

After thoroughly reviewing existing tools and comparing variations in designs, the team summarized learnings to inform the mockup drafting process

	Feature	Learnings
1	**Login**	• The first page viewed by the user after entering URL must provide two options: – Create a new account – Log into an existing account using a username • If a user enters an existing username in the "create a new account" option, they should receive an error stating "User already exists" and be redirected to the login functionality • Could provide limited functionality for guests (users without accounts) if accessed information is public – likely not the case with this prototype
2	**Profile**	• The profile should differentiate between view and edit modes; new users should be directed to the profile and prompted to fill blanks (with notifications or clear buttons/labels) • To keep the profile simple and uncluttered, it can be divided into sections on separate pages as needed • Typically the profile presents different content than the home or landing page
3	**Search**	• The search tool input can be combined with search results on a single page to reduce extra clicks / pages • The results page should ideally provide a map and list view to provide users with multiple viewing options • Users can pre-filter results while entering search inputs and criteria to narrow down the quantity of results
4	**Inbox**	• The inbox can be combined with message reading and composing capabilities to reduce clicks / pages • Messages can be grouped by sender(s) or listed individually with a subject name for each • Each message should include sender name and timestamp in addition to the message body

3.3 Storyboarding

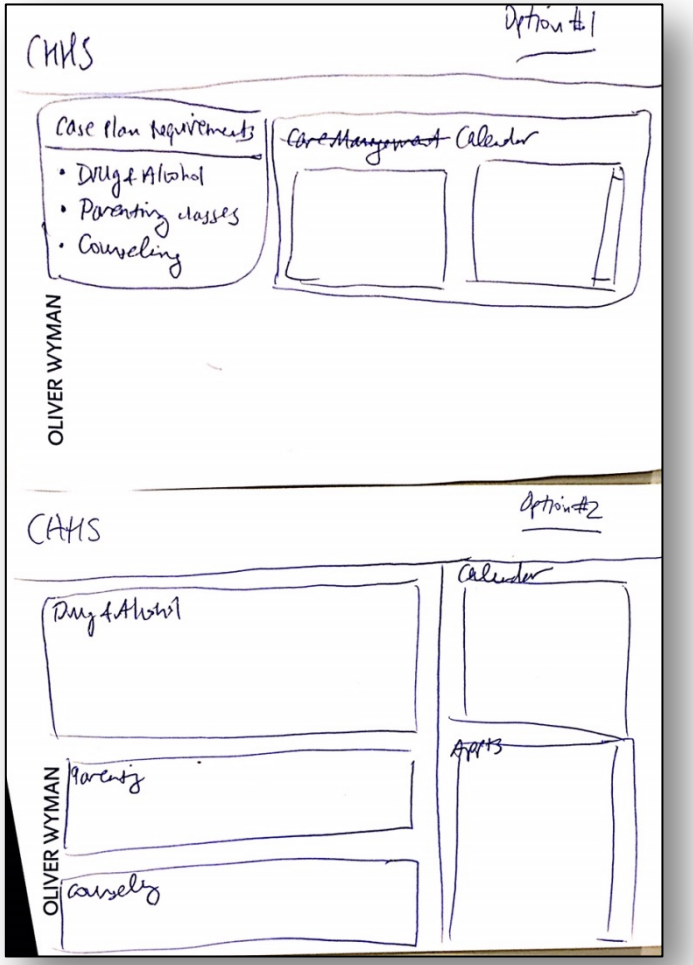
Storyboarding approach

The team created initial mockups of the prototype design before planning examples of user scenarios

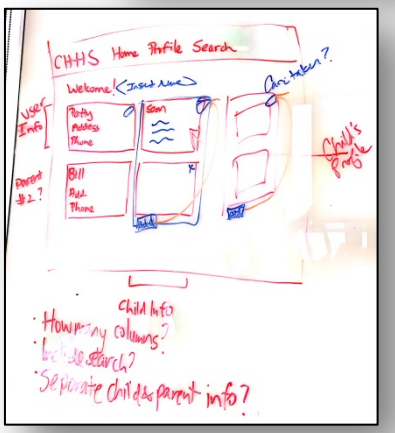
1	**Create initial mockups**	• Establish overall page structure • Ensure all requirements from the RFI are included • Draft content and initial flow
2	**Brainstorm user scenarios**	• Brainstorm problems or issues that the user might experience, in order to challenge the existing design • Identify areas in which incorrect information could be entered or produced
3	**Illustrate scenarios to refine design**	• Consolidate learnings from brainstorming process into plans for updated design • Ensure that the narrative presented is clear and straightforward

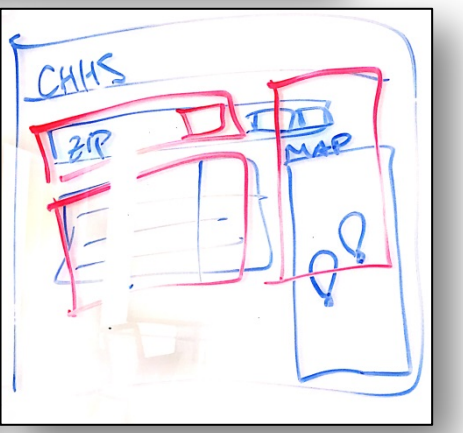
Design sketching
After discussing prototype requirements, the team sketched page designs

Example sketches
Profile and Case Management pages



Team design discussions
Profile and search pages





Feature #1: Login

Initial mockup of login page

Log In

User Name

Log In

OR

Create New Account

User Name

Parent First Name

Parent Last Name

Sign Up

Feature #1: Login

Initial mockup of home page after logging in

CHHS California Health & Human Services Agency

Child Welfare Services Care Management System

Home | Profile | Messages | Search Facilities | Sign Out

Welcome Jane!

Profile Information See All >

Foster Child Edit
Full Name: Joe Smith
Parent(s): Jane Smith, Mark Smith
Address:
10283 Crescent Dr.
Palo Alto, CA 94301

Phone Number: (650) 222-2943

Foster Child Edit
Full Name: Sam Smith
Parent(s): Jane Smith, Mark Smith
Address:
10283 Crescent Dr.
Palo Alto, CA 94301

Phone Number: (650) 222-2943

Recent Messages See All >

You have 1 new message.

Message		Date
Scott Spooner (G	To-Do List - I've share	4:40 am
Jenny Kang	Should we go to this	4:26 am
Max Stein	I won't be able to wal	12:23 am
Emily Million	Hey lady! - New rug fc	11:50 pm
Google Offers	Your second chance: c	5:40 pm
Zagat	7 Must-Try Romantic F	3:56 pm
Jonathan Pelleg	Surprise Party! - Yo, w	1:20 pm
Blitz Air	Your Flight Itinerary -	12:00 pm
Google+	Kate Baynham shared	11:26 am

Find a Facility

Zip Code

Search

Feature #2: Profile

Initial mockup of view profile page after first login (section 1 of 2)

CHHS California Health & Human Services Agency

Child Welfare Services Care Management System

Home | Profile | Messages | Search Facilities | Sign Out

My Profile

Parent Information

Jane Smith Edit
Parent of: Joe Smith, Sam Smith
Address: 10283 Crescent Dr. Palo Alto, CA 94301
Home Number: (510) 234-2453
Mobile Number: (650) 222-2943
Email Address: jane@smith.com
JS SS

Mark Smith Edit
Parent of: Joe Smith, Sam Smith
Address: 10283 Crescent Dr. Palo Alto, CA 94301
Home Number: (510) 234-2453
Phone Number: (650) 232-2342
Email Address: mark@smith.com
JS SS

Add new…

Foster Child Information

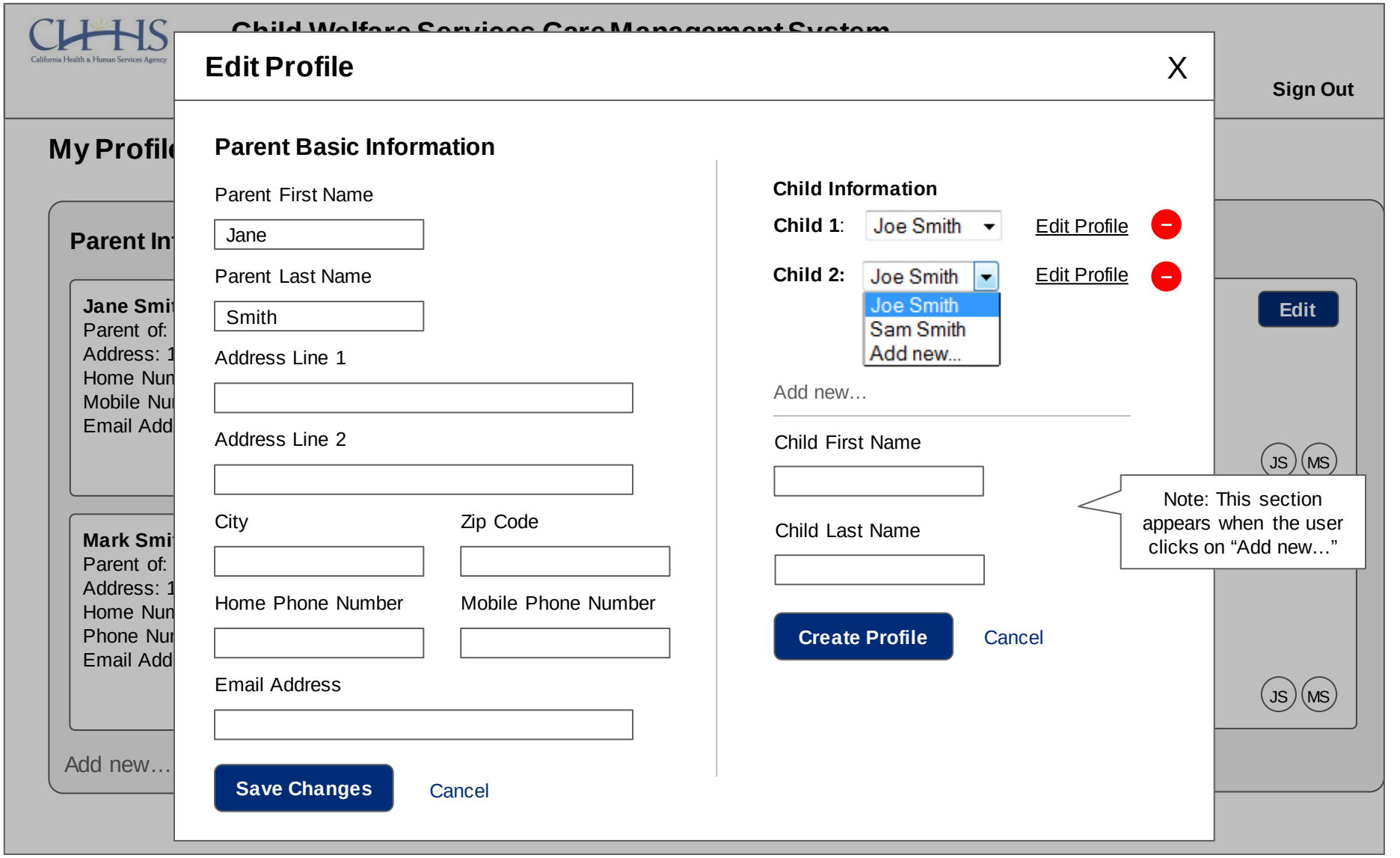
Joe Smith Edit
Parent(s): Jane Smith, Mark Smith
Date of Birth: 10/23/2001
Address: 10283 Crescent Dr. Palo Alto, CA 94301
Phone Number: (650) 222-2943
JS MS

Sam Smith Edit
Parent(s): Jane Smith, Mark Smith
Date or Birth: 5/2/2007
Address: 10283 Crescent Dr. Palo Alto, CA 94301
Phone Number: (650) 222-2943
JS MS

Add new…

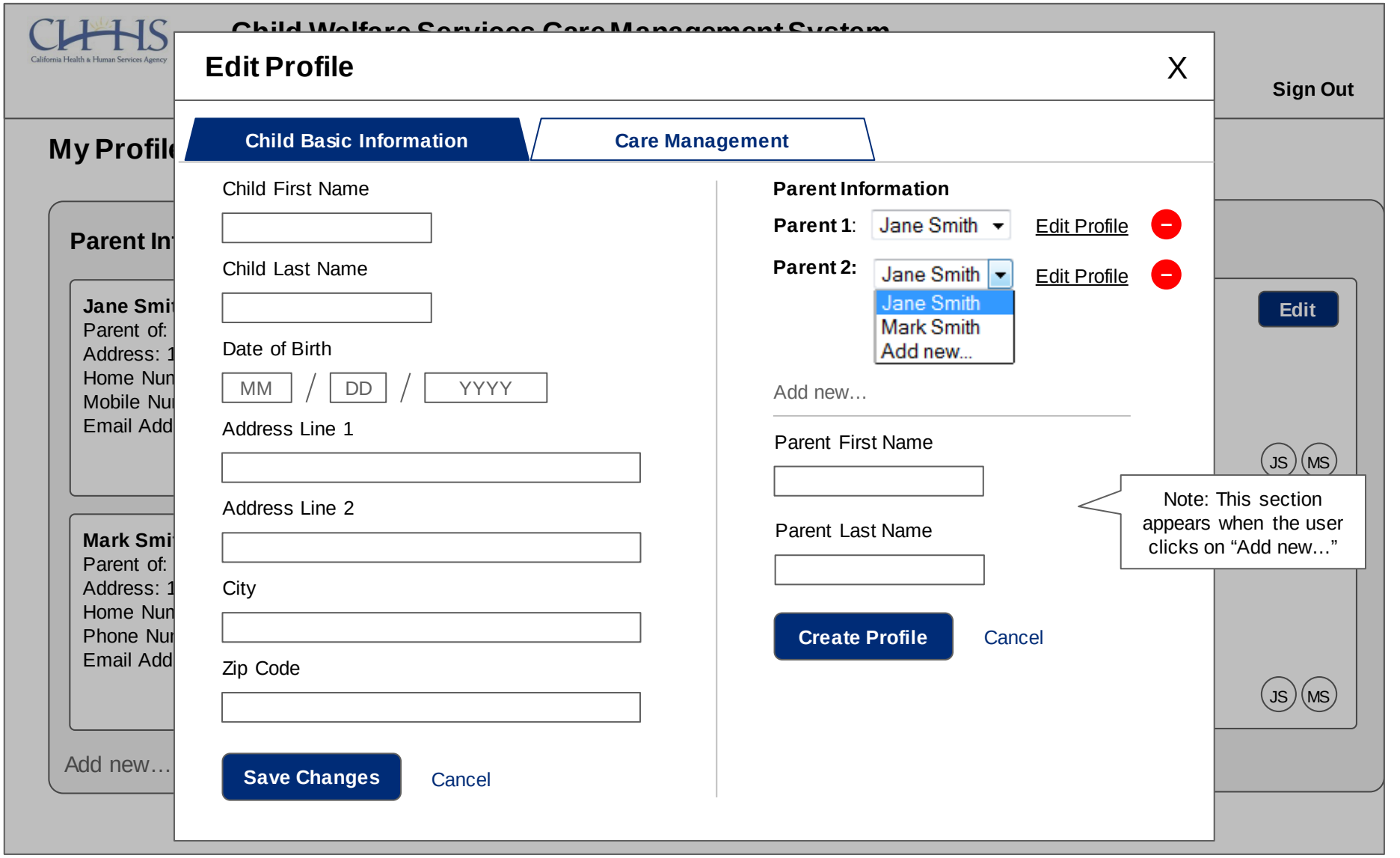
Feature #2: Profile

Initial mockup of edit profile page after first login (section 1 of 2)



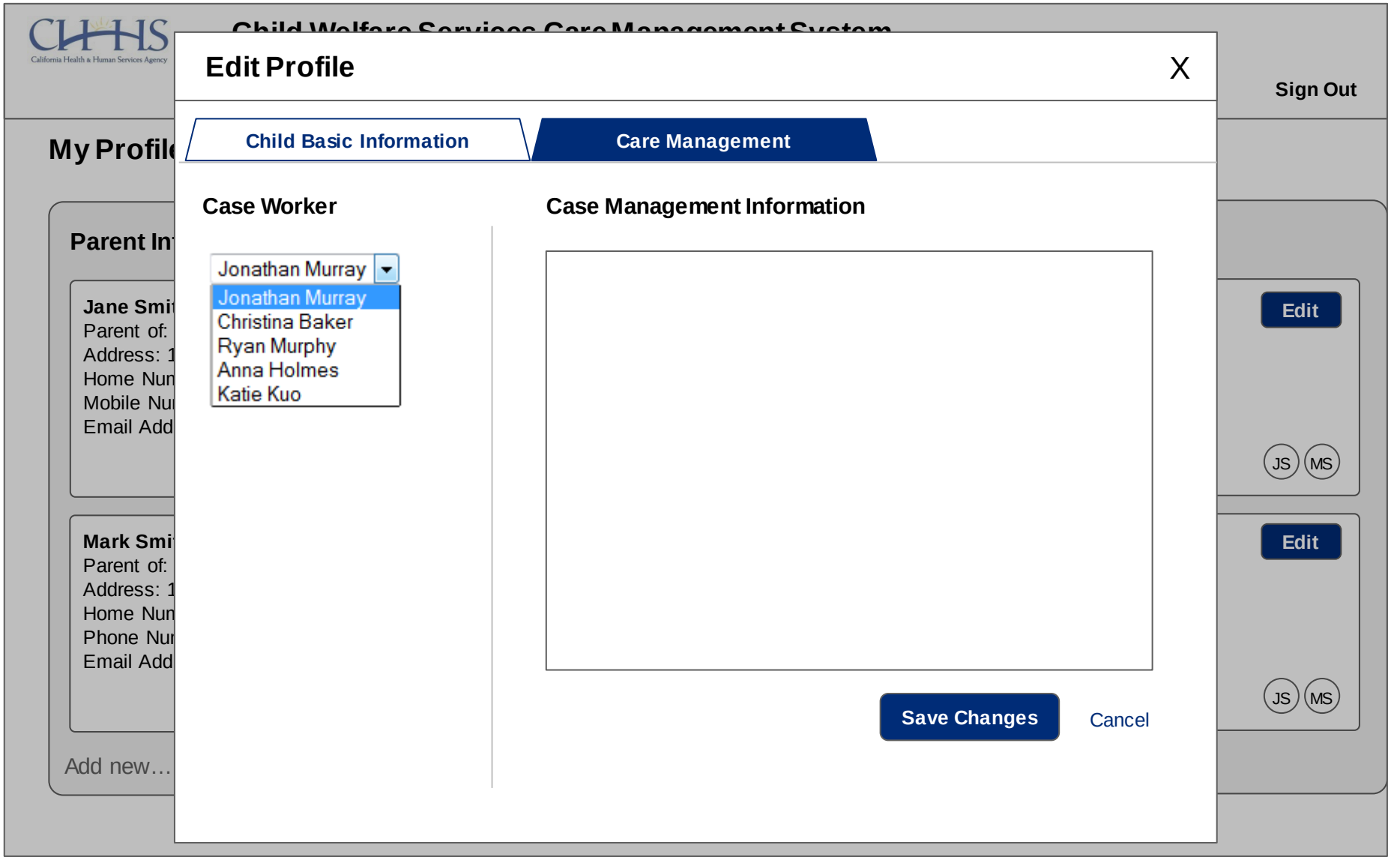
Feature #2: Profile

Initial mockup of edit profile page after first login (section 2 of 2)



Feature #2: Profile

Initial mockup of edit profile page after first login (section 2 of 2)



Feature #3: Search

Initial mockup of facility search functionality

CHHS California Health & Human Services Agency

Child Welfare Services Care Management System

Home Profile Messages Search Facilities Sign Out

Search Facilities

Zip Code 94604 ☑ Adoption Agencies ☑ Foster Family Agencies **Find Facilities** Clear Search

Alameda County Social Services Agency 401 Broadway Oakland, CA 94604	0.7 mi
AASK (Adopt a Special Kid) 401 Broadway Oakland, CA 94604	1.4 mi
AASK (Adopt a Special Kid) 401 Broadway Oakland, CA 94604	2.2 mi
AASK (Adopt a Special Kid) 401 Broadway Oakland, CA 94604	5.1 mi
AASK (Adopt a Special Kid) 401 Broadway Oakland, CA 94604	10.2 mi

Feature #4: Inbox

Initial mockup of messaging functionality

CHHS California Health & Human Services Agency

Child Welfare Services Care Management System

Home Profile Messages Search Facilities Sign Out

Messages

Inbox

Compose New

Sender	Subject	Date
Scott Spooner (Gc	To-Do List - I've shared an item wit	4:40 am
Jenny Kang	Should we go to this concert? - I	4:26 am
Max Stein	I won't be able to walk your dog t	12:23 am
Emily Million	Hey lady! - New rug for our place?	11:50 pm
Google Offers	Your second chance: don't miss ou	5:40 pm
Zagat	7 Must-Try Romantic Restaurants;	3:56 pm
Jonathan Pelleg	Surprise Party! - Yo, was thinking a	1:20 pm
Blitz Air	Your Flight Itinerary - Hi Jess, Atta	12:00 pm
Google+	Kate Baynham shared a post with y	11:26 am

Message

Mary Miller

March 15, 8:45am

Hi Jane,

I want to schedule our next meeting with Joe for April. Please let me know when you will be available to meet.

Thanks,
Mary

Write your message…

Send

Extra feature: Care management page

Initial mockup of care management page with appointments and trainings

CHHS California Health & Human Services Agency

Child Welfare Services Care Management System

Home | Profile | Messages | Search Facilities | Care Management | Sign Out

Care Management Information

Case Worker Information

Mary Miller Edit
Case worker for:
Joe Smith, Sam Smith
Address:
10283 Crescent Dr.
Palo Alto, CA 94301
Phone Number: (650) 222-2943
Email Address: mary@acssa.org
JS SS

Add new…

Care Management Appointments

May 2016

S	M	T	W	T	F	S
24	25	26	27	28	29	30
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

June 1, 2016 – 5 PM
Case worker visit

June 15, 2016 – 8 PM
Local agency meeting

July 1, 2016 – 5 PM
Case worker visit

Add New

Parent Training Information

Edit

Trainings to complete

Practical Tools for Foster Parents Due Date: 5/22/16
4 days remaining

Completed trainings

Introduction to Foster Care Completed on: 5/6/15

Scenario brainstorming and updates to design

After creating initial mockups, the team discussed additional use cases and embellishments to the tool beyond the explicit RFI instructions

Scenario	Suggested updates to design	Result / Rationale
Existing login credentials	• User enters a username in the "create new account" section – If the username has already been saved in the past, the tool alerts the user that an error has occurred and prompts the user to enter a different username or log in using the initial username entry – If the username entered has not already been used previously, the tool directs the user to the home page	• Added all suggested updates
Messaging capabilities	• User may need to perform the following messaging capabilities: – Review sent messages – Trash messages – Compose message to multiple recipients	• Added all updates except ability to compose messages to multiple recipients, as parent communication is likely restricted to case workers only
Search for specific facility types	• In addition to searching by zip code, the user may want to filter facilities based on their category or type (e.g. exclude closed or pending facilities) • In the search results list view, the user should be able to preview additional details about each facility, including address and administrator name and contact	• Added all suggested updates; added "open facilities only" filter
Linking children and parents	• User should be able to link children and parents in both directions: – On each child's edit profile page, the user should be able to select parent names from a drop-down or add a new parent name if needed – On each parent's edit profile page, the user should be able to select child names from a drop-down or add a new child name if needed • Changes made in either of the above steps should be reflected across the website	• After clarifying that users are birth parents, decided that the parent-child linking feature would not be necessary • Instead, added "additional caretakers" to profile that can be linked to children

3.4 Usability testing

Usability testing plan
Two usability testing sessions were held on 5/31 and 6/7

Component	Description
Scope	• First and second tool iterations; first iteration includes login and search only, second iteration includes all pages • Focus is on navigation; will also ask for feedback on content
Purpose	• Can the users navigate to important information from the home page? • Which navigation methods are used most (i.e. toolbar or links within body of page)? • Can the users easily understand the information that is being presented?
Sessions	• **2 in-person sessions** lasting 30 minutes each, including tool introduction, prompts, and review session – 2 users in session #1 (both using laptops) – 2 users in session #2 (1 using laptop, 1 using iPhone) • Each participant will perform use cases / scenarios based on prompts (*see next page for prompts*) • Session to be facilitated by User Researcher and notes/observations to be recorded by Delivery Manager
Equipment	• Laptop (PC and Mac) and smartphone (iPhone and Android)
Participants	• 4 participants with varying levels of experience with usability testing and computer expertise and no prior involvement in design work or development of the product
Metrics	• Quantitative metrics (measured during demo): – Successful task completion rate for each user (# of prompts correct / # of prompts) – # of critical errors for each user (deviation from scenario target) – # of non-critical issues for each user (inefficient use or points of confusion) – Error-free rate of the group (# of participants with no errors / # of total participants) • Qualitative ratings (asked during and immediately after session): – How easily were you able to perform the prompts in this tool? – Did you experience any problems? Did you find any features to be confusing? – What did you like about the tool? What did you dislike? – Any other comments or recommendations?

Usability testing scenario prompts for each session

During each session, users were asked to complete the following prompts to test individual features of the tool

Testing scenarios – prompts for session #1

- Can you create a new account?
- Can you login using your created username?
- Can you find an **open** facility in the zip code **94103**?
- Can you edit the **zip code** in your profile?
- Can you add a **child** to the profile?
- Can you add an **additional guardian** to the child's profile?

Testing scenarios – prompts for session #2

- Can you create a new account, then login using your created username?
- Can you find an **open** facility in the zip code **94103**?
- Can you edit the **zip code** in your profile?
- Can you add a **child** to the profile?
- Can you add an **additional guardian** to the child's profile?
- Can you compose and **send a message** to your case worker?
- Can you edit the child's birth date to be **January 18, 2007**?

Usability testing session #1 – Feedback (1 of 2)

The user completed all prompts successfully but experienced some points of confusion with the login and edit profile tools

Issues

- **Login page**: User tried signing in twice before realizing that she needed to create an account
  - **Solution**: Need to add more help text to the login page or update the structure to guide this process
- **Profile**: User expected the edit profile window to close after entering zip code and hitting "Save Changes" button – when it didn't, she questioned whether the zip code had actually saved.
  - **Solution**: The Save Changes button should close the window, perhaps followed by a pop up notification saying "Your changes are saved"
- **Search tool**: After entering a zip code and hitting enter, no results appeared under the table heading, which makes it seem like the tool is not responding.
  - **Solution**: Add a notification when there are no search results for the zip code entered.

Suggestions

- User's focus is on the body of the home page, not the tool bar, so she was drawn to the notification about “1 new message” and it took some extra time to know where to find the Search Facilities link in the tool bar.
- It would be helpful to have more instructions via a walk through on the landing page.

Metrics

- **Quantitative metrics:**
  - All prompts completed successfully; 1 prompt required guidance
  - No critical errors (deviation from scenario target)
  - 3 non-critical issues (inefficient use or points of confusion)
- **Qualitative feedback**:
  - Hardware used: Laptop
  - Ease of use: Navigating through the tool was fairly easy, but some of the tool’s results / information was unclear
  - Likes: Clear layout / structure
  - Dislikes: Extra clicks required

Usability testing session #1 – Feedback (2 of 2)
The user identified gaps in content within the profile and search results

Issues

- **Login page**: User tried signing in before realizing that she needed to create an account (same issue as previous user)
  - **Solution**: Need to add more help text to the login page or update the structure to guide this process
- **Search**: User was confused by the "closed" facility status (i.e. does "closed" mean that the facility is closed indefinitely, in which case it would not be useful information for a parent)
  - **Solution**: Consider only showing search results for facilities that are open.

Suggestions

- Add a notification or count to indicate when there are no search results for a given zip code
- Not actionable in the prototype, but suggestions for future reference:
  - Potentially add links to agencies and facility hours
  - Add search results for facilities in nearby zip codes
  - Fix data issues in the facilities data (i.e. duplicates)

Metrics

- **Quantitative metrics:**
  - All prompts completed successfully; 1 prompt required guidance
  - No critical errors (deviation from scenario target)
  - 2 non-critical issues (inefficient use or points of confusion)
- **Qualitative feedback**:
  - Hardware used: Laptop
  - Ease of use: Completing the prompts was fairly easy, with some minimal points of confusion
  - Likes: Interactive map with pop ups and reactive table (hovering)
  - Dislikes: Map search results were confusing at times

Usability testing session #2 – Feedback (1 of 2)

The user completed all prompts successfully but experienced some points of confusion with the login and edit profile tools

Issues

- **Search tool**: User thought the search tool looked blank before entering a zip code, as the search results table initially has no information.
  - **Solution**: Add zip code as an input into the "Create an Account" page; this will be used as the default entry for the Search Facilities tool.
- **Care management**: Case plan requirements list is very long; user needed to scroll past the calendar on the right hand side, which limits the user's ability to view both features simultaneously.
  - **Solution**: Add a scroll bar to the "Case Plan Requirements" left panel so that both panels can be viewed simultaneously.

Suggestions

- Add more detail on the parent's profile page – the current details on name, and zip code details seem insufficient

Metrics

- **Quantitative metrics:**
  - All prompts completed successfully without guidance
  - No critical errors (deviation from scenario target)
  - 2 non-critical issues (inefficient use or points of confusion)
- **Qualitative feedback**:
  - Hardware used: Laptop
  - Ease of use: Easy to navigate and complete prompts
  - Likes: Care management calendar and details
  - Dislikes: Blank search tool

Usability testing session #2 – Feedback (2 of 2)

The user completed all prompts successfully but experienced some points of confusion with the login and edit profile tools

Issues

- **Profile**: User entered a typo for the child's birth date (i.e. "207" instead of "2007"), which caused an incorrect date value to save; this happens more easily when the user is typing on a phone.
  - **Solution**: Bind the birthdate input to a date value.

Suggestions

- User noted that the inbox looked blank; suggested adding a default "Welcome" message

Metrics

- **Quantitative metrics:**
  - All prompts completed successfully; 1 prompt required guidance
  - No critical errors (deviation from scenario target)
  - 1 non-critical issues (inefficient use or points of confusion)
- **Qualitative feedback**:
  - Hardware used: iPhone
  - Ease of use: Completed all prompts quickly and efficiently
  - Likes: Easy to navigate on the phone
  - Dislikes: Typos were not caught by the tool

Summary of feedback from usability testing and solutions

After aggregating user feedback, the team determined whether it was appropriate to add suggested solutions to the final tool

Session	Feedback	Suggested Solution	Result / Rationale
1	Login page is confusing; users try to sign in multiple times before creating an account	Add a clearer notification stating that the username is not recognized, instructing user to create account	✓ Added
	Not clear when profile edits are saved	When the user hits the "Save Changes" button, the edit profile modal should close with a notification	✓ Updated edit profile modal to close but did not add notification (would add extra click to close pop-up)
	Not clear whether the search tool has processed a request when the tool does not yield any results (table does not change after submitting zip code)	Add a notification or visual to indicate that the search input was processed, but that there are no results for the entered criteria	✓ Added a results counter to clarify when results have not been found
2	Search tool looks blank when no zip code is entered	Add zip code as an input into the "Create an Account" page; this will be used as the default entry for the Search Facilities tool so that it is automatically populated	✓ Added
	Child's birth date input allows for any string value / typos	Bind the birthdate input to a date value	✓ Added
	Parent profile page seems sparse / minimal	Add more detail on the parent's profile page – the current details on name, and zip code details seem insufficient	× Did not add more parent inputs to limit unnecessary personal information
	Inbox looks blank during initial login	Add a Welcome message to inbox	✓ Added
	Case management requirements panel is very long	Add a scroll bar to panels with long tables to cap their length	✓ Added

4 Agile development approach

Agile approach and core principles

Oliver Wyman uses a rapid, flexible, and iterative development approach to gather feedback regularly and respond to change with continuous delivery

For the user, by the user

- Focus on what the user really needs
- Establish user needs up front and agree on the scope of work for the development team
- Continue gathering regular feedback from users to drive development
- Define and prioritize an evolving list of user stories based on user feedback

Continuous improvement

- Conduct sprints to discover, design, develop and test features agreed upon by the Product Manager and development team
- Hold standups and retrospectives to identify areas for improvement and make adjustments
- Enable the team to make small improvements continuously in order to drive better results

Visibility and feedback

- Provide high visibility into project progress and product evolution at all levels
- Create a fast feedback loop by gathering high-quality feedback (via sprint demos) and delivering results early and often
- React quickly after identifying issues early on (e.g., a test failed which may indicate a bug)

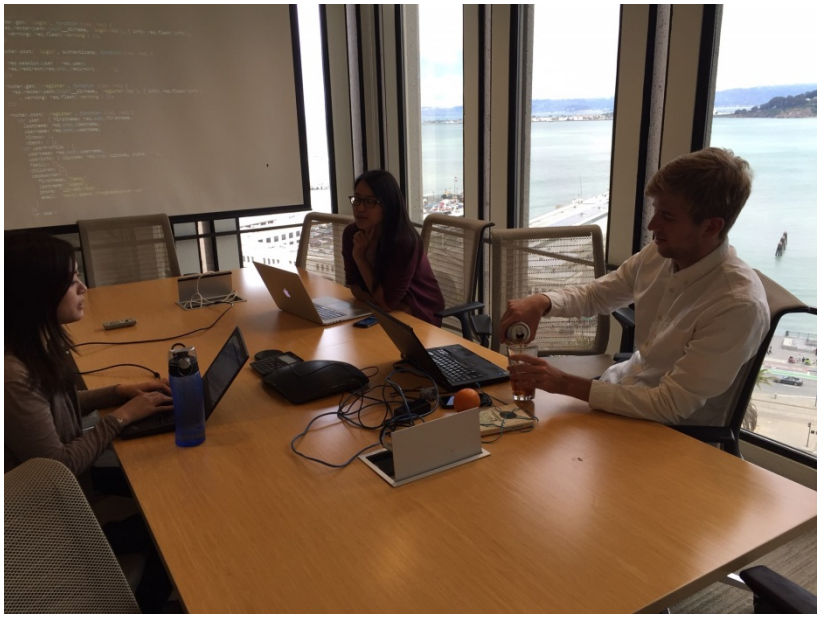
All Agile team members are committed to collaborating, managing work, delivering rapid iterations, and finding ways to improve

Team collaboration methods

To the extent possible, the team worked side by side to ensure user needs were being delivered and to quickly resolve development issues

Collaboration meetings

- **Backlog refinement (weekly)**
  - Prepare User Stories so they are ready for development
  - Detail acceptance criteria for each Story
- **Sprint planning (weekly, at start of sprint)**
  - Team commits to deliver specific User Stories during Sprint
- **Team stand-ups (daily)**
  - Discuss how each team member's tasks might affect others on the team
  - Identify blockers/impediments – Delivery Manager to note and work to remove
- **Sprint demos (weekly, last two weeks of project)**
  - Team demonstrates the work completed during the Sprint
  - Product Manager and User Researcher provide feedback
  - User Stories are marked as Done on the backlog
- **Sprint retrospectives (weekly, at end of sprint)**
  - Team identifies what went well and what needs improvement
  - Outcome is 1-2 action items to improve for the next Sprint
- **Continuous discussion and development**
  - Teams discuss questions and issues on an ongoing basis in person or via video conference, instant message, or comment



Development tools by requirement

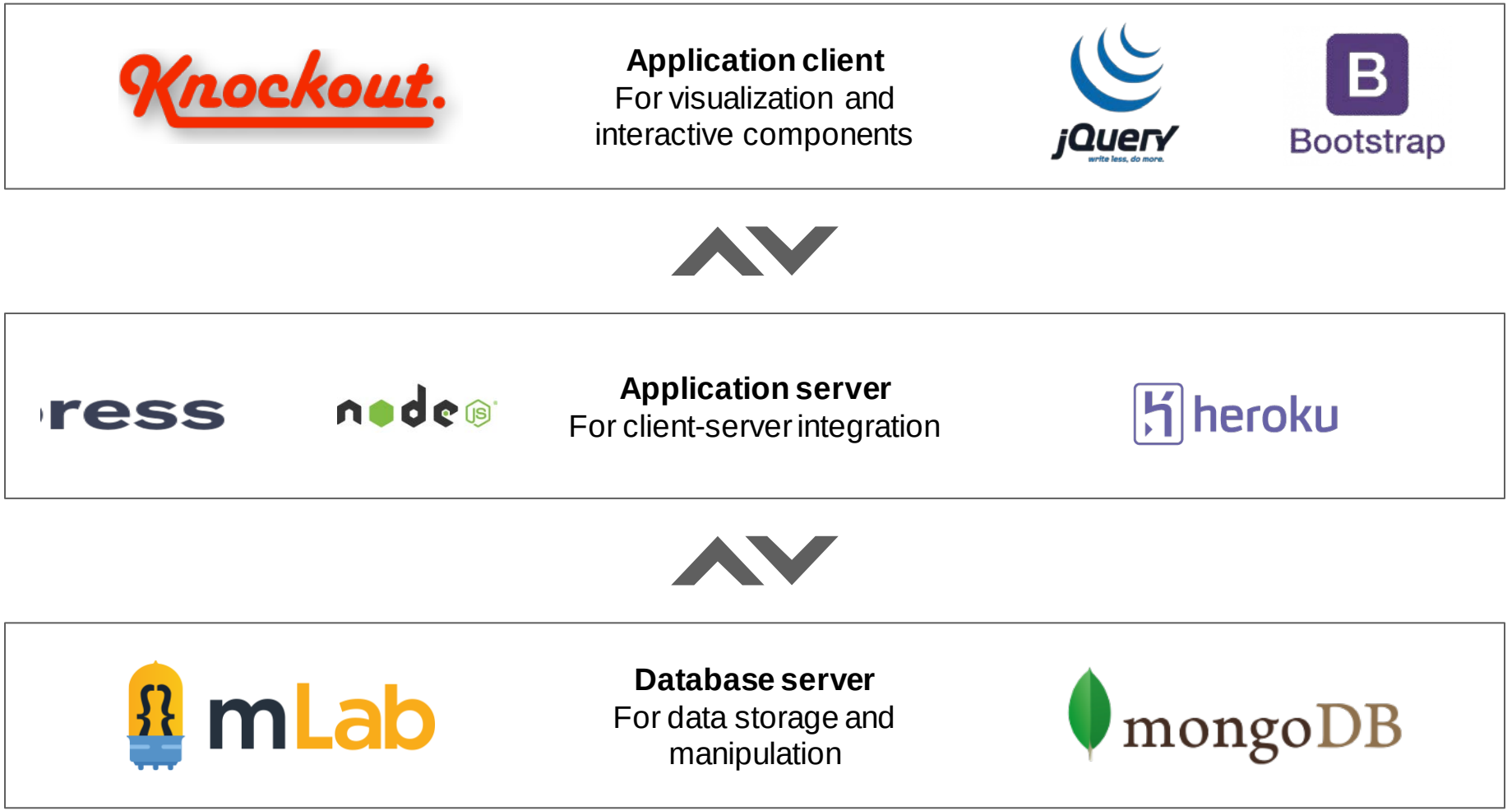
Summary of tools used in prototype that fulfill RFI technical requirements

	Technical requirement	Tools used
h	Created a prototype that works on multiple devices, and presents a responsive design	• Front-end framework based on Bootstrap used to ensure responsive design that works on Web browser and phone
i	Used at least five modern (see Note #2) and open-source technologies, regardless of architectural layer (frontend, backend, etc.)	• Docker, Jenkins, MongoDB, Node.js, Knockout
j	Deployed the prototype on an Infrastructure as a Service (IaaS) or Platform as Service (PaaS) provider, and indicated which provider they used.	• Heroku used as PaaS provider
k	Developed automated unit tests for their code	• Mocha/Chai used for testing
l	Setup or used a continuous integration system to automate the running of tests and continuously deployed their code to their IaaS or PaaS provider.	• Jenkins used for continuous integration
m	Setup or used configuration management	• Git used for configuration management
n	Setup or used continuous monitoring	• New Relic used for continuous monitoring
o	Deployed their software in a container (i.e., utilized operating-system-level virtualization)	• Docker used to create container
p	Provided sufficient documentation to install and run their prototype on another machine	• README file in Git repository
q	Prototype and underlying platforms used to create and run the prototype are openly licensed and free of charge	• Docker, Jenkins, MongoDB, Node.js, Knockout • This project is licensed under the terms of the GPL license

Additional project management tools: HipChat, Join.Me, and Confluence (*see slides 76-81 for details*)

Application architecture

The team used a JavaScript-based architecture for client and server-based business logic, supported by a carefully selected set of modern frameworks



Description of technologies used

Application development work is based on beta version of an in-house framework using a curation of current open-source technologies

Browser-side

- We use a model-view-view model architecture powered by Knockout.js, with extensive use made of components and some custom bindings
- Overall layout and styling is managed using Bootstrap
- Single page application routing is handled through pager.js
- jQuery is used directly only sparingly (largely for Ajax calls to APIs)
- Other libraries within the framework include:
  - Select2 for improved controls
  - lodash for cleaner array manipulation
  - bower and require for dependency management

Server-side

- We use node.js as our application server due to ease of horizontal scaling, cross-platform suitability and overall simplicity
- Express is used to enhance the route handling and management capabilities of node
- Sequelize serves as our ORM for SQL-based and we use Mongoose for NoSQL, with MongoDB as our preferred option
- We prefer to use SAML authentication managed by passport.js and associated libraries
- Other libraries include:
  - lodash for cleaner array manipulation
  - npm for dependency management
  - moment for date manipulation

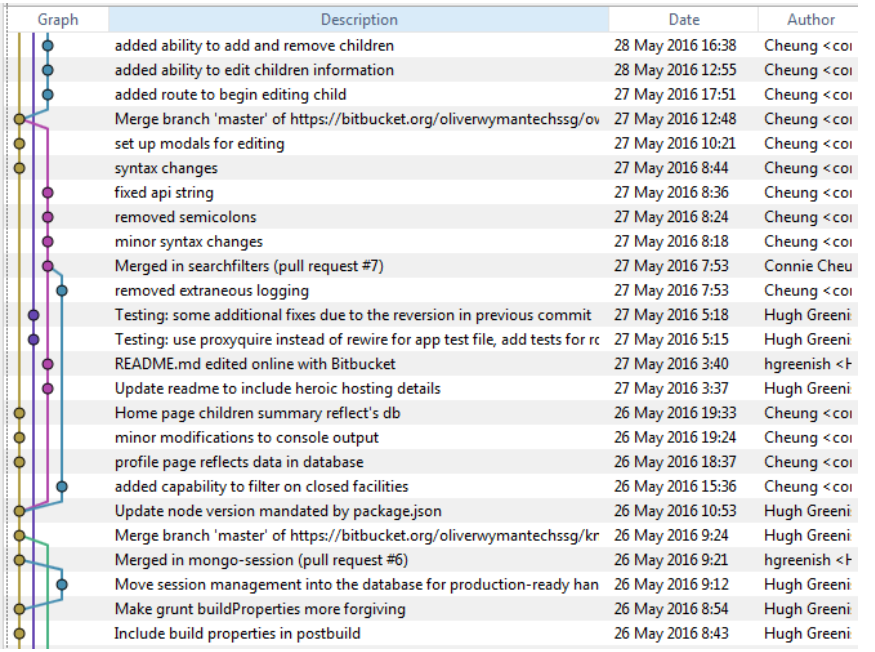
Development framework

- We use grunt as our task runner with live-reload integrated for ease of review of code changes
- For our JavaScript components, we use eslint to improve the readability and consistency of code
- We use cloud-based version control with Git hosted on a private Bitbucket instance
  - Changes to code are subject to peer review through pull request prior to merging
- We use Mocha and Chai for unit testing
- These testing frameworks are referenced by our continuous integration framework (Jenkins)
- We have specific testing tools available where required (i.e. Veracode for static / dynamic security and Gatling.io for performance)

Configuration management
The team used Git / Bitbucket to maintain version control during development

Configuration management using Git

- The team used Git to maintain version control in changes to source code by multiple team members, who used the following process:
  - **Create branches** for team members to make changes on different features of the application concurrently in independent workflows
  - **Add and commit changes** made to branches with a message detailing the changes made
  - **Submit a pull request** for changes made to each branch; each pull request needs to be **reviewed and approved** by another team member, who provides comments and feedback
  - **Merge changes** to the master branch after requests are approved
  - **Pull changes** from the Git repository after other team members have merged their changes
- The full history of changes in the repository can be reviewed and managed using a visualization tool such as SourceTree
- After completing the development process on Bitbucket, the team moved the repository to Github to ensure that the prototype is open-sourced



Graph	Description	Date	Author
	added ability to add and remove children	28 May 2016 16:38	Cheung <coı
	added ability to edit children information	28 May 2016 12:55	Cheung <coı
	added route to begin editing child	27 May 2016 17:51	Cheung <coı
	Merge branch 'master' of https://bitbucket.org/oliverwymantechssg/ov	27 May 2016 12:48	Cheung <coı
	set up modals for editing	27 May 2016 10:21	Cheung <coı
	syntax changes	27 May 2016 8:44	Cheung <coı
	fixed api string	27 May 2016 8:36	Cheung <coı
	removed semicolons	27 May 2016 8:24	Cheung <coı
	minor syntax changes	27 May 2016 8:18	Cheung <coı
	Merged in searchfilters (pull request #7)	27 May 2016 7:53	Connie Cheu
	removed extraneous logging	27 May 2016 7:53	Cheung <coı
	Testing: some additional fixes due to the reversion in previous commit	27 May 2016 5:18	Hugh Greeni
	Testing: use proxyquire instead of rewire for app test file, add tests for rc	27 May 2016 5:15	Hugh Greeni
	README.md edited online with Bitbucket	27 May 2016 3:40	hgreenish <h
	Update readme to include heroic hosting details	27 May 2016 3:37	Hugh Greeni
	Home page children summary reflect's db	26 May 2016 19:33	Cheung <coı
	minor modifications to console output	26 May 2016 19:24	Cheung <coı
	profile page reflects data in database	26 May 2016 18:37	Cheung <coı
	added capability to filter on closed facilities	26 May 2016 15:36	Cheung <coı
	Update node version mandated by package.json	26 May 2016 10:53	Hugh Greeni
	Merge branch 'master' of https://bitbucket.org/oliverwymantechssg/kr	26 May 2016 9:24	Hugh Greeni
	Merged in mongo-session (pull request #6)	26 May 2016 9:21	hgreenish <h
	Move session management into the database for production-ready han	26 May 2016 9:12	Hugh Greeni
	Make grunt buildProperties more forgiving	26 May 2016 8:54	Hugh Greeni
	Include build properties in postbuild	26 May 2016 8:43	Hugh Greeni

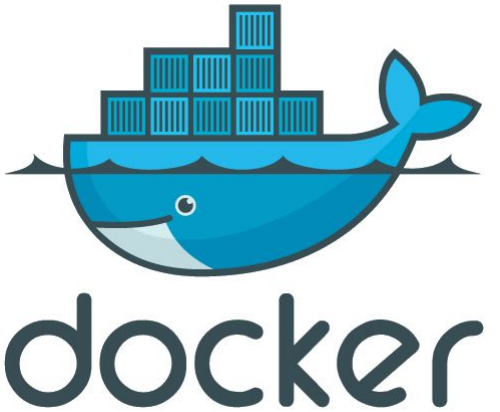
4.1 Open-source technologies

Open-source technologies: Docker

The team used Docker for containerization to package the application and its dependencies into a standardized unit for software development

About Docker[1]

- Docker is the leading containerization product and allows the team to efficiently and automatically spin up entire hosting environments.
  - Containers have similar resource isolation and allocation benefits as virtual machines but a different architectural approach allows them to be much more portable and efficient.
- Docker containers are based on open standards allowing containers to run on all major Linux distributions and Microsoft operating systems with support for every infrastructure.
- Containers running on a single machine all share the same operating system kernel so they start instantly and make more efficient use of RAM. Images are constructed from layered filesystems so they can share common files, making disk usage and image downloads much more efficient.
- Containers isolate applications from each other and the underlying infrastructure while providing an added layer of protection for the application.



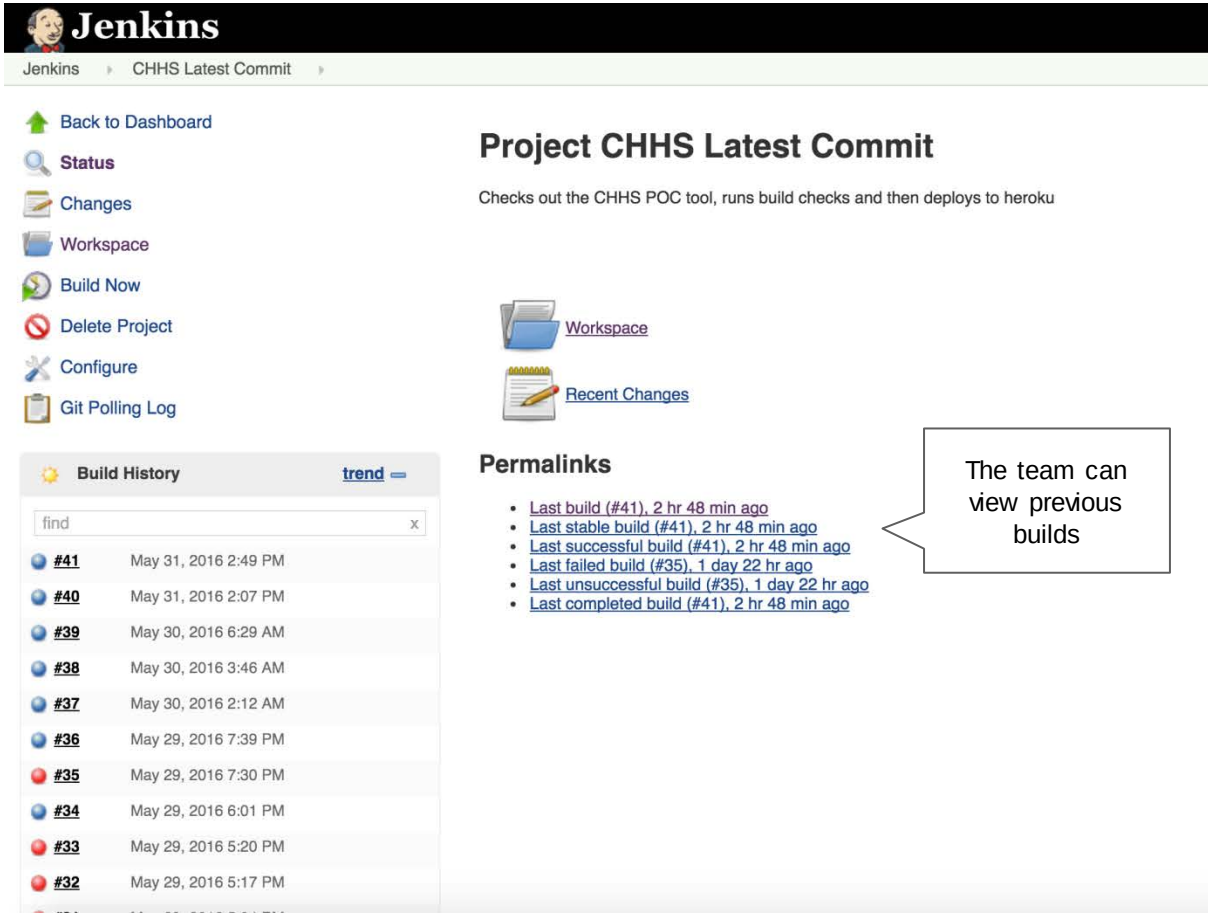
1. Docker

Open-source technologies: Jenkins

The team used Jenkins as its solution for continuous integration to perform automated building and testing of projects

Tool Example

Jenkins Dashboard



The team can view previous builds

Jenkins Primary Features[1]

- **Easy installation** that does not require a database
- **Easy configuration** via the Jenkins GUI with on-the-fly error checks and inline help
- **Rich plugin ecosystem** to integrate with various SCMs and build tools
- **Extensibility** to customize via plugins
- **Distributed builds** allow users to distribute build/test loads to multiple computers with different operating systems

1. Jenkins

Open-source technologies: MongoDB

The team used MongoDB as the underlying database for the application

About MongoDB[1]

- MongoDB is a free, open-source cross-platform document-oriented database.
- MongoDB's key features include:
  - High performance data persistence, including embedded data models and indexes supporting faster queries that can include keys from embedded documents and arrays
  - Rich query language to support read and write operations and data aggregation
  - High availability using replica sets that include automatic failover and data redundancy
  - Load balancing or horizontal scalability to distribute data across a cluster of machines
  - File storage using a grid file system

1. MongoDB Developer Manual

Open-source technologies: Node.js

The team used Node.js as the application server given its ease of horizontal scaling, cross-platform suitability and overall simplicity

About Node.js[1]

- Node.js is an asynchronous event driven JavaScript runtime designed to build scalable network applications, with a non-blocking I/O model that makes it lightweight and efficient
- The team uses node.js as the application server due to ease of horizontal scaling, cross-platform suitability and overall simplicity
- Node can handle many connections concurrently and its package ecosystem, npm, is the largest ecosystem of open-source libraries in the world

1. Node.js

Open-source technologies: Knockout

Knockout is a JavaScript library that handles dynamic data binding in the browser

About Knockout[1]

- The team used Knockout to create rich, responsive display and editor user interfaces with a clean underlying data model
- In particular, Knockout allows for sections of UI to update dynamically based on the user's actions or changes to data sources
- Features include:
  - **Elegant dependency tracking** - automatically updates the right parts of the UI whenever the data model changes
  - **Declarative bindings** - a simple and obvious way to connect parts of the UI to the data model. Complex dynamic UIs can be constructed easily using arbitrarily nested binding contexts.
  - **Trivially extensible** - custom behaviors are implemented as new declarative bindings for easy reuse.

1. Knockout documentation

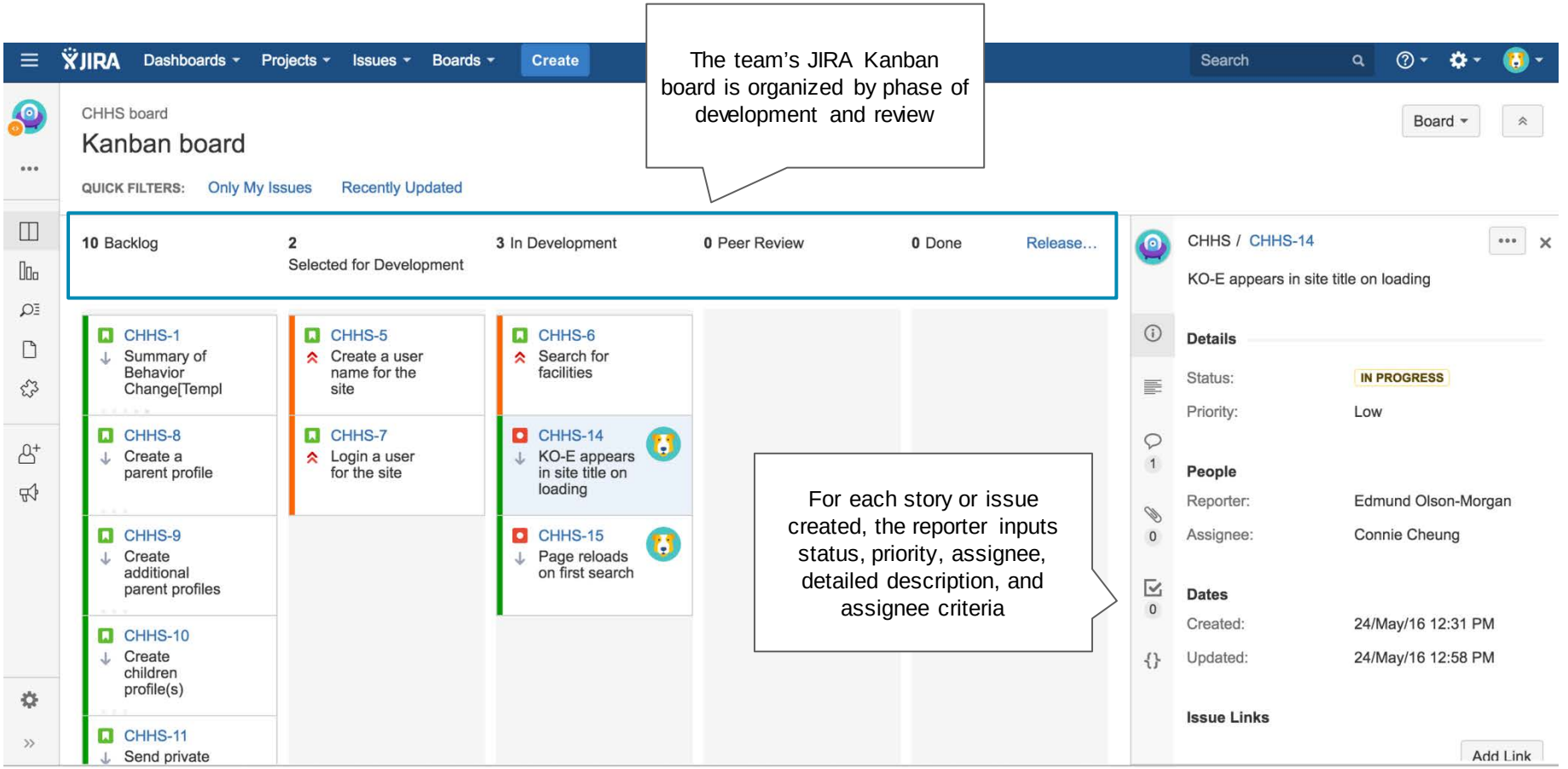
4.2 Project management tools

Project management tools: JIRA

The team used JIRA to organize development tasks, plan stories, and assign tasks to team members with priority

Tool Example

CHHS JIRA Kanban board

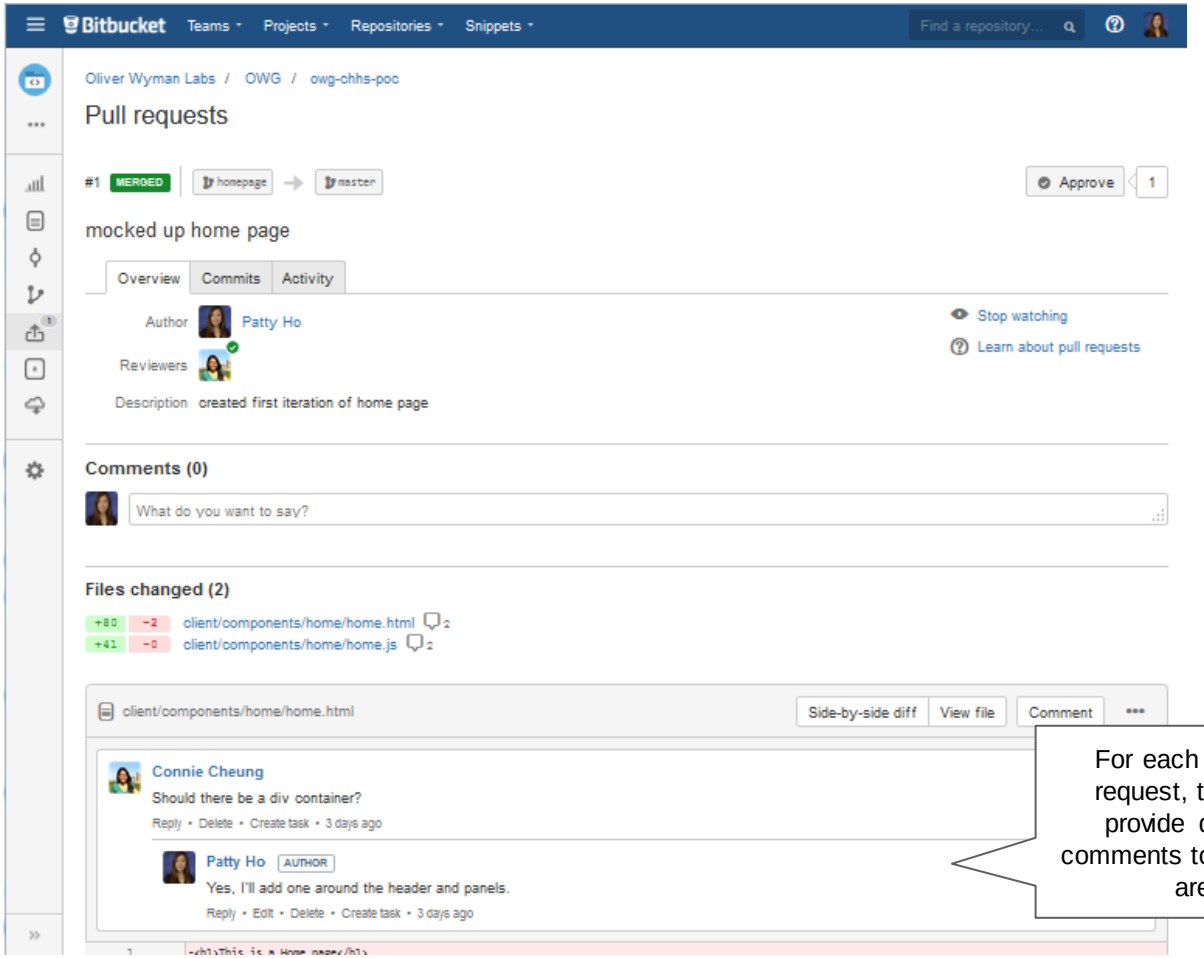


Project management tools: Git / Bitbucket

Bitbucket was the team's Git solution to collaborate and manage version control during development; the repository was then moved to Github

Tool Example

Pull request with comments

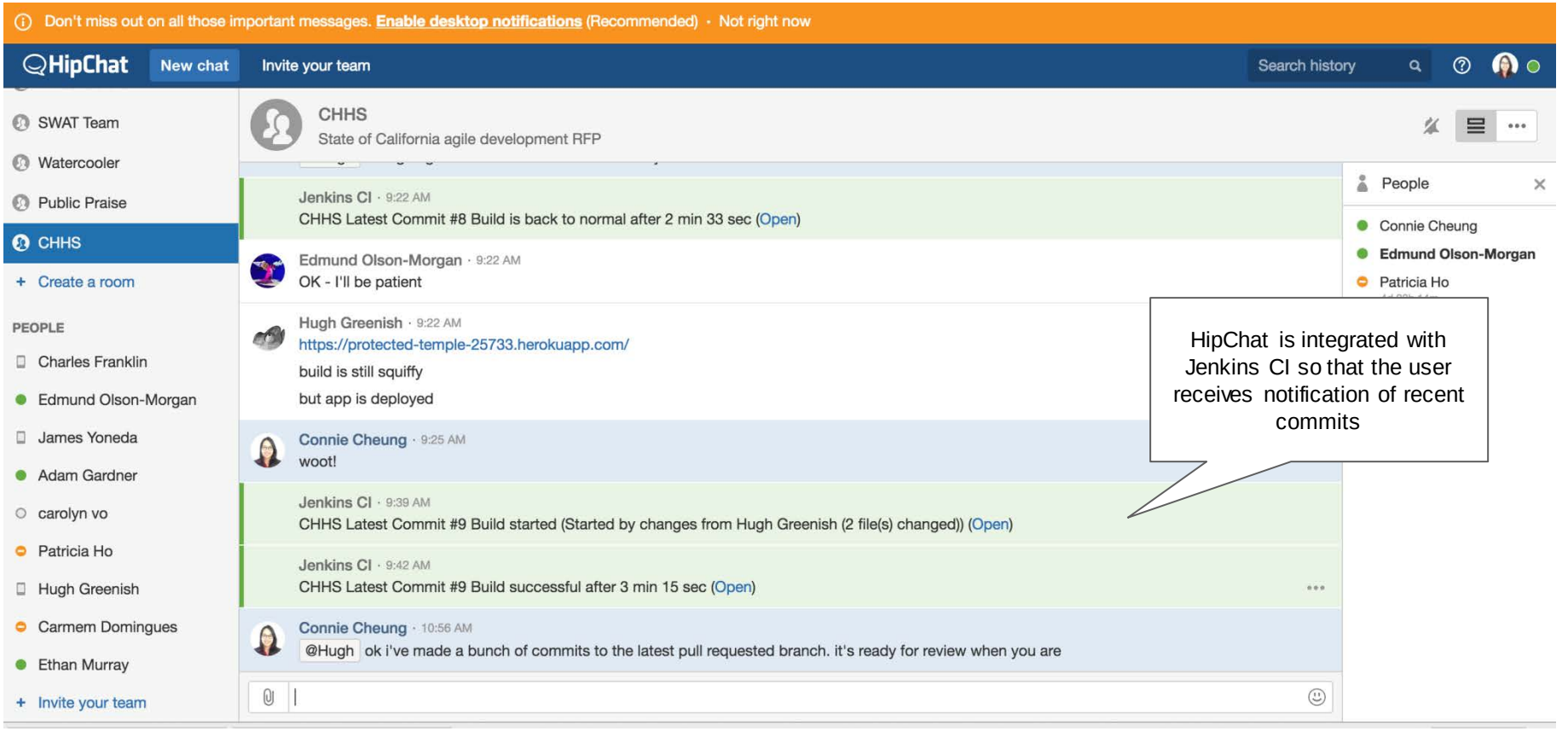


Project management tools: HipChat

The team used HipChat for instant communication and daily collaboration on development and troubleshooting

Tool Example

CHHS project group chat

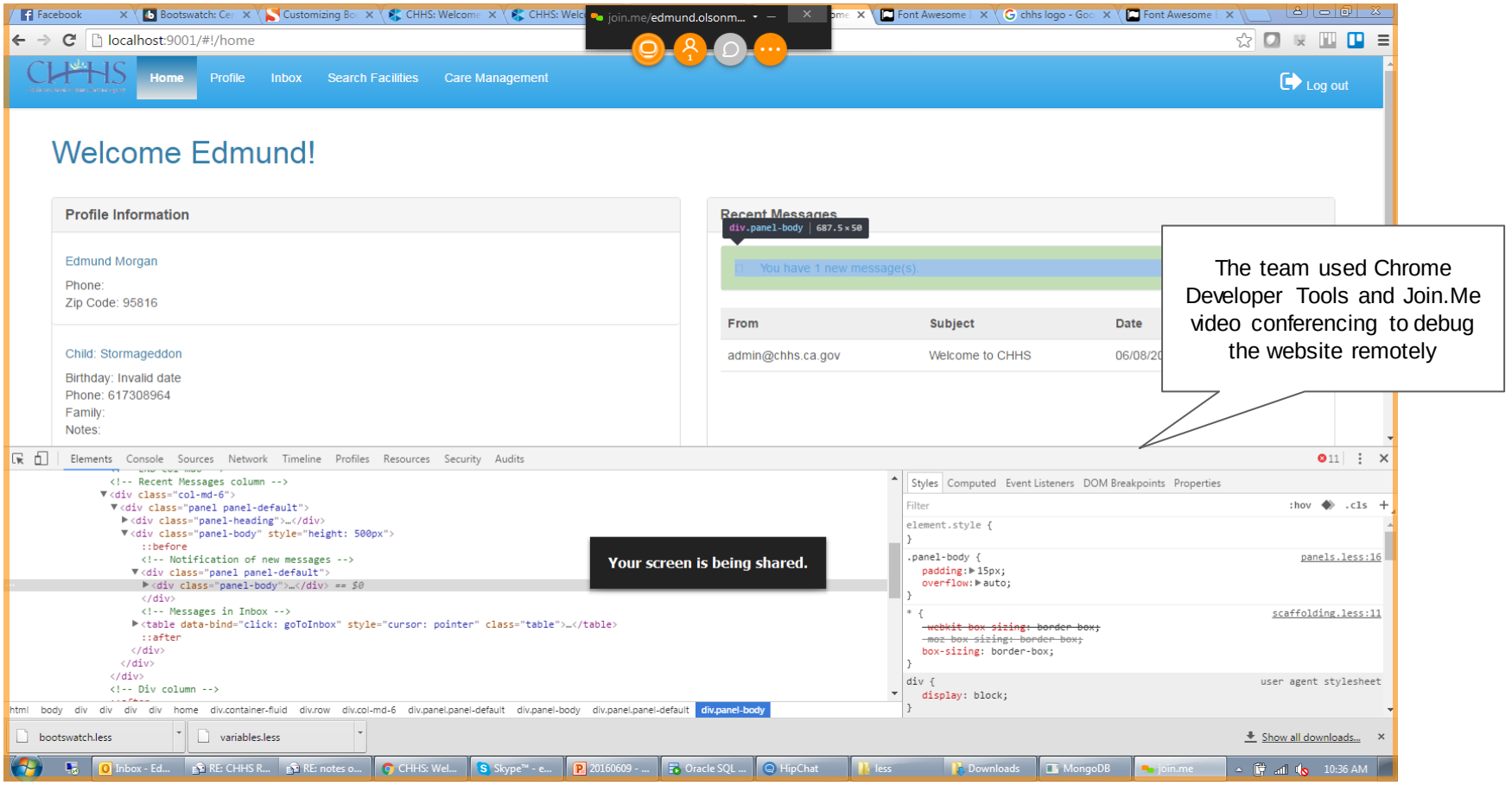


Project management tools: Join.Me

The team used Join.Me video conferencing and screen sharing to collaborate on development and debugging

Tool Example

Join.Me screenshare

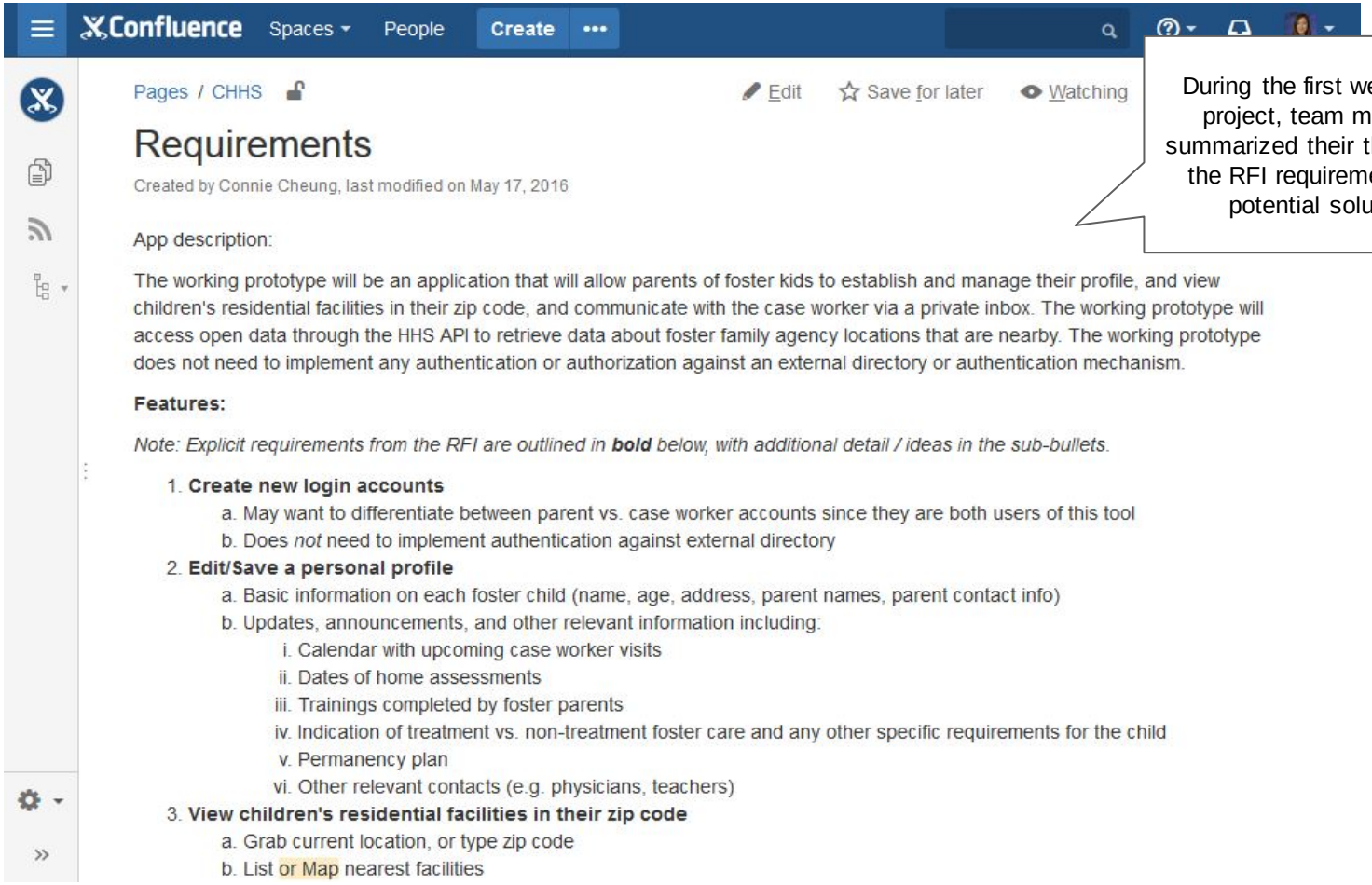


Project management tools: Confluence

The team used Confluence to document details on prototype requirements

Tool Example

CHHS requirements page



During the first week of the project, team members summarized their thoughts on the RFI requirements with potential solutions

5 | Iterations and feedback

Login page iterations

Users initially experienced confusion when attempting to sign in with a new email address, so a pop-up notification was added to clarify the issue

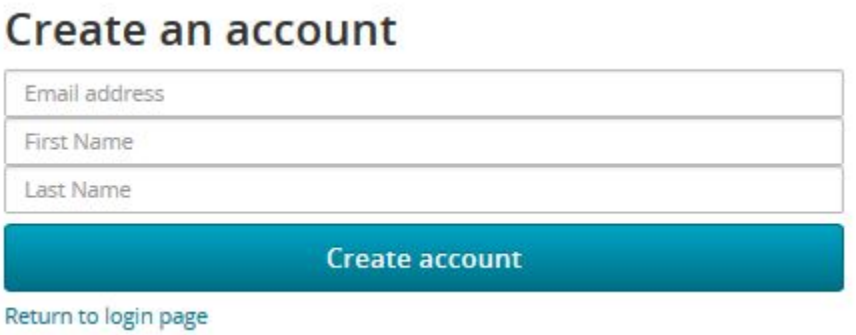
Iteration #1

Iteration #2

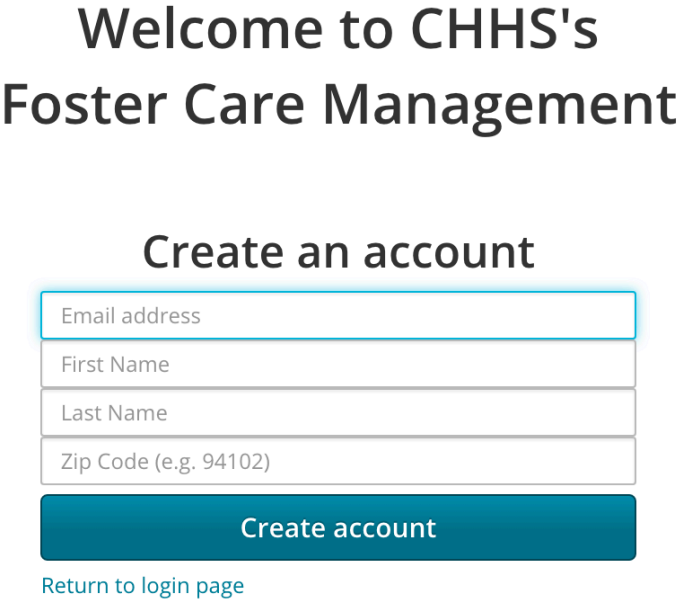
Create new account page iterations

A zip code field was added to the account creation page to set a default zip code for the user's profile

Iteration #1

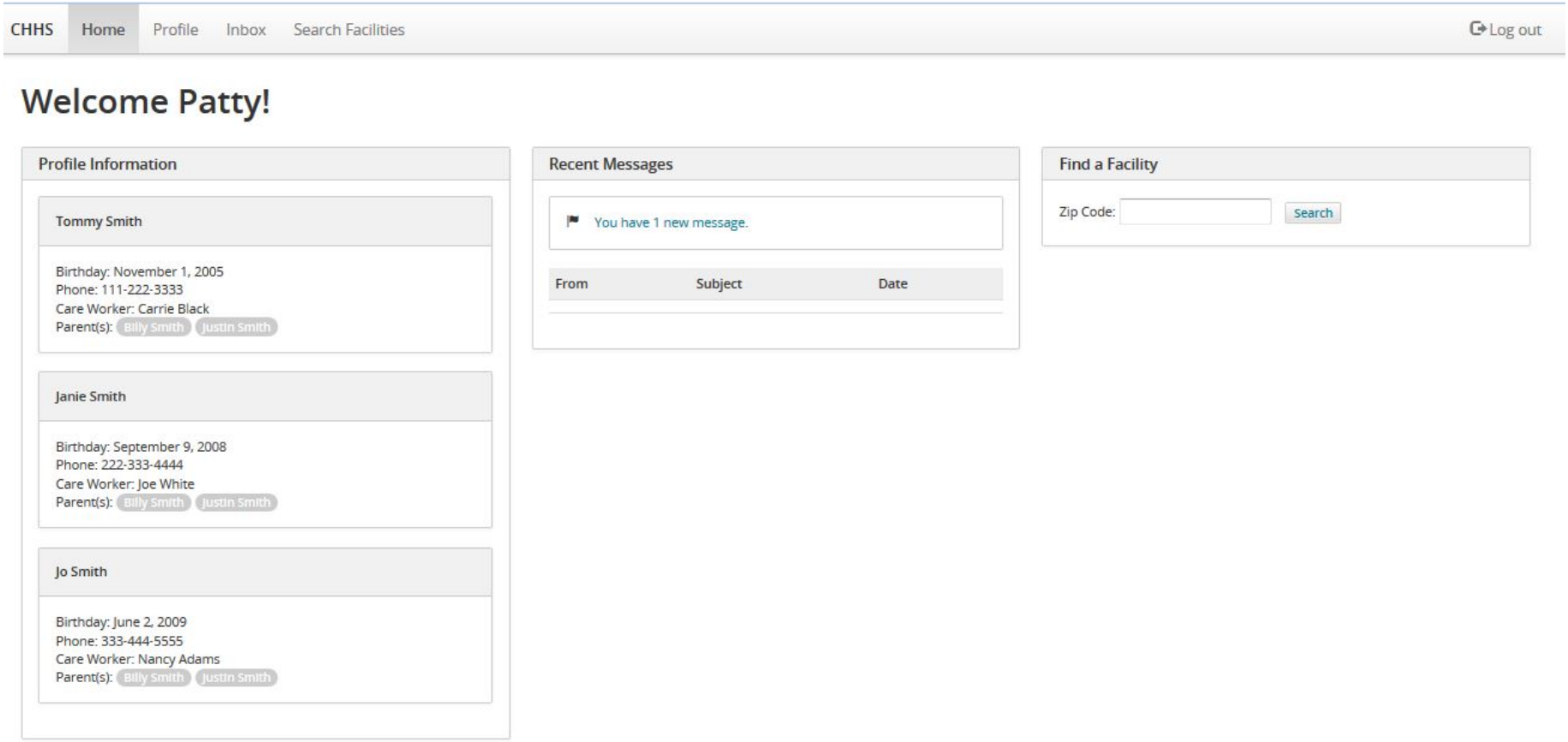


Iteration #2



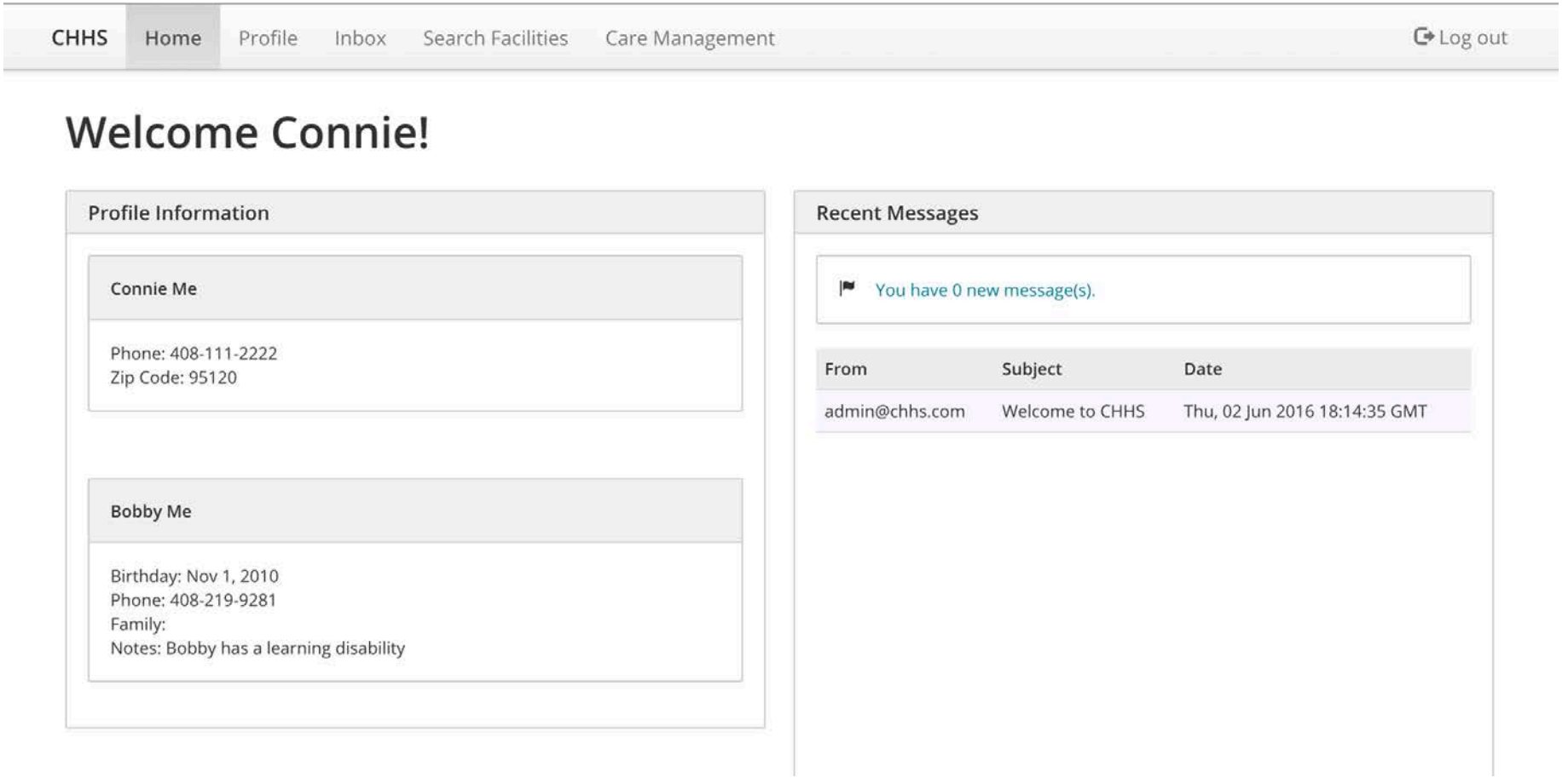
Home page iterations (1 of 2)

When reviewing the initial iteration, the team noted a large amount of white space beneath the “Find a Facility” panel



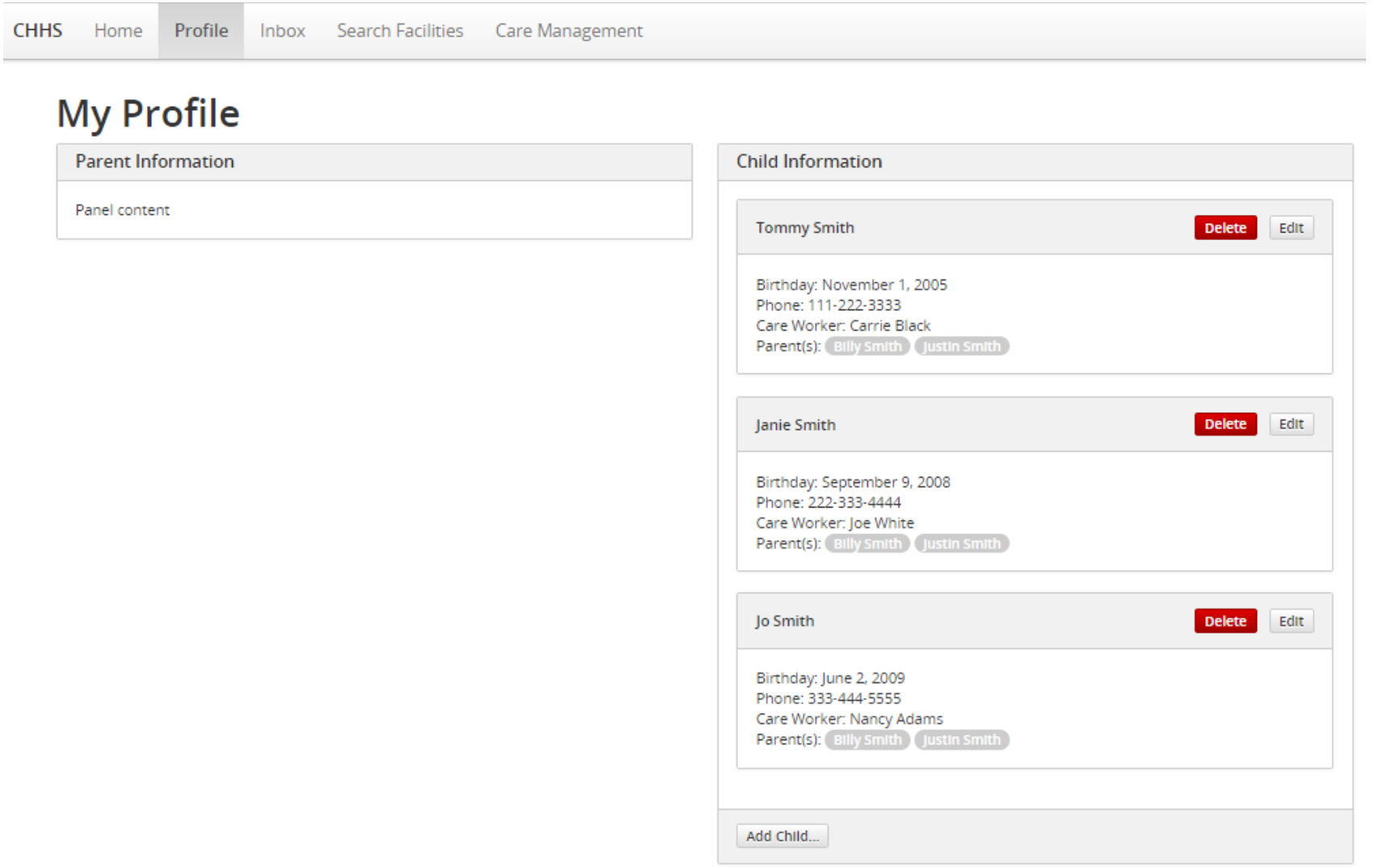
Home page iterations (2 of 2)

The second iteration of the home page includes both user information and child information; to de-clutter the page, the search column was removed



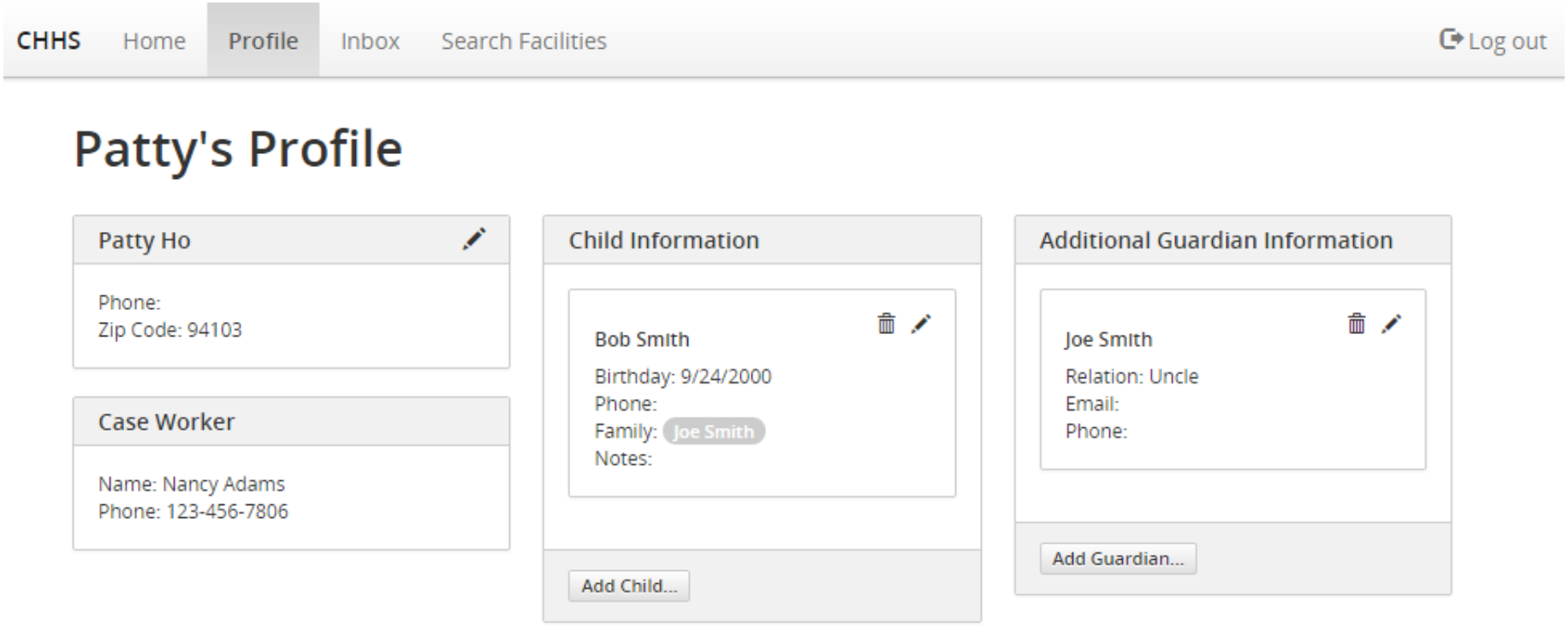
Profile page iterations (1 of 2)

The initial version of the profile page included panels to provide information on the user (birth parent) and foster kids, but did not include the case worker



Profile page iterations (2 of 2)

Responding to feedback from the expert interview, the team identified only one case worker and added a panel for additional guardians

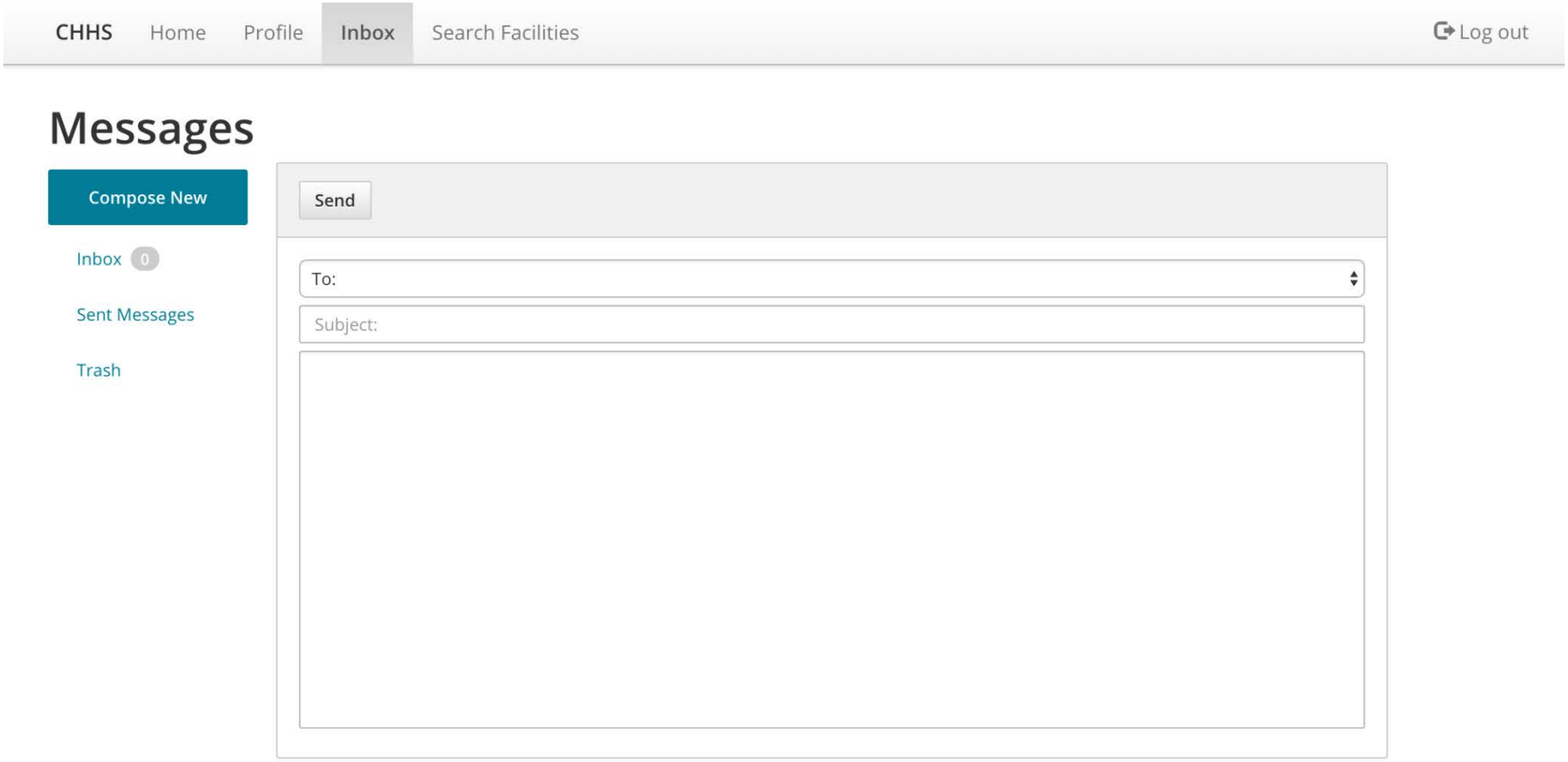


Inbox – Compose new message iterations (1 of 2)

In the first iteration, the modal to compose a new message draws the user away from the inbox

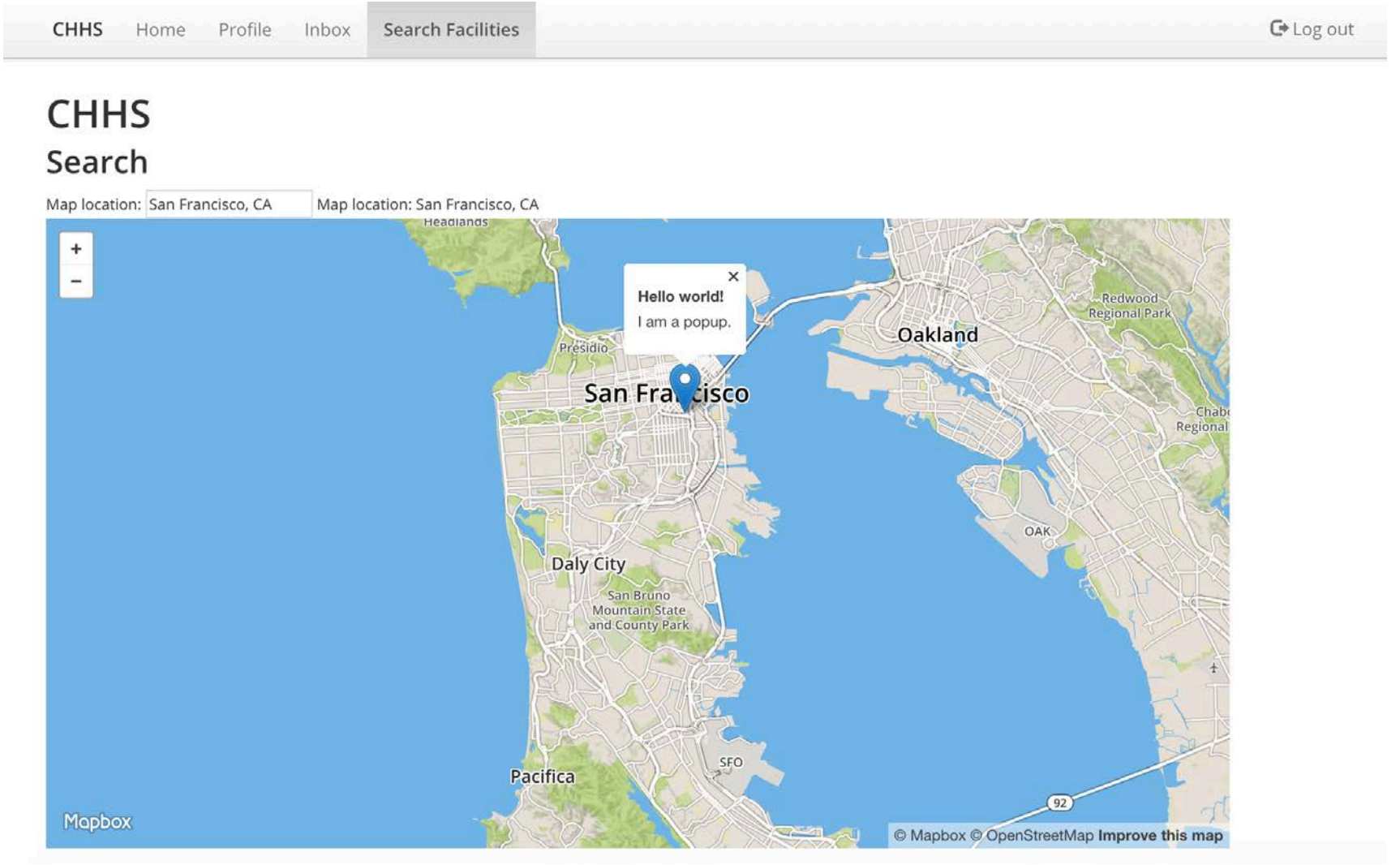
Inbox – Compose new message iterations (2 of 2)

The user can more easily toggle between the compose message tool and the other inbox sections



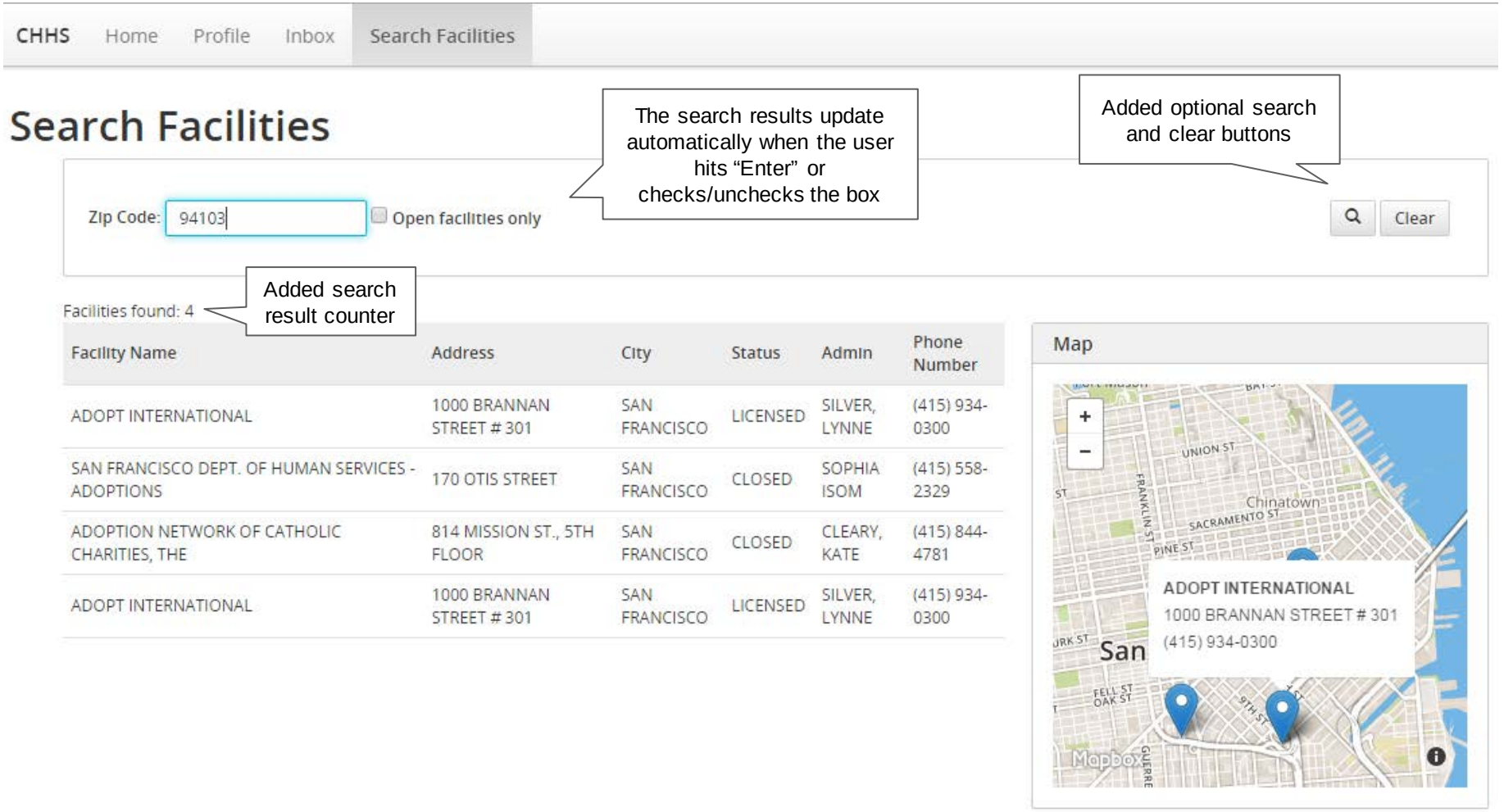
Search page iterations (1 of 2)

The initial search iteration lacked a table for search results; the zip code input was also unclear



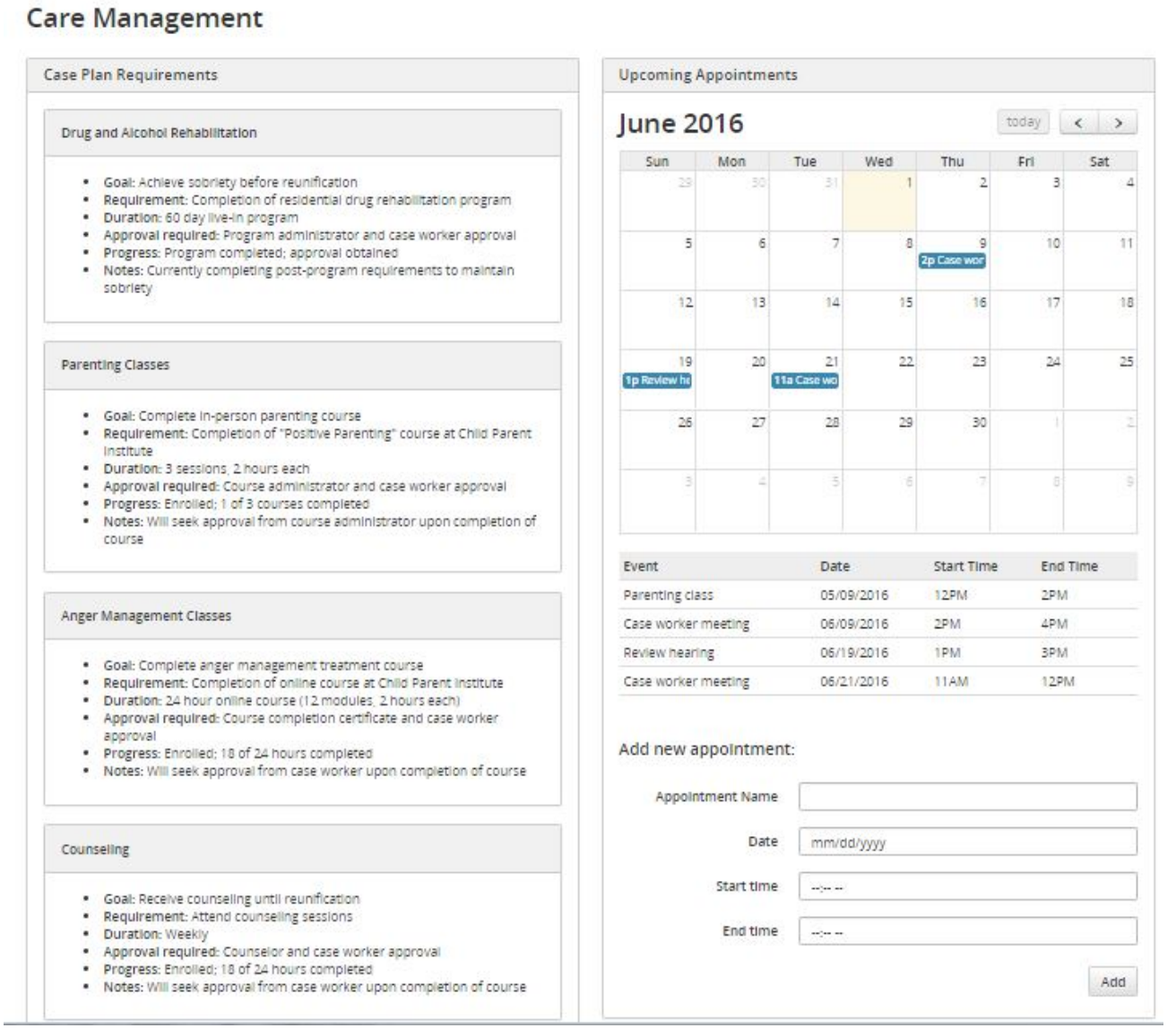
Search page iterations (2 of 2)

The updated search page includes a table with search result details and the ability to only show open facilities



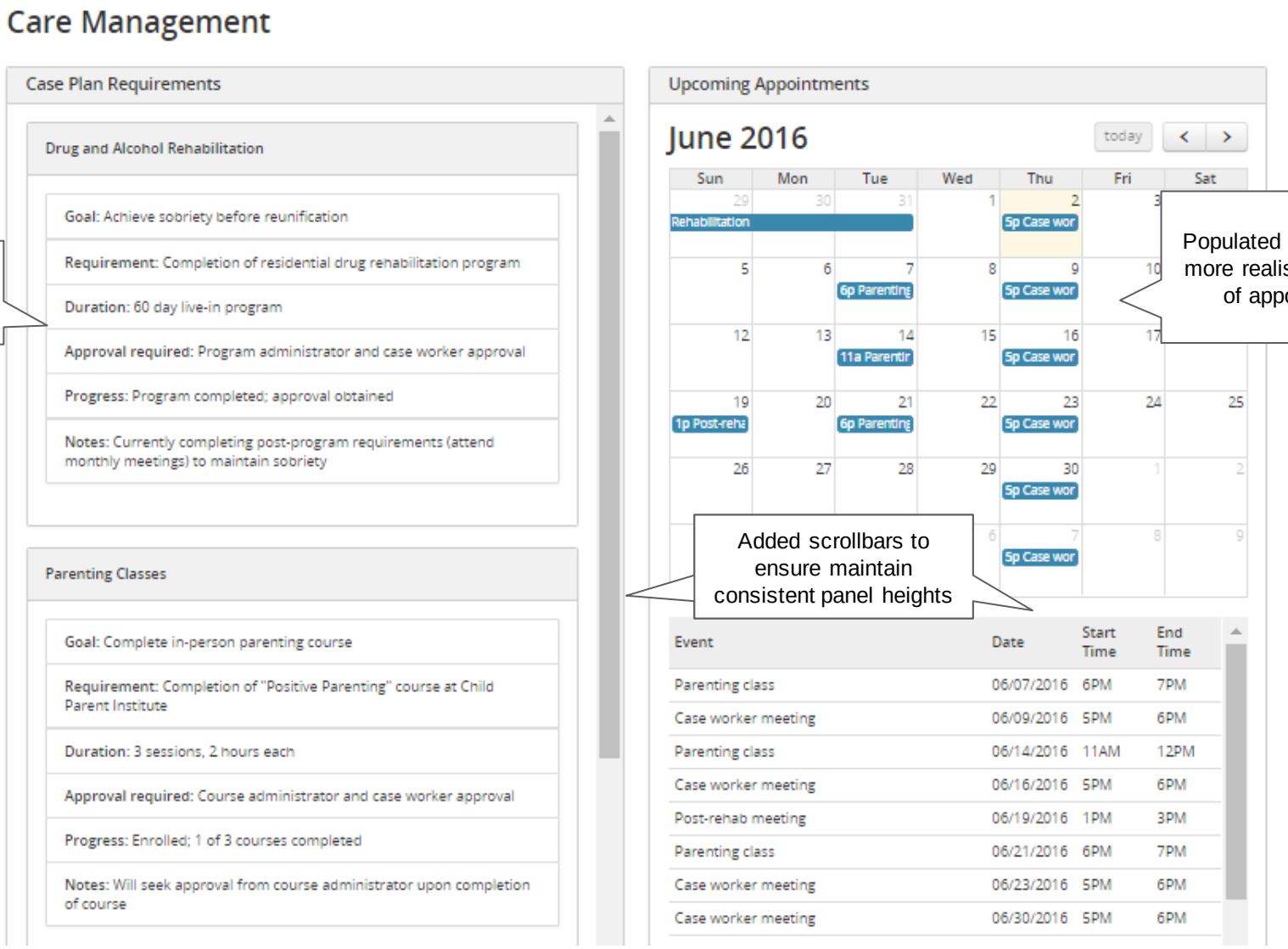
Care management page iterations (1 of 2)

Note: The team created the care management page as an additional feature



Care management page iterations (2 of 2)

Note: The team created the care management page as an additional feature



Used cleaner style for requirements list

Populated calendar with more realistic examples of appointments

Added scrollbars to ensure maintain consistent panel heights

QUALIFICATIONS, ASSUMPTIONS AND LIMITING CONDITIONS

This report is for the exclusive use of the Oliver Wyman client named herein. This report is not intended for general circulation or publication, nor is it to be reproduced, quoted or distributed for any purpose without the prior written permission of Oliver Wyman. There are no third party beneficiaries with respect to this report, and Oliver Wyman does not accept any liability to any third party.

Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been independently verified, unless otherwise expressly indicated. Public information and industry and statistical data are from sources we deem to be reliable; however, we make no representation as to the accuracy or completeness of such information. The findings contained in this report may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties. Oliver Wyman accepts no responsibility for actual results or future events.

The opinions expressed in this report are valid only for the purpose stated herein and as of the date of this report. No obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof.

All decisions in connection with the implementation or use of advice or recommendations contained in this report are the sole responsibility of the client. This report does not represent investment advice nor does it provide an opinion regarding the fairness of any transaction to any and all parties.