Creating the New Face of Buildertrend



Team: sddec20-07 Advisor: Mai Zheng Client: BuilderTrend Members: Josh Bump, Dallas Evers, Melissa Hernandez, Mitchell Knoth, Kailyn Mann-Calaway, and Darnesha Randle Team Leader: Darnesha Randle Website url: <u>http://sddec20-07.sd.ece.iastate.edu/</u>

Background of Project

- Buildertrend (BT) has been migrating their current web pages to React for the past year
- Migration has been costly and is straining BT's resources
- Until the migration is completed BT must
 - Maintain the current website
 - Complete the React migration
 - Support both outdated front end web pages and newer React pages



Motivation of Project

- BT is converting outdated ASP.NET web pages to React
 - Modern UI
 - Faster and more efficient
 - Easier maintenance reuse of components
 - Faster rendering



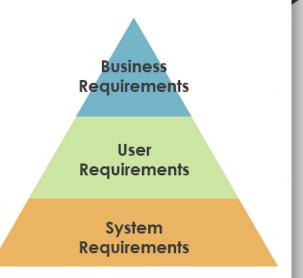
Project Overview

- BT has turned to ISU students to help speed up the process of the React Migration
- Project Goal (Scope)
 - Responsible for reverse engineering a minimum of 3 pages into React
- Constraints
 - Time: Project completed by November 2020
 - Budget: There should be no cost to completing the project



Requirements

- Complete tech discoveries prior to coding each web page
- Security
 - Adhere to all confidentiality agreements set by our client
 - Keep code on an internal Buildertrend repository
 - Implement solutions utilizing APIs Buildertrend already has in place
- User Interface
 - Utilize React components and Ant design library

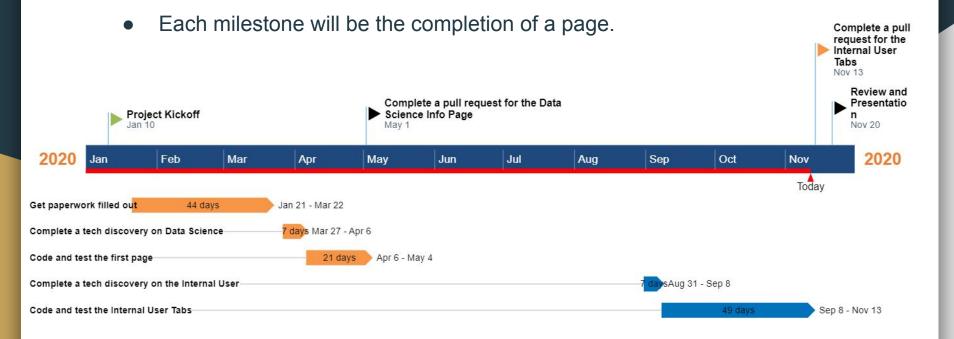


Risk Identification & Mitigation

- Risk Identification
 - Lack of knowledge of the required coding languages and frameworks
 - Pieces of the code could potentially be implemented in inaccurate or non-optimal ways
- Risk mitigation
 - Learn required languages
 - Use BT support



Project Milestones & Timeline





Process of Creating a New Page

Step 1: Tech Discovery

- Completed before the start of each page
- Black box approach
- The team test the original page and logs the results
 - Capture all requirements (functional and non functional)
 - Identify and document components
 - API calls
 - Validation requirements
- Tech discoveries serve as an important reference for our team and for anyone who will work with our pages in the future



Functional Reqs.

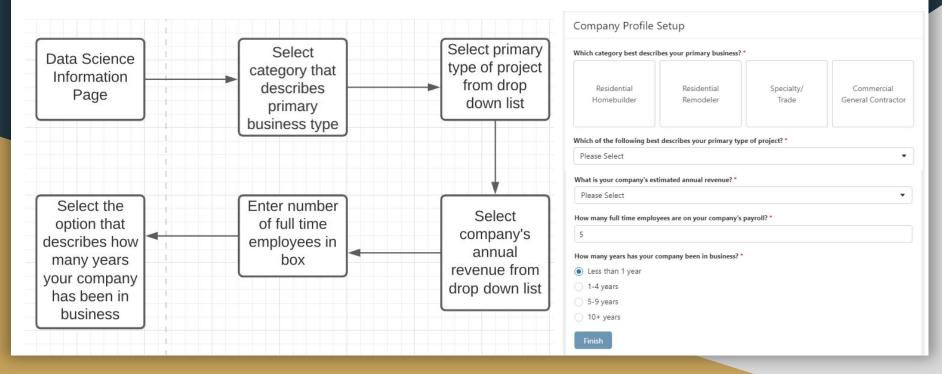
- The pages that we are converting will follow all the functional requirements given to us from the Tech Discovery
- For example:
 - When the "Manage Users" Link is clicked, the Manage User Modal will open on screen
 - When user types to change username, the username will be changed accordingly to the new username

Non-Functional Reqs.

- Performance (Response Time)
- Reliability
- Maintainability
- Usability
- Appearance (API)



Functional Decomposition (Data Science Information Page)

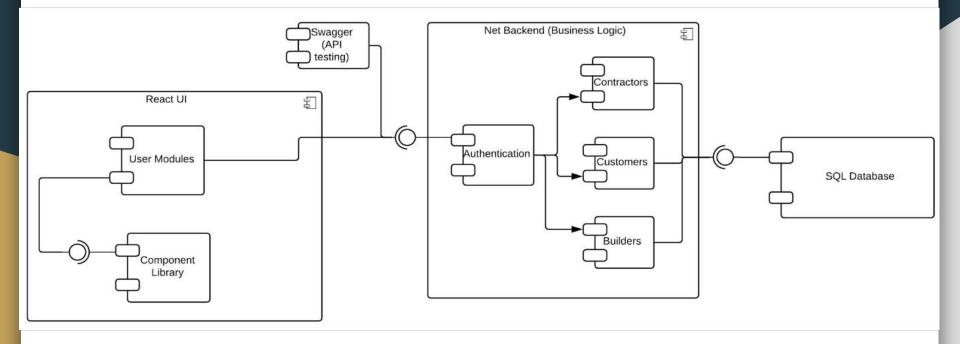


Step 2: Design

- Use the tech discovery and the new visual mock-ups to build the pages
 - Modified workflow
 - Visual decision made by Buildertrend
- Existing components
 - Data input and output mismatches with API
 - Where and how to handle data manipulation
- Making the design maintainable
 - Reusing existing components
 - Layered hierarchy

New/ Edit Role - Manage Role Plan	_	_	_	_	_
sage Roles					
Seve Back Delete					
Permissions Assigned Users (3)					
Internal User Custom Role Setup					Copy From Another Role
Role					
Melk's Role					
Role Description					
This role is created for Mari to test the Internal User Custom Role Setup permissions.					
	View	Add	Edit	Delete	
Sales					
Assign salesperson					
View other salesperson leads and activities					
Convert to job					
Export to Excel					
Project Management					
Schedule			\checkmark		
Set baseline					
Daily Logs			V		
To Do's			~		
Assign users					
Global - can see all To Do's					
Change Orders	V		~		
Selections			V		

System Diagram



Software Design

Internal User Entity

Internal User : API functions, data passing, error handling

Internal User Presentation : Sync data, common display, tab handling

Internal User Presentation Overview

Internal User Presentation Permissions

Internal User Presentation Notifications

Internal User Presentation Job Access

Internal User Presentation Preference

Other Design Decisions

• Central Types

- Easy to export for use in other pages
- Better VS code suggestions, faster development
- API Handlers
 - Production API handler
 - Fake API handler
- Mock data
 - Allow flexible interactions
 - Use of knobs to modify JSON fields



Step 3: Code

- Understand which existing Buildertrend common components our team can use
- Utilize the requirements and documentation gathered during tech discovery to understand the needs of custom components
 - Ensure maintainability and flexibility of any new components we built
- Build an API handler that makes the correct API calls, performs as expected, and is well documented



1	import	React from 'react';				
2	import	<pre>ReactDOM from 'react-dom';</pre>				
	import	'./index.css';				
4	import	App from './App';				
5	import	<pre>* as serviceWorker from './servi</pre>	LceWork	er';		
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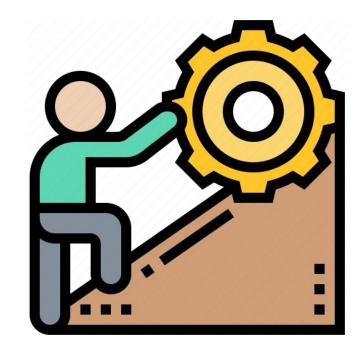
Challenges

- Both our team and BT have been working remotely
- Learning Curve
 - BT interns go through an intensive process prior to the start of working to get familiar with the BT code and systems
 - We did not go through this process, thus we have had many difficulties familiarizing ourselves with BT systems and code
- Permission issues
 - Took many weeks to receive access to BT VM's
 - Often times, different team members are locked out of the BT repos and accounts



Technical Challenges (Building Pages)

- Challenges building the pages
 - Some pages are large and have many complex features
 - Understanding the existing parts of the code base that directly tie into our pages
 - Integration was a slow and challenging process
 - Understanding and following Buildertrend's coding standards
 - Tying together all of the components we built to have one functioning React page



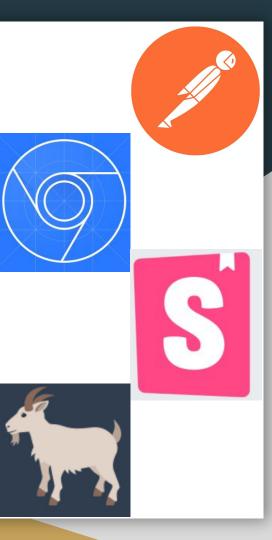
Technical Challenges (React)

- Using React
 - React's documentation is not beginner friendly
 - Our team could sometimes get stuck on weekends or evenings when BT employees weren't available to help
 - Steep learning curve
 - Difference in technical understanding with BT
 - Mistakes and bugs in current BT implementation



Step 4: Testing

- Postman
 - Test API calls and ensure they return the correct information
- Google Chrome Developer Tools
 - Flush out Tech Discoveries to illustrate all moving parts of webpage (including API calls)
- Storybook
 - Develop and test different component types in isolation
- React testing libraries
 - Used for testing React components
- After a significant portion of the page is completed we test: performance, usability, and reliability of the page
- Repeat steps 3 (code) 4 (test) as needed for refactoring



Step 5: Version Control

- Submit a pull request to the BT team
- If request is accepted then our code is merged into the master branch by BT
- Repeat steps 1 5 for each page





Project Success

Data Science Information Page

which category best descri	bes your primary business?		
Residential Homebuilder	Residential Remodeler	Specialty/ Trade	Commercial General Contractor
	t describes your primary typ	e of project? *	
Please Select			
What is your company's est	imated annual revenue? *		
Please Select			
		payroll? *	
How many full time employ	yees are on your company's		
How many full time employ	yees are on your company's		
5	company been in business? *		
5			
5 How many years has your c			

Permissions Page

Manage Roles Plan

Manage Roles

Back

Standard Roles

Ful		

Access to perform all actions on every item in Buildertrend.

Project Manager

Access to add and edit all job-related items except for Owner Invoicing and Internal Users and Subs. User will not have access to Sales items.

Office Manager

Access to add and edit most items in Buildertrend. User will not have access to Estimates or Warranty.

Bookkeeper

Access to all financials and accounting integrations as well as most job-related items. User will not have access to Sales, RFIs, Daily Logs, or Warranty.

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Selections Coordinator

Access to cost and price information on Selections, POs, and COs. User will not have access to Owner Invoicing, Sales, Warranty, or Estimates.

Warranty Coordinator

Access to Warranty, To-Dos, and most communication items. User will not have access to Customer, Job, or Sub information.

Architect

Access to view COs and Selections without cost or price information as well as full access to most job-related items. User will not have access to Sales, Owner Invoicing, Warranty, or Estimates.

Permissions Page

dd New/ Edit Role - Manage Role Plan	_	_	_	_	
Manage Roles					
Save Back Delete					
Permissions Assigned Users (3)					
Internal User Custom Role Setup					Copy From Another Role
Role					
Melk's Role					
Role Description					
This role is created for Mari to test the Internal User Custom Role Setup permissions.					
	View	Add	Edit	Delete	
Sales					
Assign salesperson					
View other salesperson leads and activities					
Convert to job					
Export to Excel					
Project Management					
Schedule	S		~		
Set baseline					
Daily Logs					
To Do's					
Assign users					
Global - can see all To Do's					
Change Orders	V	V	V		
Selections					
		_	_		

Preferences Page

Save Save & New Overview Permissions Notifications Job Access (14) Preferences User Information User Settings Sarah Biben Archive User Fuil Admin Email sarah biben@builderfrend.com Password Schedule Schedule Reset External Calendar Integrations External Calendar Integrations Schedule Items Schedule Items	Derview Permissions Notifications Job Access (14) Preferences User Information User Settings Archive User User Archive User User Settings Melt1234 Passord Schedule Schedule Item Conflicts Schedule Item Selected - - All Schedule Item Selected -	Derrories Notifications Job Access (14) Preferences Preferences User Settings Sarah Biben Archive User Enail Netri234 sarah.biben@builderfreed.com Preserved Schedule Image: Status Inter are multiple Schedule Item Conflicts Schedule Item Conflicts Join External Calendar Intergrations Larah Schedule Item Selected - - All Schedule Item Selected - - All Schedule Item Selected - - All Schedule Item Selected - - Create Feed	ternal User Details	
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Preferences Page

Time Clock

Require location on mobile and track when lan clocks in or out beyond the geofence.

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Default labor cost code

Default Labor Cost

Message Preferences

Message Signature



Message Signature Image



1 Replace File

Design Agreement - Final.png

Contact

Contact Information

Textarea placeholder

Textarea caption message.

Job Access Page

Access	3		
	Job Name	Job Status	Date Opened
	Aaron Smith	Open	Oct 01, 2019
	Bricke	Open	Jun 11, 2019
	Brown - 5521 Elmwood - H.24001	Open	Jan 07, 2014
	BT Media Schedule	Open	Feb 28, 2020
	Clarkson Commercial Remodeling Services	Open	Aug 23, 2019
	Corby - 541 S. 198th St - H. 24002	Open	May 30, 2017
	Dugger - 321 A. St - H.24003	Open	Jan 07, 2014
	Karen - 1345	Open	May 31, 2019
	Lamason - 26 Tail Lane - H.24004	Open	Jul 08, 2015
	McKenna - 11818151 - H.24005	Open	Nov 26, 2018
	Rodge: Atkins	Open	Jun 12, 2019
	Rodger Atkins	Open	Jun 12, 2019
	Smith - 125 B St. H.24006	Open	Aug 08, 2018
	Sub Demo	Open	Jun 11, 2019

JOD ACCESS 18D

Save & New

User Information

Sarah Biben Ful Admin

Email

sarah.biben@buildertrend.com

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Engineering Standards

- IEEE 1028-1997 IEEE Standard for Software Reviews
- IEEE 12207-1996 Information Technology - Software Life Cycle Processes
- IEEE 12207-2017 Systems and software engineering -- Software life cycle processes

Design Practices

- Iterative prototyping
- Modular design



Advancing Technology for Humanity

Lessons Learned

- Lessons Learned
 - Code: React, Formik, Storybook, Ant Design, and TypeScript
 - Ability to work in remote environment
- Industry experience
 - Business mindset
 - Working with other teams' code
 - Importance of communication, reaching out for help



Conclusions

- Conclusions
 - Help provide BT customers with faster and more modern user experience by converting ASP.net pages into React
- Future work
 - BT will use our code for their updated website
 - BT will continue the process of their React Migration



Thank You!



Questions?