Creating the New Face of Buildertrend

Design Document

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Executive Summary

Development Standards & Practices Used

List all standard circuit, hardware, software practices used in this project. List all the engineering standards that apply to this project that were considered.

- Write clean, well documented, modular code
- Follow the Buildertrend React migration progress
    - Work with BT dev, product, and QA teams
- Follow Buildertrend frontend design guidelines
- The React pages should be composed of high quality, correct, bug-free code

Summary of Requirements

- The team must adhere to all confidentiality agreements set by our client
- Meet with the client once a week
- Maintain communication with Buildertrend teams
    - Microsoft Teams
    - Pull Request Comments / Suggestions
- Each team member must contribute at least 3 hours of work a week
- Tech discoveries must be done before each page is created
- The team must test original pages and log the results
- Build React common components
- Use the given Buildertrend API

Applicable Courses from Iowa State University Curriculum

List all Iowa State University courses whose contents were applicable to your project.

- Com S 227
- Com S 228
- Com S 309
- S E 319
- SE 362

New Skills/Knowledge acquired that was not taught in courses

List all new skills/knowledge that your team acquired which was not part of your Iowa State curriculum in order to complete this project.

- React Development
- Conversion of legacy code to new platform
- Testing, quality assurance, and documentation of previously written code (tech discoveries)
- Communication with client

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List of figures/tables/symbols/definitions (This should be the similar to the project plan)

1. Introduction

1.1 Acknowledgement

This project is being sponsored by Buildertrend Solutions. Our team received technical assistance and guidance from Buildertrend's Senior Architect Rick Kalasky, Project Manager Alli Kellner, and Software Developers Daric Teske and Cameron Hessler.

1.2 Problem and Project Statement

General problem statement: Buildertrend is currently in the process of trying to improve the speed and stability of their application website. To do this, Buildertrend is converting their outdated code into something newer, faster, and more efficient through the help of ReactJs. This conversion is taking time though, which is straining Buildertrend's team, seeing as they must currently support two different front-end systems.

General solution approach: Our senior design team will be responsible for building as many of Buildertrend's new website pages as possible. Our team will be given access to the existing Buildertrend pages and will be responsible for reverse engineering them into ReactJs. The pages our team creates for Buildertrend are expected to replace the older pages and will go live on the company's website by the end of the senior design year. While we are only required to convert a minimum of three pages, our senior design team is hoping to accomplish much more than this. Our project will greatly help Buildertrend by speeding up the React Migration the company has been undergoing for about a year now.

1.3 Operational Environment

Buildertrend provides its clients with software meant to simplify and optimize the building experience for homeowners, contractors, and remodelers. The environment in which our pages will be used will primarily be on an online application, accessible through laptops, desktops, and mobile devices. Due to the nature of most technology applications, our pages must be quick, reliable, stable, and thoroughly tested. We wish

to avoid pages that crash or lag often, seeing as we want the users to have a pleasant experience using the Buildertrend application.

1.4 Requirements

List all requirements for your project – functional requirements within your project context, economic/market requirements, environmental requirements, UI requirements, and any others relevant to your project.

1. We will be required to complete tech discoveries for each web page we recreate to capture all of the requirements of the page we are recreating.
2. We will be required to complete the project utilizing React Components when dealing with the User Interface recreations.
3. We will be required to implement the solutions utilizing API's that Buildertrend already has in place at their company.
4. We will be required to keep our code on an internal Buildertrend Git repository
5. We will be required to use Visual Studio and Visual Studio Code as we develop our code.
6. Testing must be done utilizing Storybook and React testing libraries.
7. Some User Interface components must be designed using the Antd library.

1.5 Intended Users and Uses

Intended Users	Intended Uses
Homebuilders	1. Everything you need to manage the home building process from start to finish. 2. Turbo charge your efficiency with the Buildertrend platform. 3. Customer management tools that allow you to keep your customers up to date on the project. 4. Project Management tools that allow you to easily view documents, mark up plans, manage scheduling, send estimates

	and more. 5. Financial tools that allow you to set budgets, send purchase orders, formalize pricing and manage the lifecycle for your projects.
Remodlers	1. Renovate your business model with a full suite of tools and resources. 2. Connect with your crew, keep your customers happy and grow your business with help from Buildertrend. 3. Customer management tools that allow you to keep your customers up to date on the project. 4. Project Management tools that allow you to easily view documents, mark up plans, manage scheduling, send estimates and more. 5. Financial tools that allow you to set budgets, send purchase orders, formalize pricing and manage the lifecycle for your projects.
Speciality Contractors	1. Solutions that are adaptable, intuitive, and focused on boosting profitability. 2. A single, powerful platform is all you need to expertly manage all aspects of your business. 3. Customer management tools that allow you to keep your customers up to date on the project. 4. Financial tools that allow you to set budgets, send purchase orders, formalize pricing and manage the lifecycle for your projects. 5. Pre-sales process tools that allow you to manage new leads, win more bids and streamline your sales process with tools that belong on a superhero's utility belt.
Commercial Contractors	1. Grow your business with powerful project management tools. 2. Take your business to the next level

	with software that's as ambitious as you. 3. Project Management tools that allow you to easily view documents, mark up plans, manage scheduling, send estimates and more. 4. Financial tools that allow you to set budgets, send purchase orders, formalize pricing and manage the lifecycle for your projects. 5. Pre-sales process tools that allow you to manage new leads, win more bids and streamline your sales process with tools that belong on a superhero's utility belt.

1.6 Assumptions and Limitations

Assumptions	
Design (color scheme)	All web pages will follow the required Buildertrend company color scheme.
Methodology	The project will be completed using the tools and techniques prescribed by the Buildertrend methodology.
Technology	The project will use the following technology, tools, and libraries: React, Formik, Storybook, Ant Design, and TypeScript.
Product Environment	All web pages must be accessible through the Buildertrend website and able to be viewed on laptops, desktops, tablets, and mobile devices.
Product Performance	The maximum number of simultaneous

	users / customers is unknown at this time. The number of users / customers varies greatly depending on the season. For now we will assume a maximum number of simultaneous users to be 100. This is important because we want to ensure that our pages are quick, reliable, and stable. If we underestimate the number of simultaneous users then the pages may crash or lag often.
End product geographical use	The end product will be used all over the world.
Team Performance & Skill	Each team member is expected to have the necessary technological skills to be able to contribute to the project in a meaningful way.

Limitations	
Budget & Finance	The cost of completing the product shall be no more than $500, which is the allotment given to us by departement for senior design projects.
Schedule	The project must be completed by the end of the senior design year in December 2020.
Scope	A minimum of 3 web pages will be converted to react.

1.7 Expected End Product and Deliverables

At the end of our senior design product, we will have recreated at least three web pages for Buildertrend. Each web page should look and function as close to the original web page as possible. All documentation regarding the web pages will be commented within the code. The web pages will be delivered periodically throughout the Spring and Fall 2020 semesters; we do not currently have set deadlines, however, the final products are expected to be deployed in December 2020.

2. Specifications and Analysis

2.1 Proposed Approach

We have not been able to start on the project yet, however, we have been learning the required coding languages in an attempt to mitigate future coding issues. Our planned general approach to this project is to use Buildertrend's tech discoveries (and Buildertrend's website) to gain basic knowledge of the web pages's functionality, and then recreate and test the web pages using the required APIs and coding languages (found in section 1.4).

2.2 Design Analysis

So far, our team has been roadblocked in our project due to important confidentiality and non-disclosure agreement documents. Because of the nature of our project, our team is prohibited from posting or sharing our code or Buildertrend's anywhere. We have been in the process of signing and sending documents for about a month now. This has taken time due to the many different documents we've had to sign and the various signatures we've needed from faculty members at ISU.

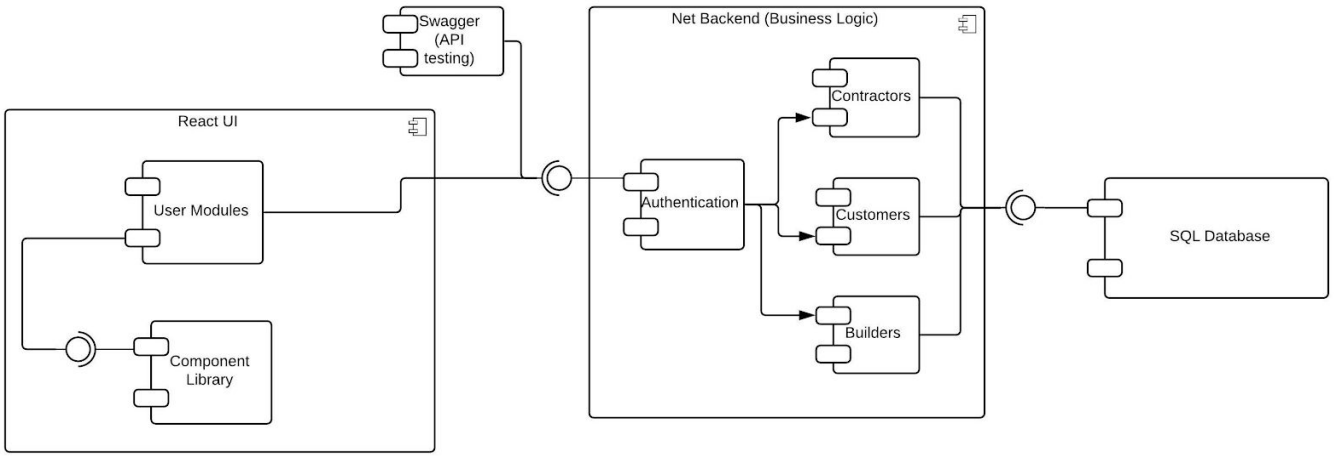
Our architecture of our project will be coherent with Buildertrend's architecture that they have in place for all their applications. The React pages that we work on will be created on a premade API that is made for us by Buildertrend. We will stick to what

development practices Buildertrend outlines us to follow. Our expected results will be at a minimum three pages fully converted by the end.

2.3 Development Process

Our team will be using the typical scrum approach. We will be using a scrum board that will be populated with tasks that our team leaders create. Each one of us will take responsibility for a card and follow it through the development cycle. Throughout the process, we will be making pull requests and seeing them through to be merged into master. Prior to each conversion of webpage to React, we will need to make a tech discovery about the webpage (figure out all the functionality of the webpage and write it down to ensure we maintain the same functionality on the React page.

2.4 Conceptual Sketch



3. Statement of Work

3.1 Previous Work And Literature

Include relevant background/literature review for the project

– If similar products exist in the market, describe what has already been done

– If you are following previous work, cite that and discuss the **advantages/shortcomings**

– Note that while you are not expected to "compete" with other existing products / research groups, you should be able to differentiate your project from what is available

Detail any similar products or research done on this topic previously. Please cite your sources and include them in your references. All figures must be captioned and referenced in your text.

3.2 Technology Considerations

Highlight the strengths, weakness, and trade-offs made in technology available.

Discuss possible solutions and design alternatives

3.3 Task Decomposition

In order to solve the problem at hand, it helps to decompose it into multiple tasks and to understand interdependence among tasks.

3.4 Possible Risks And Risk Management

Include any concerns or details that may slow or hinder your plan as it is now. These may include anything to do with costs, materials, equipment, knowledge of area, accuracy issues, etc.

3.5 Project Proposed Milestones and Evaluation Criteria

What are some key milestones in your proposed project? Consider developing task-wise milestones. What tests will your group perform to confirm it works?

3.6 Project Tracking Procedures

What will your group use to track progress throughout the course of this and next semester?

3.7 Expected Results and Validation

What is the desired outcome?

How will you confirm that your solutions work at a **High level**?

4. Project Timeline, Estimated Resources, and Challenges

4.1 Project Timeline

• A realistic, well-planned schedule is an essential component of every well-planned project

• Most scheduling errors occur as the result of either not properly identifying all of the necessary activities (tasks and/or subtasks) or not properly estimating the amount of effort required to correctly complete the activity

• A detailed schedule is needed as a part of the plan:

– Start with a Gantt chart showing the tasks (that you developed in 3.3) and associated subtasks versus the proposed project calendar. The Gantt chart shall be referenced and summarized in the text.

– Annotate the Gantt chart with when each project deliverable will be delivered

• Completely compatible with an Agile development cycle if that's your thing

How would you plan for the project to be completed in two semesters? Represent with appropriate charts and tables or other means.

Make sure to include at least a couple paragraphs discussing the timeline and why it is being proposed. Include details that distinguish between design details for present project version and later stages of project.

4.2 Feasibility Assessment

Realistic projection of what the project will be. State foreseen challenges of the project.

Getting used to Buildertrend's platform and new exposure to React.

4.3 Personnel Effort Requirements

Include a detailed estimate in the form of a table accompanied by a textual reference and explanation. This estimate shall be done on a task-by-task basis and should be based on the projected effort required to perform the task correctly and not just "X" hours per week for the number of weeks that the task is active

4.4 Other Resource Requirements

Identify the other resources aside from financial, such as parts and materials that are required to conduct the project.

4.5 Financial Requirements

If relevant, include the total financial resources required to conduct the project.

5. Testing and Implementation

Testing is an **extremely** important component of most projects, whether it involves a circuit, a process, or a software library

Although the tooling is usually significantly different, the testing process is typically quite similar regardless of CprE, EE, or SE themed project:

1. Define the needed types of tests (unit testing for modules, integrity testing for interfaces, user-study for functional and non-functional requirements)
2. Define the individual items to be tested
3. Define, design, and develop the actual test cases
4. Determine the anticipated test results for each test case 5. Perform the actual tests
6. Evaluate the actual test results
7. Make the necessary changes to the product being tested 8. Perform any necessary retesting
9. Document the entire testing process and its results

Include Functional and Non-Functional Testing, Modeling and Simulations, challenges you've determined.

5.1 Interface Specifications

– Discuss any hardware/software interfacing that you are working on for testing your project

5.2 Hardware and software

– Indicate any hardware and/or software used in the testing phase

– Provide brief, simple introductions for each to explain the usefulness of each

5.3 Functional Testing

Examples include unit, integration, system, acceptance testing

5.4 Non-Functional Testing

Testing for performance, security, usability, compatibility

5.5 Process

– Explain how each method indicated in Section 2 was tested

– Flow diagram of the process if applicable (should be for most projects)

5.6 Results

– List and explain any and all results obtained so far during the testing phase

- – Include failures and successes
- – Explain what you learned and how you are planning to change it as you progress with your project

- – If you are including figures, please include captions and cite it in the text

• This part will likely need to be refined in your 492 semester where the majority of the implementation and testing work will take place

-**Modeling and Simulation**: This could be logic analyzation, waveform outputs, block testing. 3D model renders, modeling graphs.

-List the **implementation Issues and Challenges**.

6. Closing Material

6.1 Conclusion

Summarize the work you have done so far. Briefly re-iterate your goals. Then, re-iterate the best plan of action (or solution) to achieving your goals and indicate why this surpasses all other possible solutions tested.

6.2 References

This will likely be different than in project plan, since these will be technical references versus related work / market survey references. Do professional citation style(ex. IEEE).

6.3 Appendices

Any additional information that would be helpful to the evaluation of your design document.

If you have any large graphs, tables, or similar that does not directly pertain to the problem but helps support it, include that here. This would also be a good area to include hardware/software manuals used. May include CAD files, circuit schematics, layout etc. PCB testing issues etc. Software bugs etc.