CIS 330 Final Project Paper

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CIS-330 Systems Analysis & Design

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1. Problem Statement and Feasibility Study

1.1 Current System Description:

Price Heating and Air currently uses a field service management (FSM) system called Sera Software. Sera Software is designed with HVAC companies in mind to provide them with various services to help business operations. Sera's services help Price Heating and Air identify efficiency gaps, manage scheduling and dispatching, and optimize their workflow all within the one service.

1.2 Problem Statement:

The current system (Sera Software) that Price Heating and Air uses is riddled with issues that cause efficiency problems through unrefined UI and not offering their clients the services they pay for. For example, Sera Software is supposed to offer offline tracking for service calls when technicians enter areas that do not have cell service. This is not the case, however, as the technicians at Price have to manually enter their time and dispatch status due to the software not offline logging their calls. This issue has also caused Price to pay for a different service that can track their technicians when they go on calls. Another problem with Sera Software is that its UI can both confuse its users and delay critical actions with a lack of buttons with definite functions and hide certain actions in places around the screen instead of having them "up-front" for the user. One last issue with Sera Software is that if a technician claims and starts a service call, they are unable to quickly cancel said call without going through several pages on the website. To summarize, Price is paying for a service that wastes time for its employees and does not offer the services that they claim to provide.

1.3 Feasibility Areas:

1.3.1 Economic

Our project's economic feasibility will be positive for Price Heating and Air. We aim to provide an in-house developed Field Service Management Software that will increase productivity, save on subscription expenses, and cut costs on operational inefficiencies present with the current SERA Software. Our estimated costs are as follows, development: $20,000, cloud infrastructure hosting: $5,000 Annually, and employee training: $3500. Our estimated benefit is as follows; it saves $9,000 a year (no subscription). Our breakeven

point is set to take the firm 2.7 years to break even, this includes the price of training and cloud hosting. We believe that the benefits of this new system will help Price Air maintain financial health both in the short term and long term.

1.3.2 Technical

This project will require Price H&A to use cloud infrastructure to host the new application. This will be no issue as the SERA Software currently in use also utilizes the same method. The application will require a secure database, and well-designed web application/interface for both management and technician users. This approach will limit the need for IT/office staff as much of the work will be done on the implementation of the project. All infrastructure and server security will be maintained by the cloud service providers. Our risks include a need for user training and cloud infrastructure training.

1.3.3 Operational

The current SERA software causes inefficiencies for both the management and technician users. Our goal is to implement a completely new software solution that will grant users a better experience. We understand that many employees believe the UI of the current software to be outdated and confusing. We believe our proposed system will be able to meet user expectations, integrate with current timekeeping systems, and is overall a highly feasible operation that will allow Price Air a smooth system transition.

1.3.4 Legal

This project will require adherence to data protection laws and requires secure storage of both customer, employee, and call data. Any subscriptions for development tools needed for the development of this application will need to be licensed. All current subscriptions to current SERA software will need to be terminated and data must be transferred responsibly.

1.3.5 Time

Our timeline for the project spans over six months. We will set milestones for certain parts of the project. We will need to analyze our resources and decide where to use them in the timeframe we have set for the project. We will have a planned schedule, and this will ensure that our project is successful and achievable.

2. Review of Requirements Analysis and Specification

2.1 Functional:

- The subsystem shall allow technicians and dispatchers to view, interact, and modify information within the job logging system.
- The subsystem shall log important data like service type, labor hours, customer information, job location and assigned dispatcher/technician.
- The subsystem will allow for the creation of tickets, modification of tickets, acceptance of tickets, and the ability to look up customer information.
- The subsystem allows an admin/service manager to interact with the system in order to exchange and modify information.
- The subsystem shall have a database using MySQL to store customer, job, and user information.
- The subsystem shall integrate the database with a web app that allows users to take actions and complete Price Heating and Air business processes related to job logging.
- The web app shall allow different user roles to be formed to limit the privileges of certain users and maintain security.

2.2 Operational:

- The subsystem should not exceed a cost of $8000 to develop
- The subsystem should not exceed an annual cost of $1500 to operate its cloud computing infrastructure.

2.3 Maintenance:

- The subsystem shall have an annual uptime of 99.5% (This allows for roughly 45 hours of downtime, or 5 standard workdays. The amount of available work can heavily wane depending on certain seasons during the year, which allows for this much downtime).
- The subsystem's software shall both check for new updates and install them no matter the condition of the updates.

- The subsystem shall utilize cloud-based hosting and should not have any on-site hardware to host the database or web application.
- The subsystem should be maintained by present IT staff.

3. Preliminary Design

3.1 System of Interest

Our Field Service Management System for Price Heating and Air consists of three main subsystems designed to streamline service operations. This system will help manage job orders, schedule and dispatch technicians efficiently, and provide real-time information to service technicians and dispatchers. By integrating cloud-based storage and a web application, the system ensures seamless communication and data accessibility for all users.

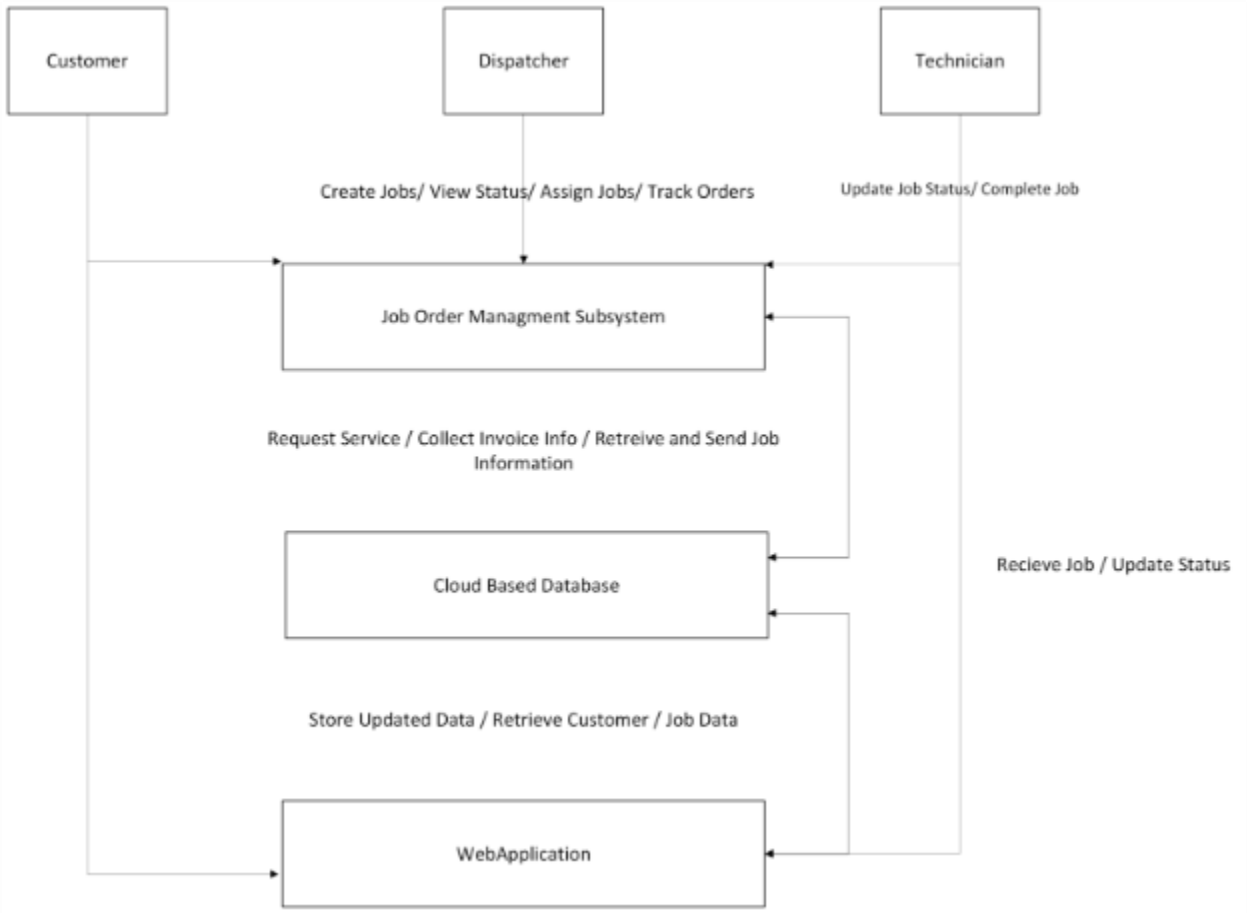
The first subsystem is the Job Order Management Application, which handles job scheduling, tracking, and completion. Dispatchers will use this system to assign jobs based on technician availability and skill set. Job statuses, such as Pending, In Progress, and Completed, will be tracked within this subsystem to ensure efficient workflow management.

The second subsystem is a Cloud-Based Database, which will securely store all job orders, customer records, technician schedules, and invoices. This database ensures that all users have real-time access to accurate information. It will be designed with strong security measures to protect sensitive customer and financial data while maintaining system reliability.

The third subsystem is the Web Application, which will serve as the primary interface for technicians and dispatchers. Technicians will use the app to receive job details, update job statuses, and generate invoices, while dispatchers can use it to enter service requests, track technician arrival times, and confirm payments. The web application may be developed for use with web browsers, ensuring broad accessibility and even allowing use with mobile devices.

These three subsystems will work together to create an efficient and user-friendly Field Service Management System. The integration of real-time data, cloud storage, and web

browser/mobile accessibility will help Price Heating and Air improve service response times, enhance customer satisfaction, and optimize field operations.



3.2 Environment

The proposed Field Service Management (FSM) system will be deployed on Google Cloud Platform (GCP), providing scalable, secure, and cloud-native infrastructure. It will be accessible on a wide range of devices and operating systems, including Windows 11, iOS, and Android, ensuring compatibility for both onsite computers and off-site mobile devices such as phones and tablets.

The FSM will integrate with the organization's existing Identity and Access Management (IAM) system to provide secure, role-based authentication across all platforms. Users, whether office staff or field technicians, will be able to access real-time data and services through a responsive interface tailored to their devices.

Data synchronization will occur instantly across all user touchpoints, allowing seamless coordination between mobile users in the field and desktop users at headquarters. The system will also support integration with external systems via APIs for email notifications, cloud file storage (ex. Google Drive), and potential CRM or analytics platforms.

In summary, the FSM system will enhance operational efficiency by unifying communication, data access, and task management across all devices and systems, while leveraging the power and flexibility of GCP and existing company technologies.

In terms of device usage, the FSM system will be fully optimized for:

- Mobile phones and tablets, enabling technicians and supervisors to receive work orders, update job statuses, capture images, collect signatures, and communicate with customers in real-time.
  Desktop and laptop computers, used by dispatchers, customer service agents, and management teams for scheduling, reporting, and administrative functions.

4. Detailed Design

4.3 Application Components

The key parts of this FSM will be divided into three primary components: the cloud database, web app, and the application hosting server. All of these will be purchasable, however the software and environment for these components will be developed in-house.

The design application components will consist of functional parts of the system that will handle specific tasks. The key parts will include the user interface, authentication & authorization, device integration, and data storage components. There will also be integration APIs alongside a security layer.

4.3.1 Size/Scope:

Functional Scope:

- Track customer job orders, including service date, location, and issue details.
- Allow dispatchers to assign jobs to technicians based on availability and skill.
- Let technicians view job details, update job status, and record service notes.

- Generates and stores invoices and reports for completed jobs.

Out-of-Scope:

- Does not handle payroll or HR tasks.
- Will not include real-time GPS tracking of service vehicles (at this stage).
- Does not include a full CRM (Customer Relationship Management) component.
- Does not allow customers any access to the system.

4.3.2 Programming Languages:

Job Order Management Application:

The Job Order Management Application will be developed using C# and the .NET framework for use on windows workstations.

Web Application:

The web application will utilize the Django (high-level Python web framework) for simple, practical, and cheap design of the web app. Django utilizes standard HTML, CSS, JavaScript and Python for development. Interactions with APIs will utilize JSON data formatting.

Database:

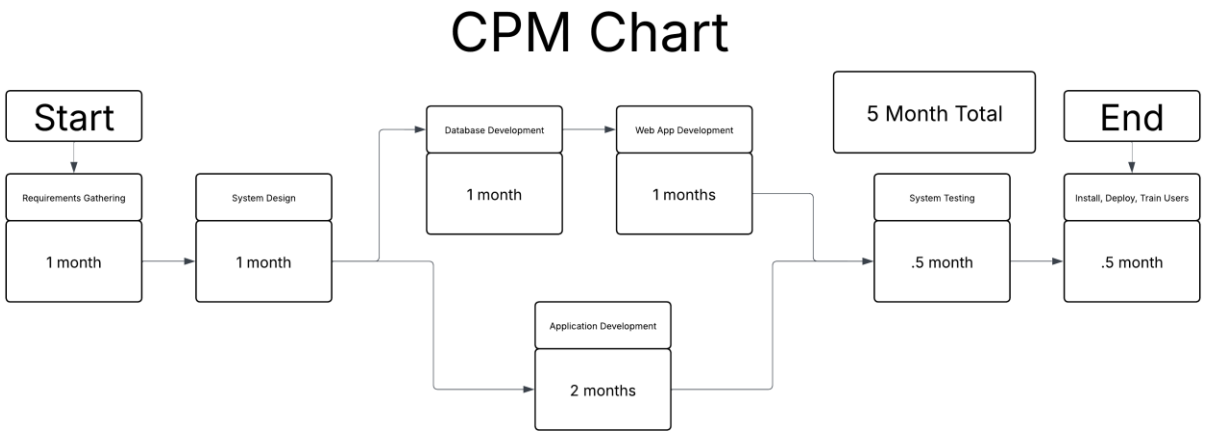
The database will utilize PostgreSQL as its open-source relational database management system (with the use of SQL as its query language). This DBMS is well supported with Django and allows for JSON data to be stored efficiently along with standard relational database structured data.

5. Project Management

5.1 Net Present Value, Payback Period, & Return on Investment

	A	B	C	D	E	F	G	H
1	JHS FSM System Cost/Benefit Analysis							
2		Category	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
3	1	Value of Benefits		$17,500.00	$17,500.00	$17,500.00	$17,500.00	$17,500.00
4	2	Development Costs	-$20,000.00					
5	3	Annual Expenses		-$8,500.00	-$8,500.00	-$8,500.00	-$8,500.00	-$8,500.00
6	4	Net benefit/costs	-$20,000.00	$9,000.00	$9,000.00	$9,000.00	$9,000.00	$9,000.00
7	5	Discount Factor (6%)	1	0.94	0.88	0.82	0.76	0.7
8	6	**Net present value**	-$20,000.00	$8,460.00	$7,920.00	$7,380.00	$6,840.00	$6,300.00
9	7	Cumulative NPV	-$20,000.00	-$11,540.00	-$3,620.00	$3,760.00	$10,600.00	$16,900.00
10	8	**Payback Period**	~2.5 years	3,620 / (3620+3760) = .490				
11								
12		**ROI with discount =**	6300 / 17000 =	37%				
13		**ROI without discount =**	9000 / 17000 =	45%				

5.2 CPM Chart

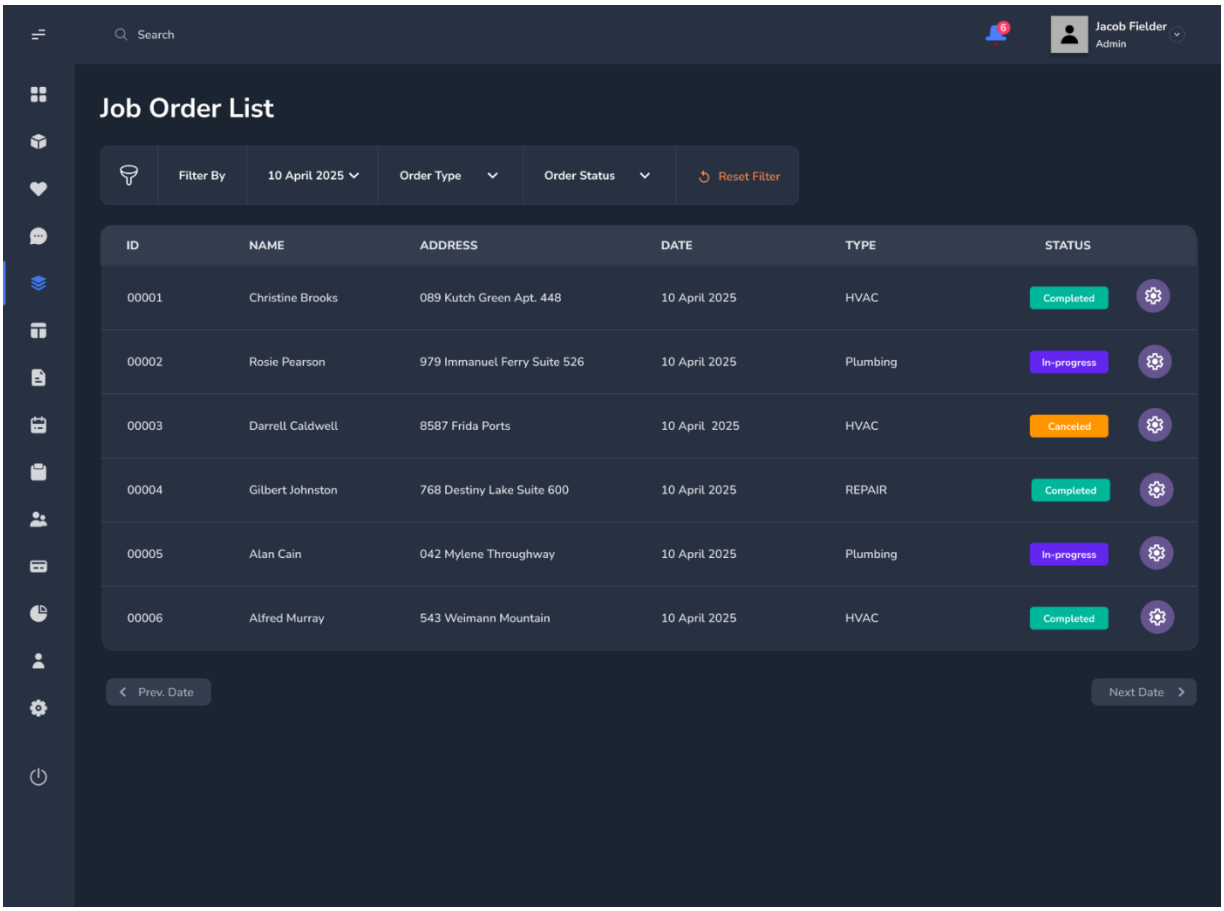


6. Mockup of Prototype

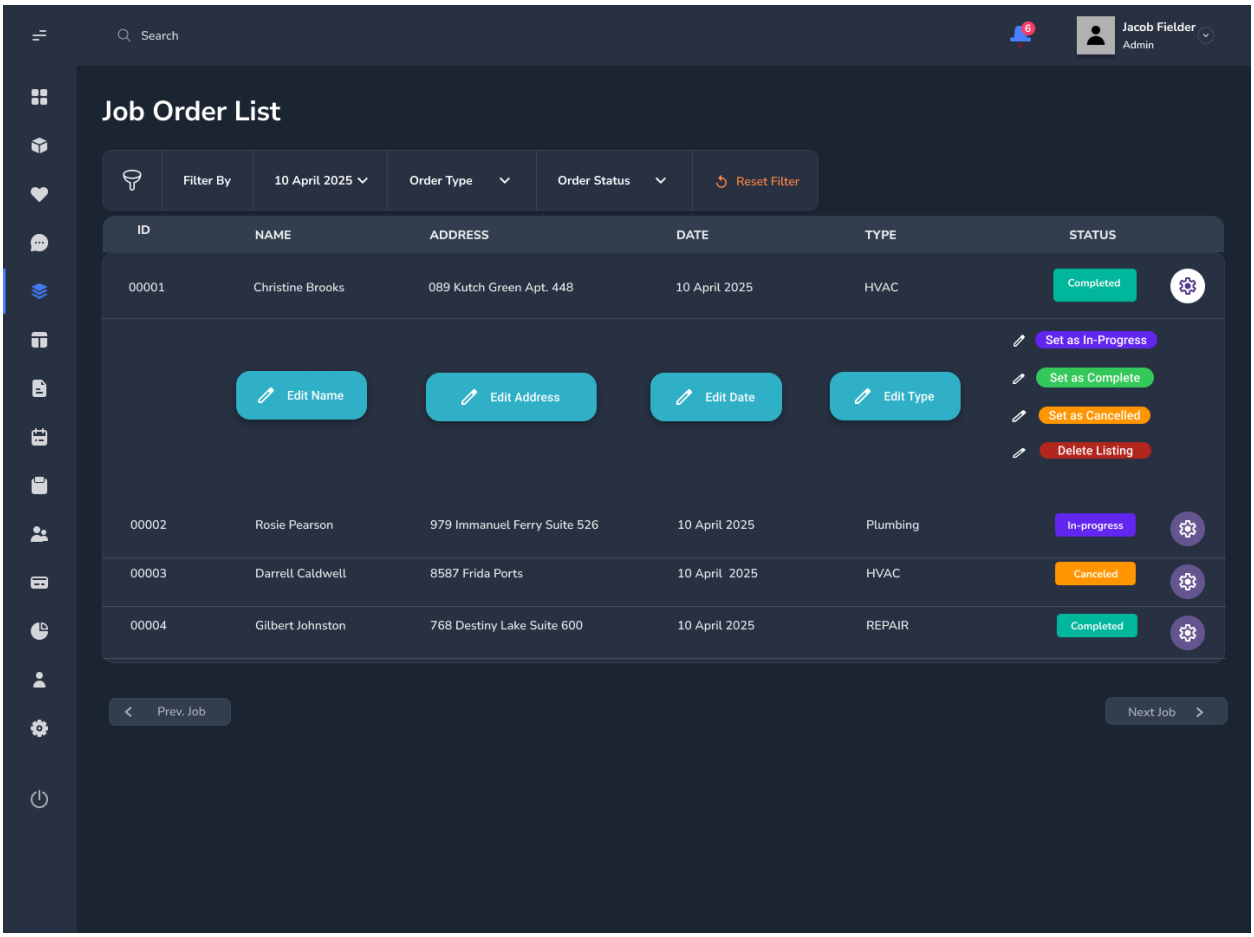
6.1 Prototype Description:

JHS Login Page A - This page contains boxes that request a user for their login credentials, and login button, and a forgotten password selector if the user has forgotten their password.

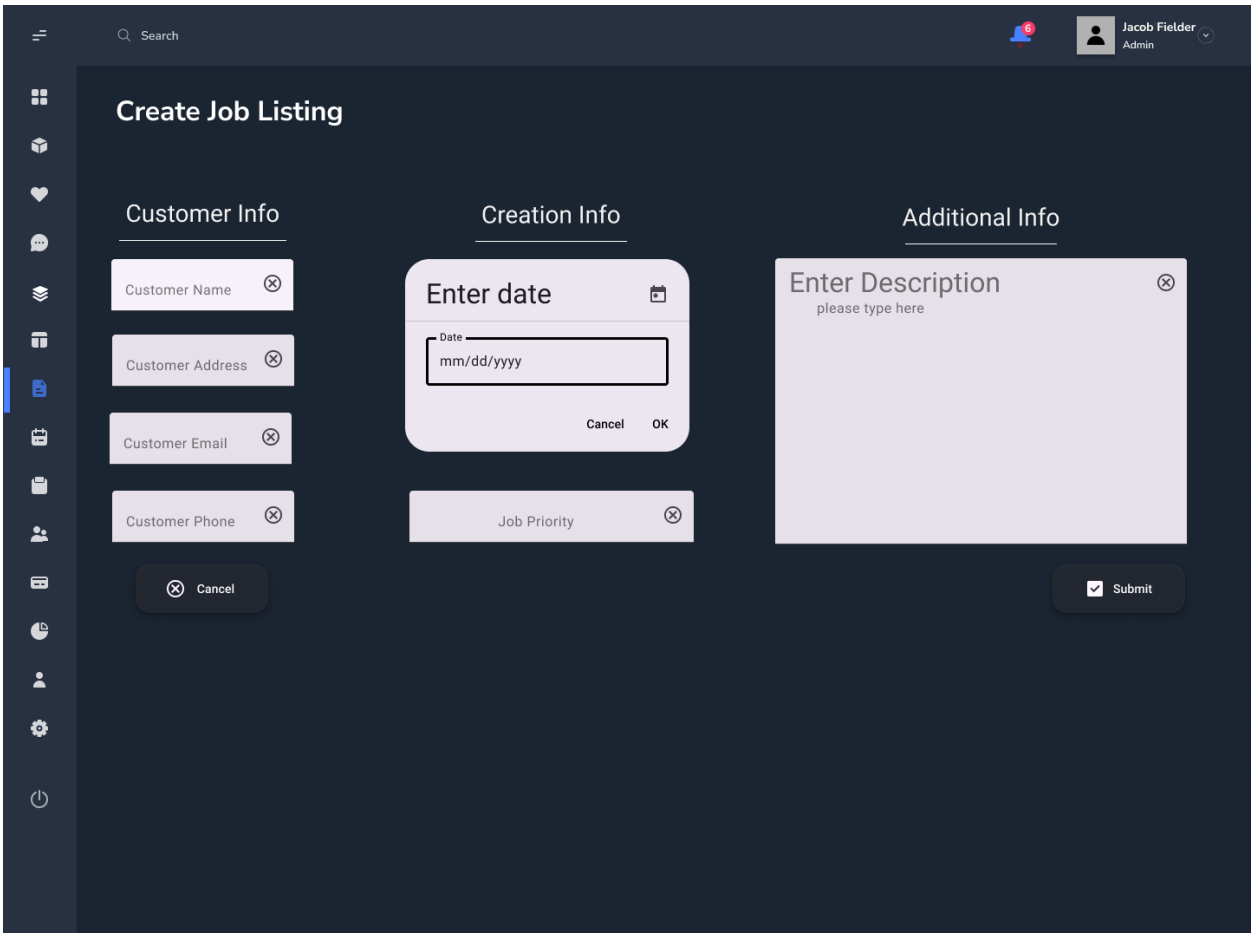
Dashboard Page B - This is the Dashboard page that displays important metrics like sales details and recent job details. The user is also able to navigate to different pages by using the left side vertical menu.



Job Order List Page C – Users can **sort previous and current jobs** by using the **filter** at the top of the page. This page shows customer information and gives an option to edit the job with the gear icon to the far right.



Job Order List Expanded Page D - Users can **expand the list** using the **gear icon** and edit the selected job's details, status, etc.



Create Job Listing Page E – Users can input information gathered from customer phone calls and email requests to create a new job listing. Users will put in general customer information as well as discern job priorities and provide unique information through use of the description box.

6.2 Device Mockup:

This is an example of what our final prototype would look like on stationery and mobile devices. The mockups include a desktop computer, a laptop, a tablet, and a smartphone.

6.3 Prototype Flowchart: