



# WPI

## Scoreboard Message Standardization

A Worcester Red Sox and WPI Collaboration

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*This report represents the work of WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its website without editorial or peer review. For more information about the projects program at WPI, please see <http://www.wpi.edu/academics/ugradstudies/project-learn>*

## Abstract

This project for the WooSox and Polar Park aimed to make paying for scoreboard messages easier for stadium goers and teams. Currently, Polar Park and most other stadiums in the country have an antiquated system that involves an online form that requires excessive time and resources.

We worked on a system that allows scoreboard messages to run with increased automation. This website is integrated with payment capabilities and designed following research from interviews and analysis of the market. The goal of this project was to get this system operational for Polar Park and begin to gauge interest from other teams. Our work contributes to the long term vision for this company: make this website the hub of scoreboard message purchases across the country for professional sports teams.

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## 1.0 Introduction

As of 2021 the Worcester Red Sox, the Triple-A affiliate of the Boston Red Sox, have called Worcester, the second largest city in New England, home. Formerly hailing from McCoy stadium in Pawtucket, Rhode Island, the professional minor league baseball team now also known as the WooSox has wasted no time in becoming a major part of Worcester's culture. The move to Worcester was decided by team owner Larry Lucchino and his desire to relocate the team to a busier area, preferably outside of Rhode Island. The City of Worcester had been looking to continue the redevelopment of the Canal District and Kelley Square.

The largest task that existed prior to the team's arrival was the construction of the brand new stadium located at 100 Madison Street. Polar Park seats 9,508 people and hosted its inaugural season opener on May 11, 2021. Despite the stadium's completion finishing nearly \$60 million over budget, the work for making Polar Park stand out is not over yet.

At our first meeting of the term with the WooSox, we were introduced to our new project. Our project was to create a more efficient way for ballpark customers to use the scoreboard messages often used for birthdays, anniversaries, and other announcements seen between innings. The means of achieving this was to pool information on how current stadiums operate, to design a more efficient means for purchasing scoreboard messages online for Polar Park, and to then sell this new method to other stadiums across the nation. The long-term goal is to make our website the hub of scoreboard message sales for sporting event goers across major sports and major stadiums.

Our direct sponsor and stakeholder is the CFO and CTO Matt Levin. Other stakeholders include the WooSox organization, customers of Polar Park and other stadiums, the City of Worcester, charities that often receive the proceeds of scoreboard messages, and potential clients who may consider adopting this technology for their stadiums.

This scoreboard message project is important to the WooSox as they attempt to make Polar Park a hub of innovative financial technology. Success of this project means success for more than just the WooSox. The ability to use and expand this technology to other stadiums can also generate more revenue as more people will be willing to pay for a scoreboard message if it is easier to do so. Most professional sports teams offering the sale of scoreboard messages direct the revenue to their charities, so success of this project could mean success of communities all over the country.

## 2.0 Research

### 2.1 Domain Research

Most professional sports teams in the country have much in common in regards to the sale of scoreboard messages: most teams offered them, most teams used the revenue for their charitable causes, most teams had a strict character limit for the message, most teams limited the number of messages displayed per game, and most teams used nested forms online for message request submissions. Expectedly, there were exceptions to these rules. Some teams did not offer scoreboard messages (Dallas Cowboys n.d.), some teams did not donate the revenue (Texas Rangers n.d.), some required phone calls, etc. From our industry research, the features listed above were what we determined is the norm as we moved forward and designed a website to accommodate most teams' stadiums. (Venue Method Research, Appendix C)

### 2.2 Existing Application Research

There are no existing applications that serve a similar purpose or have the same set up as the website we hoped to create. We wanted a user to be able to select the stadium, team, or event; find the correct date, and continue on to submit their custom scoreboard message. The search feature seen on the main page of the website might look similar to Priceline in that you are searching for something with a certain location and time, but Priceline is used more as a comparison tool. Ticketmaster is also set up with search options of time, location, and event, but the products Ticketmaster is selling are very different from what our website sells. The home pages of Ticketmaster and Priceline may serve as inspiration for the aesthetic of our website's home page, but the purpose is quite different. If a customer is on our website, they most likely already hold tickets for the game for which they wish to purchase a scoreboard message. It would be confusing to attempt to sell them additional scoreboard messages for other stadiums or events because they have only one reason for being on our website and they know the specific venue and date they want a message.

Because there is no existing service that exclusively offers scoreboard messages, as a result, there is no standard means of charging customers or teams who are interested in adopting this website for their own home games. We needed to conduct financial research to determine what worked best in terms of generating revenue for the website and for the teams. Plenty of options exist including selling the website, charging teams on a subscription model, charging customers a fee for every message purchased, or some combination of these and many more. Because no company has previously tackled this problem, we have an opportunity to start something novel although there is no data or clear path for us to follow.

## **2.3 Support for Project Completion**

After researching how other venues across the country sell and operate their scoreboard messages, it was apparent that this application we worked on can fill a niche in the professional sports market. Most stadiums have an antiquated system in place that requires attention and time from team employees to sift through the messages, relay them to the videography team, and follow up with the customers for clarification. Some teams, such as the Boston Bruins have a long and confusing process that would deter many from purchasing a message in the first place. Construction of an application that makes the process more intuitive and appealing for potential customers was a promising accomplishment for the WooSox at Polar Park. Furthermore, the system can be sold to other teams in the future. This website can increase sales and decrease labor and resources required to sell and display scoreboard messages. There is a significant market for this system to be sold to stadiums around the country.



### 3.0 Methodology

The software development methodology we used was the Agile Scrum methodology. Agile is a methodology that encourages small development in increments with continuous planning, testing and reviewing. Scrum's values are courage, commitment, focus, openness, and respect. Scrum uses predetermined blocks of time called Sprints as a standard unit of project progress. Daily Scrum meetings are held by the Scrum Master and act as an open forum of ideas, problems, and anything else the team needs to discuss. The Scrum Master, Product Owner, and Developers are all members of the Agile Scrum team and work together on the same level meaning there is no hierarchy. ("What Is Scrum?" n.d.)

Agile Methodology is a software development tool that pulls tasks from a grand backlog and places them into Sprints of 1-4 weeks each. In our case, Sprints are 1 week long. The first event of the Sprint is Sprint Planning. This planning event brings the team together to create or pull events out of the backlog and focus the weekly objectives for the sprint to come. The goal of these Sprint Planning Events is to outline a Sprint that can be viewed as a mini project with clear deliverables for the week. ("What Is Scrum?" n.d.)

Daily Scrums are held throughout the Sprint to check in on the team and the feasibility of completing what was set up at the Sprint Planning meeting. Although it is common for members to share their progress with each other, these meetings are supposed to be less of a progress report and more a review on the Sprint goals. These Daily Scrums are a great time to bring up any blockers or issues the team may be experiencing. ("What Is Scrum?" n.d.)

The Sprint Review Event takes place at the end of the Sprint. At this meeting, the team revisits what was set up at the beginning of the week at the Sprint Planning Event. From there, unfinished items can be backlogged for the next week. This is the best time for a team to discuss what is done and what is incomplete so that they can rework unfinished items into future Sprints. This can help a team brainstorm what the next Sprint might look like before meeting for the next Sprint Planning Event. ("What Is Scrum?" n.d.)

The Sprint Retrospective is a meeting aimed at stepping back from the Sprint goals and project details in order to review what went well or what did not go well in regards to individual members, team dynamics, processes, or any administrative issue. With a group reflection on what went well, what went wrong, and what should be changed for the following Sprint, these meetings allow the team to speak openly and honestly about what happened in the Sprint. ("What Is Scrum?" n.d.)

There are several more aspects of Agile Scrum that need to be understood before using it as a methodology. The Product Backlog is a list of components created by the Product Owner that need to be created for the system to be functional. It is from this list that tasks are pulled from during Sprint Planning Events and tasks for the Sprints are made. User Stories are brief

descriptions of a software feature. These are written from the point of view of an end user to better articulate how the feature will provide value. A Burndown Chart is a visual tool used to display how much has been done during a Sprint and what still needs to be accomplished in the remaining time. This allows teams to monitor progress and make changes if necessary before reaching the Sprint Review. (“What Is Scrum?” n.d.)

There are three positions that make up an Agile Scrum Team: Scrum Master, Product Owner, and Product Developer. The Scrum Master is responsible for protecting the Scrum Team and the Scrum process itself. This administrative role is meant to handle issues to make sure the team remains focused and unbothered. The Product Owner is the main stakeholder in a project. This role’s main focus is to be well versed in the purpose of the project to best determine and declare what tasks have the highest priority. The Product Developer is a role that determines how to tackle the Sprint tasks and then efficiently executes with high quality. Decisions of how to delegate work and accomplish tasks are done by Product Developers. If any issues arise the Scrum Master and Product Owner are reachable during Daily Scrums. (“What Is Scrum?” n.d.)

The Software Development Life Cycle Waterfall Model was another option for our software development methodology. This model is similar to Agile Scrum in that it consists of completion of smaller phases, but there are some aspects of the SDLC Waterfall Model that make it less desirable for our project. For example, the waterfall effect that gives this model its name is quite strict in terms of phase structure. The basis of this structure uses a linear sequential flow that does not allow for as much reassessment or flexibility as Scrum. The individual phases must be seen to completion before moving on to the next phase of development. For a project of this nature, rigid phases are nearly impossible to lay out. We were not entirely sure what specific phases of this project would look like, so we needed a methodology that flows freer than the Waterfall model allowing us to reassess phase structure every day. The phases of the SDLC Waterfall Model are named eponymously after their purposes. (“SDLC - Waterfall Model” n.d.)

There are six distinct phases in the SDLC Waterfall Model. Flowing down in order they are: Requirement Analysis, System Design, Implementation, Testing, Deployment, and Maintenance. In the Requirement Analysis phase a specification document is constructed. This document lays out all everything that needs to be developed. The System Design phase takes the specifications from the previous phase and prepares a plan for development. This phase then specifies hardware necessities and defines the architecture of the project overall. The Implementation phase marks the beginning of developing units for the next phase. The Integration and Testing phase is when the developed products of the Implementation phase are joined into the system after trials. The project is tested for errors or failures. The Deployment of System phase takes place after the nonfunctional and functional testing is completed. Here the product is released to the customer and market. The Maintenance phase aims to address problems that are sure to arise during the deployment of the product to the market. Patches are constructed that put out fires and updates are constantly being made to keep the product improving. (“SDLC - Waterfall Model” n.d.)

We chose Agile Scrum methodology because it is the methodology that the WooSox use. Also, two of us were already familiar with Agile Methodology from a software engineering course. Scrum granted us the flexibility to make on-the-fly changes to the goals of each sprint. This was paramount at the beginning stages of our project as we were figuring out how the project would unfold as we were not sure what and where our exact end goal was. The elasticity and ability to alter our Sprint goals was the ultimate reason we needed to go with an Agile methodology such as Scrum. Also, particularly at the beginning stages of the project, it was crucial we conducted Daily Scrums to make sure our goals, progress, and ideas were in sync and on track with each other, our sponsor, our time constraints, and our end goal.

Our data collection methodologies varied based on what was available to each of us for each topic. For example, there was no existing way to survey or find an Excel sheet that lists or describes the requirements, price, or offerings of scoreboard messaging across major stadiums in the United States. For such data collection, we needed to visit the website of each venue and do first hand data collection one venue at a time. For data analysis of other areas, there were resources that exist including sites such as [sportsdata.io](https://sportsdata.io).

The project management tool we used was Trello. We chose this because it is free and any of us can make changes at any time. It also allows us to divide the cumulative tasks at hand into smaller, more actionable steps and put those in the appropriate sprints.

## 4.0 Software Development Environment

### 4.1 Project Management Software

The team used Trello for project management. At the beginning of each Sprint, during the planning meeting, each member would add To Do cards and assign their names to the card. The card was moved from 'To Do' to 'Doing' to 'Done'. This allowed each member to note what was needed, what was in progress, what was completed, and what was not completed. This helped us better plan our next sprint to make sure all of the requirements were met. We chose Trello over the other options because it was free, and the simplicity of its features were all we needed.

Monday.com was another option for a project management tool. This service is capable of everything Trello offers and more. Monday.com has dozens of extra features including in app messaging, budgeting tools, in depth timelines and Gantt charts and plenty of other features. However, the free version of Monday.com was only available for 2 members. Also, we agreed as a team that all of these additional features were not necessary and might even be a distraction from our project. Perhaps with a larger team and longer project Monday.com would have been the right choice, but it was more than we needed for this MQP.

The team used Slack for project communication because it is the tool the WooSox use. The Slack group included the four group members and our project advisor. Within the Slack group, different channels were created for more specific communication such as coding, general, schedule, etc.

Microsoft Teams was an alternative to Slack. Even though we use Microsoft Teams for meetings with our sponsor, he still preferred Slack over the message board and scheduling tools included in Microsoft Teams. Both platforms offer many of the same capabilities, but Slack has a more intuitive design that allows for quick communication and runs smoother.

### 4.2 Programming Environment

The application was built using Bubble.io. Bubble.io is a fast growing, non-code based platform for developing mobile and desktop applications. Although Bubble.io primarily offers a non-code based user interface, users still have the ability to add custom HTML, CSS and JavaScript to their application. Bubble.io has over 1,000 plugins and provides the functionality to build and publish individual plugins. The API Connector, one of Bubble.io's built-in free plugins, allows users to easily connect to any external API. Bubble.io is built on Amazon Web Services and every application includes SSL certificates and multi-factor authentication. There is also a built-in version control and a database management system. Lastly, Bubble.io has its own Academy, which offers interactive lessons, templates, videos and manuals.

In addition to using default Bubble.io functions and their library of plugins, we used their plugin editor to create custom plugins to accomplish the tasks that Bubble.io could not handle.

Using their plugin editor we were able create custom elements and actions that take in and return specific data types. For custom elements, we defined functions written in Javascript for when the element is visible on the page and for whenever a field changes. Custom actions were essentially functions we wrote using JavaScript that we could call in Bubble.io when necessary.

Overall, Bubble.io saves time by offering pre-built components and a vast library of plugins. In addition, Bubble.io offers the ability to add custom code when needed. Also, Bubble.io's version control, database management system and security infrastructure allowed for a quick and easy start to development.

## 5.0 Software requirements

### 5.1 Software requirement gathering strategy

Most of the requirements for the project were determined through our discussions during our daily meetings with our sponsor, Matt. The project's requirements were constantly adjusting as the project progressed. In addition, we interviewed two staff members from the WooSox Foundation that work with the current scoreboard system at Polar Park to get a better idea of what we should include in the website. These interviews can be found in Appendix C.

### 5.2 Functional and non-functional requirements

The main functional requirement of this project was creating a website where customers can order scoreboard messages for different stadiums and where stadium staff members can process all the orders for their stadium. The website also needed to include a payment system where the website owners can take a portion of the earnings from each message order. The customers should also be able to view their order history and request a refund. The primary nonfunctional requirements for this project are focused on making the website easy to use and intuitive for both the customers and staff to use. The site should be responsive and take less than 5 seconds to load any page or process the payment. All emails sent to the customers such as for resetting passwords or the receipt of an order should be sent within 24 hours. In addition, the staff should be notified of any orders or refunds within 24 hours to allow them to quickly process the order.

### 5.3 Initial User Stories

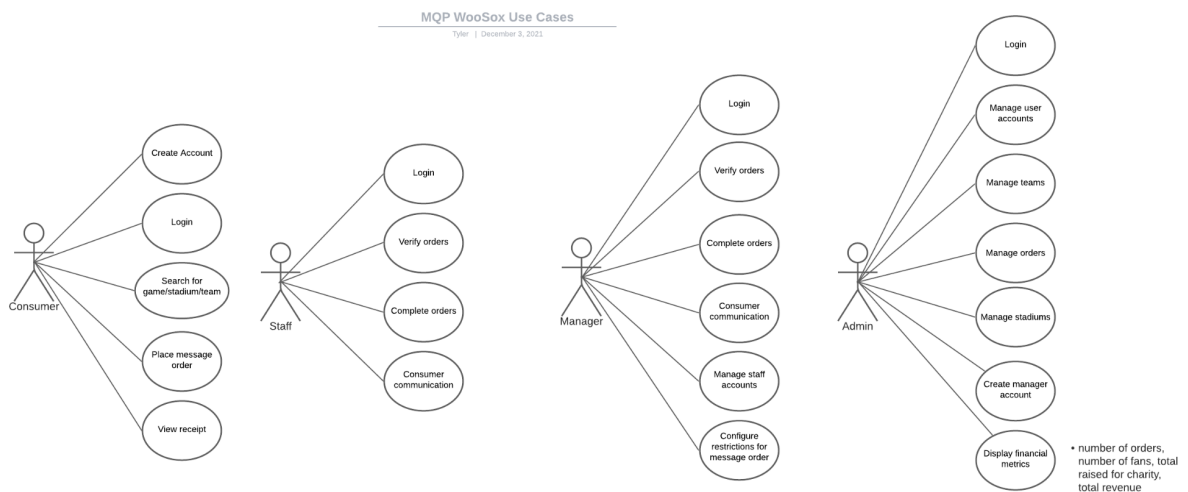
Initial User Stories	
User Story	Points
As a consumer I want to login So I can view my saved personal data	1
As a consumer I want to receive a receipt So I can I know that my order has been processed	3
As a consumer I want to register an account So I can save my personal data	1
As a consumer I want to the interface to be simple So I can easily navigate the website	5
As a consumer I want my personal data protected So I can have privacy	2
As a consumer I want to be emailed a photo of the message on the scoreboard So I can confirm it was shown and save it	8

As a consumer I want to search for a stadium near me So I can find a stadium to place a message order	5
As a consumer I want to select an available date from the teams schedule So I can skip going on the teams website and manually finding it	5
As a consumer I want to quickly see if the stadium is supported by the website So I can not waste time searching	3
As a consumer I want to contact customer service So I can ask questions	5
As a consumer I want to search for events by date So I can place a message on the day I want	3
As a consumer I want to request a refund So I can get my money back	5
As a consumer I want to see a history of purchases So I can have all of the purchases in one place	3
As a consumer I want to select a time when the message will appear So I can make sure I am there to see it	8
As a consumer I want to see the total amount raised for charity So I can see the benefit of my donation	3
As a admin I want to login So I can view my saved personal data	1
As a admin I want to manage manager accounts So I can ensure the teams have a manager account	3
As a admin I want to update website content So I can make sure the website is up to date	5
As a admin I want to add/delete/edit users So I can control who gets access to the website	3
As a admin I want to have access to all of the users So I can contact the users if needed	3
As a admin I want to manage which stadium is shown So I can add/delete stadium	3
As a manager I want to login So I can view my saved personal data	1
As a manager I want to place character limit on the messages So I can make sure the message is displayed accurately	3
As a manager I want to set a list of possible messages types So I can make sure the message is appropriate to be displayed	3

As a manager I want to automatically eliminate inappropriate message orders So I can make sure the message is appropriate	8
As a manager I want to set the prices on the messages So I can make sure the messages are properly priced	3
As a manager I want to have access to the list of orders So I can manage the orders	3
As a manager I want to edit the schedule So I can control which games are allowed to display messages	5
As a manager I want to be able to manage staff accounts So I can add/delete staffs	3
As a staff I want to login So I can view my saved personal data	1
As a staff I want to see a list of unverified orders So I can quickly verify them	5
As a staff I want to email the user when an order is verified So I can let the customer know	5
As a staff I want to add a message (free or at a different price) So I can have special occasions	2

**Table 1: Initial User Stories, Agile Methodology**

## 5.6 Initial Use cases for application



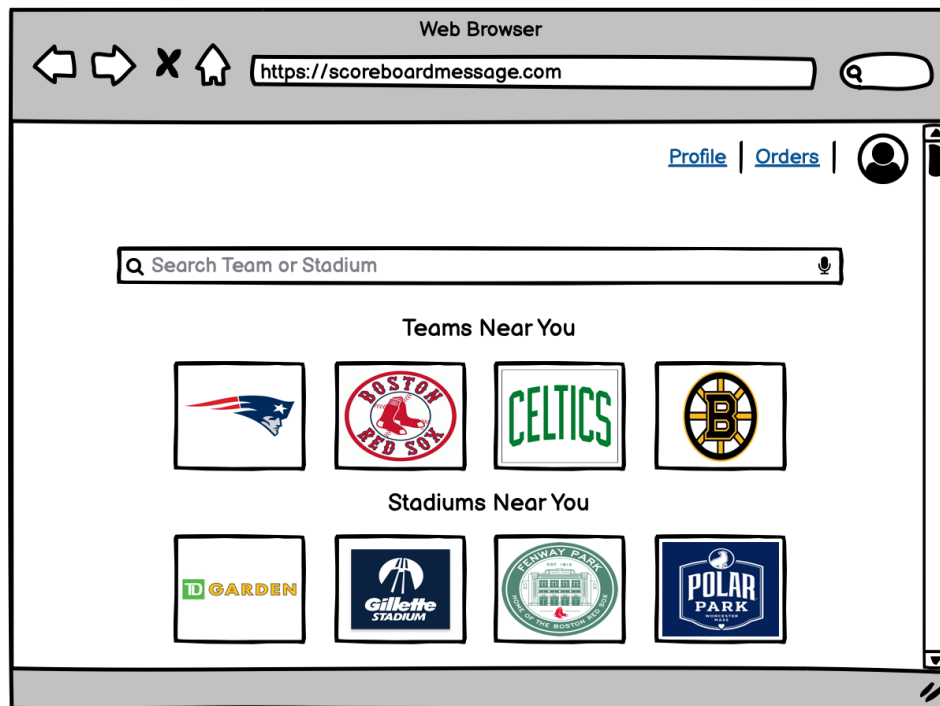
*Figure 1: Use Case Diagram, depicting Consumers, Staff, Managers, and Administrators*



## 5.7 Interface Mockups

In order to best visualize the outcome of the site before it was completed, we developed a series of wireframes that demonstrated the basic functionality of the system, without any of the backend programming. This allowed us to understand the customer experience, as well as that of any staff or administrators navigating the site.

To create these mockups, we used a program called Balsamiq, which allows users to use pre-loaded digital entities to represent features of a final form site. This program gave us the ability to connect frames and replicate forms to be implemented in the final site. Through this process, we were able to improve the flow of information and identify the aesthetic needs of the page. While the format of the wireframe was simplistic itself (example seen in Figure 2 below), it allowed us to understand the needs of our final form site, both functionally and aesthetically. The full wireframe interface mockup can be found in Appendix A.



*Figure 2: Wireframe Example, Post Sign-Up Page\**

\*This page appears after a customer has created an account and not yet placed an order. If they allow their location to be shared, they will be shown teams and stadiums in their general area. This page links to order placement, search functionality, team/stadium browsing, and profile viewing.

## 6.0 Process Analysis

To gauge the current state capabilities of the video board message system presently in use by the Worcester Red Sox, a process flow analysis was conducted. By analyzing the current state of the process, we were able to identify the pain points in the system that were causing consistent issues, or unnecessary slow downs and capacity limitations. Through speaking with our Sponsor, Matt Levin, as well as Tim Quitadamo from Videography and Sabriya Chaudhry who is involved in the Worcester Red Sox Foundation process of the message board, we were able to outline the process seen in Figure 3.

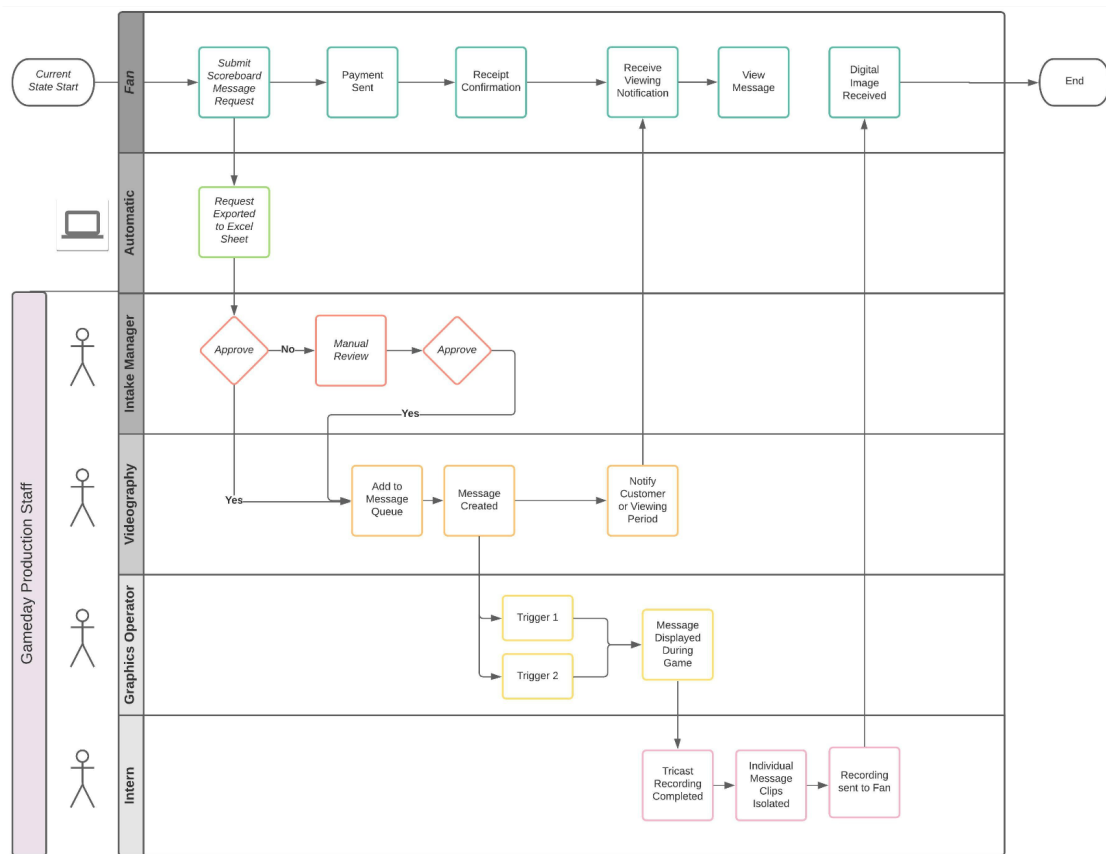


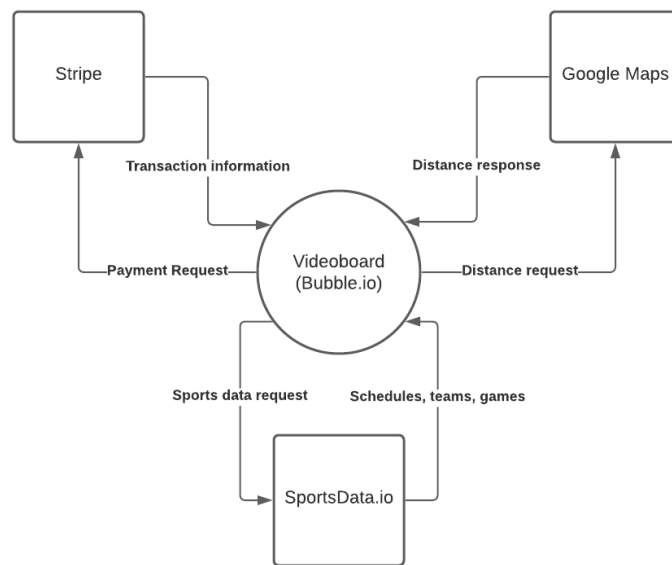
Figure 3: Current State Process Flow Swimlane Diagram

Following a current state analysis, and the primary development of new software, further attention can be paid to the total cost of the process in its current state. Using data gathered specifically from the Worcester Red Sox message process, and standard labor rates, we were able to identify the preliminary process cost before any changes were made.

## 7.0 Design

### 7.1 Software Frameworks and Architecture

Our entire project was built using Bubble.io's website builder along with multiple plugins available on the Bubble.io Marketplace and our own plugin. We used the API connector plugin to gather game and stadium data from the SportsData.io API. For the payment system, the website connects to the Stripe API to ensure a secure checkout process and payment. We also created our own plugin to perform more complex operations that Bubble.io cannot handle. A diagram of the software APIs and their interactions with our application can be found in Figure 4 below.



*Figure 4: Context Diagram*

When structuring the site, it was important to take into account the way that customers and administrators move through the system. By understanding the steps of the process, we were able to identify the points of the system that should be well connected, and easily navigable.

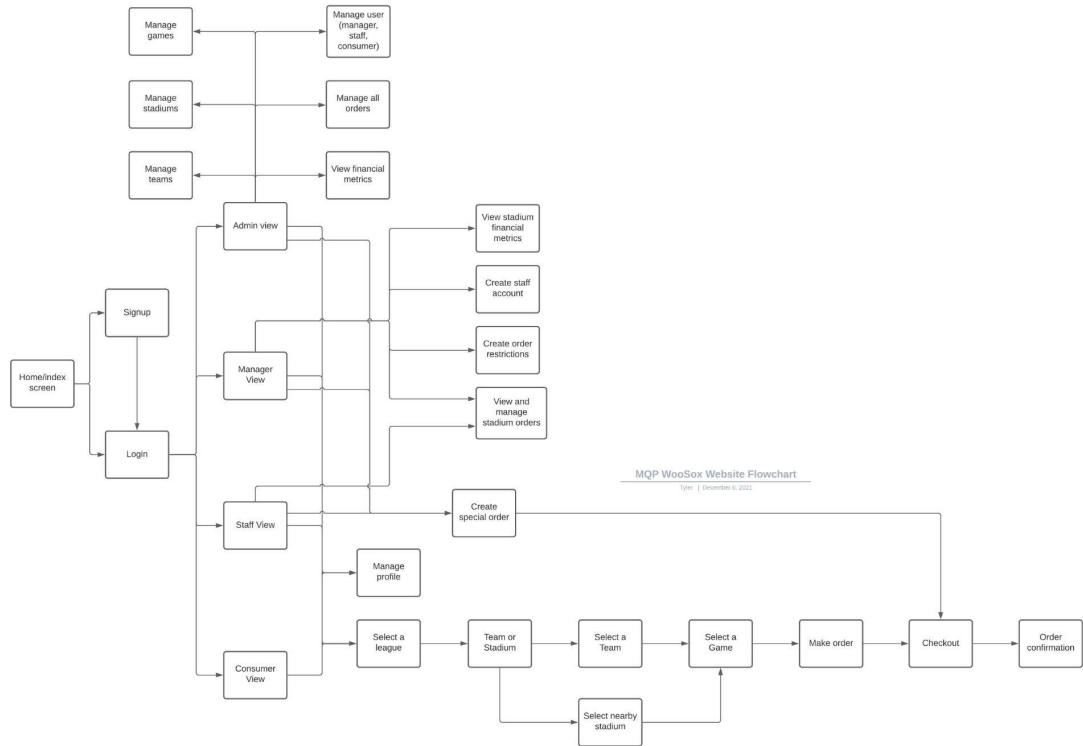


Figure 5: Site Flowchart

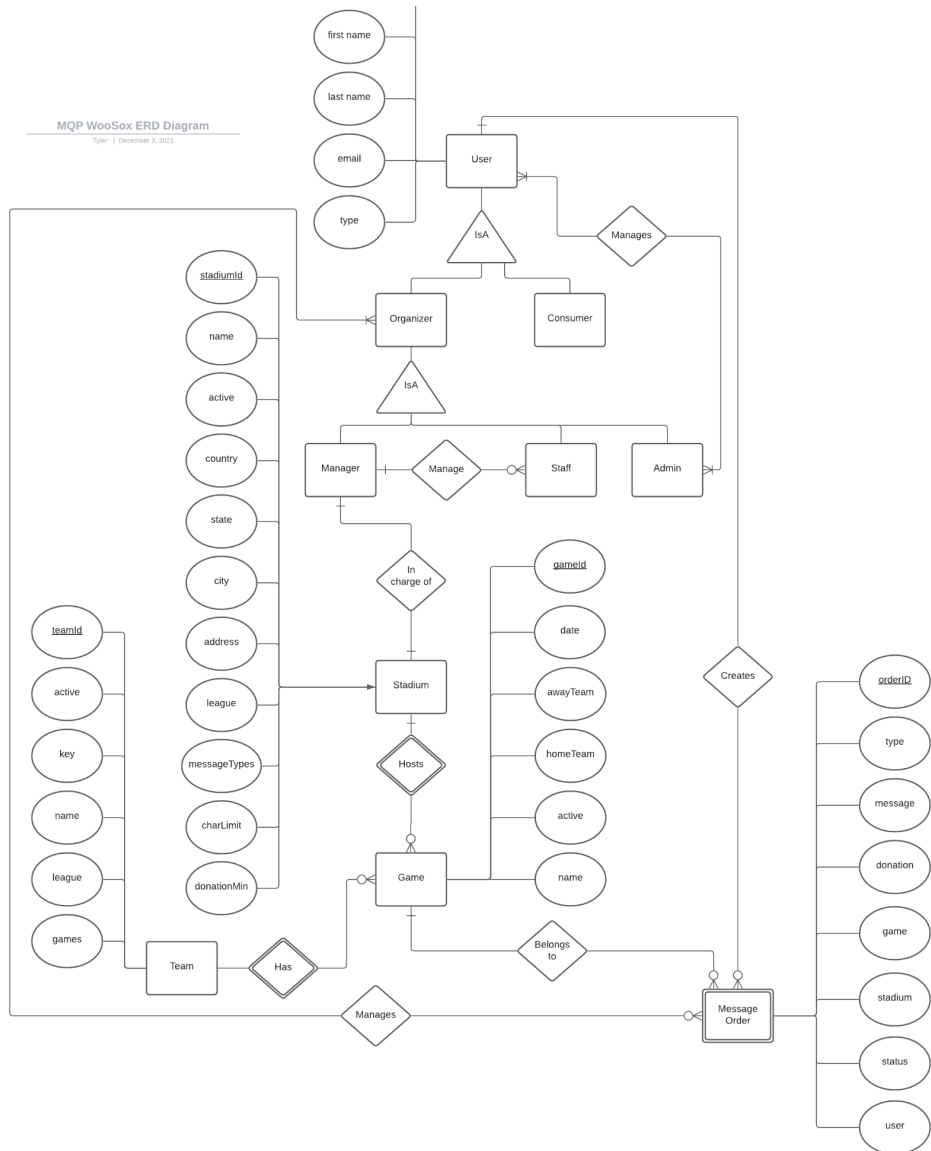


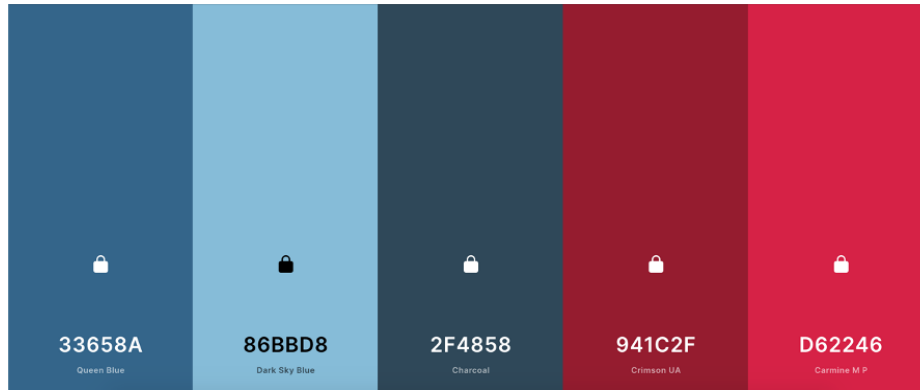
Figure 6: Entity Relationship Diagram for the Website

## 7.2 Interface Design

Developing an interface requires appealing to both the management requirements of team administrators as well as the aesthetic and functional needs of the average customer. The first part of this accommodation was creating a sense of unity and consistency across the site, regardless of the user. This involved standardizing colors, fonts, buttons, lists, search functionality, and other features that users will have direct and repeated contact with. A set of colors were selected to reflect the theme of the site, and are used in the areas of the site that are not specific to each team or venue (Figure 7).

Building on the concepts outlined in a revised list of usability heuristics, we looked specifically at the interaction between users and the system (Pribeanu 2017). We aimed to create

a balance between the real world and the system itself. By creating an interface that mimics the atmosphere of a sporting event or team, customers are more likely to feel connected to the environment, and drawn into the experience. This is far more likely to bring repeat customers, as well as entice teams to buy into the system, as they would see themselves reflected in the site itself.



*Figure 7: General Color Scheme for Digital Design\**

*\*To include standard white and black as well*

## 8.0 Software Development

For our software development, we had weekly sprints with two daily check-in meetings, one with our sponsor in the morning and one in the afternoon with just the team. We started all our sprints on Monday with a planning meeting where we would create To Do cards of all the tasks to be done for the sprint and assign members to accomplish each card. Each sprint ended with a review and retrospective on Fridays with the exception of Sprint #3 which was a few days longer due to the Thanksgiving break. During the review and retrospective meetings we would revisit the Trello board to see how well we accomplished our goals and talk about what went right or wrong and how we could improve for next week. All of these meetings were run by our scrum master via Zoom. We had a total of four sprints along with an initial week for setting up.

### 8.1 Sprint Development

Set Up - Week 1		
User Story	Point Allocation	Status
<b>As a Developer I want to</b> get familiar with Bubble.io <b>so I can</b> create the website	1	Complete
<b>As a Developer I want to</b> access Matt's Bubble.io app as a developer <b>So I can</b> begin creating the website	1	Complete
<b>As a Developer I want to</b> connect to an external API <b>So I can</b> get access to data	1	Complete
<b>As a User I want to</b> order a simple scoreboard message <b>So I can</b> send my message to the game	2	Complete
<b>As a Developer I want to</b> create initial user stories <b>So I can</b> have a plan on what to work on	1	Complete
<b>As a Developer I want to</b> create initial user cases <b>So I can</b> know what functionality the website needs	1	Complete
<b>As a Developer I want to</b> create initial ERD <b>So I can</b> create the initial data types	1	Complete
<b>As a Developer I want to</b> create website flowchart <b>So I can</b> know what pages the website needs	2	Complete
<b>As a Developer I want to</b> integrate Stripe payment system <b>So I can</b> have a secure payment system	7	Incomplete
<b>As a User I want to</b> be able to login/register <b>So I can</b>	2	Complete

access all the functionality of the website		
Total Points	12	

**Table 2:** Week One Set-Up User Stories, Point Allocations, and Completion Status

The main goals included learning about and becoming familiar with the development environment, creating initial software diagrams including user stories, use cases, an ERD and a website flowchart, and beginning development, which included pulling data from SportsData.io, an external API. One challenge was getting familiar with the Bubble.io's user interface in a short period of time. However, Bubble.io contains well documented manuals and interactive lessons that made the transition a little smoother. Another challenge was using one of Bubble's plugins, the API Connector, to connect to SportsData.io. This was a little challenging at first due to all of the terminology including authentication, shared headers, key/value parameters and data vs action. Once the application successfully pulled data from the external API, another challenge was then displaying that data in the application. However, the more this process was done, the easier it became.

Overall, the team was happy with the progress made during the first week. One improvement for the following week is more communication between the computer science majors and the business/industrial majors. More specifically, communication related to the development of the application and features that the application contains. However, the goal of the first week for the computer science majors was to get familiar with the programming environment and to start the development, both of which were completed.

Sprint #1		
User Story	Point Allocation	Status
<b>As a Developer I want to</b> Pull data from SportsData.io and convert it into bubble.io data types <b>So I can</b> update the schedules automatically for each team	2	Complete
<b>As a Developer I want to</b> Create a search input that pulls from both stadiums and games <b>So I can</b> allow users to easily find available games or stadiums	5	Complete
<b>As a Staff I want to</b> Add/edit/delete orders <b>So I can</b> manage the orders	3	Complete
<b>As a Developer I want to</b> Create an initial (non-dynamic) calendar page using the plugin <b>So I can</b> start to play around	1	Complete
<b>As a Staff I want to</b> Add/edit/delete games <b>So I can</b>	2	Incomplete



manage the games		
<b>As a Staff I want to Add/edit/delete users So I can manage the users</b>	2	Incomplete
Total Points	11	

**Table 3:** Sprint #1 User Stories, Point Allocations, and Completion Status

We had two main goals for the first sprint. The first one was to begin creating the features to allow the users to easily find available games or stadiums using an autocomplete search bar and calendar. The main challenge with this goal was allowing the search bar to auto fill for two different data types, teams and stadiums. This was challenging because each group can only have one data source. In order to get around this, we added two separate groups. One group sources from the teams and the other group sources from the stadiums. The second goal was to begin creating a page for the staff to manage the orders, games, and users. The main challenge we faced was when converting the time of the games from the SportsData.io to a bubble.io Date type. To convert it, we ended up parsing the time as a string and setting each field of the Date type. Other than that, creating a page to manage the orders, games and users took longer than expected since we were still new to Bubble.io but we managed to finish the page for the orders.

Overall, the first sprint went well and we were happy with our progress. While we did not necessarily finish all the user stories, we felt we were still in a good place. The two user stories we did not finish would be easy to finish the following week since it is similar to orders page. We thought having two daily meetings, one in the morning with Matt and one in the evening with just the team was the perfect amount. Any more would be too much and any less would not create a disconnect between the computer science majors and the business/industrial majors.

Sprint #2		
User Story	Point Allocation	Status
<b>As a Developer I want to Update the ERD So I can decrease lookup time</b>	3	Complete
<b>As a Developer I want to Integrate the Stripe API So I can ensure safe transactions for all users, display financial analysis for admins and allow third party transactions</b>	7	Incomplete
<b>As a Developer I want to Edit the order form to dynamically pull from the stadium settings. So I can ensure the manager settings are applied</b>	1	Complete
<b>As a Staff I want to Add/edit/delete stadiums So I can</b>	2	Complete

manage the stadiums		
<b>As a Staff I want to Add/edit/delete games So I can manage the games</b>	2	Complete
<b>As a Staff I want to Add/edit/delete users So I can manage the users</b>	2	Complete
<b>As a Staff I want to Create message types with specific restrictions and template So I can set restrictions based on message type</b>	7	Incomplete
<b>As a Staff I want to Manage initial stadium settings So I can set restrictions of message orders and update stadium info</b>	2	Complete
<b>As a Consumer I want to see a list of supported teams and stadiums So I can see availability without needing to search for a specific team or stadium</b>	2	Complete
<b>As a Staff I want to view financial analysis So I can view how well the message orders are doing</b>	5	Incomplete
<b>As a Developer I want to create a header So I can use it on all the pages</b>	2	Complete
<b>Total Points</b>	16	

**Table 4:** Sprint #2 User Stories, Point Allocations, and Completion Status

Our main objective was to finish all the staff pages from sprint 1 and increase flexibility for each stadium by allowing stadium managers to set restrictions of messages and update the stadium info for each specific stadium. The staff pages for the stadiums, games, and users were finished with relative ease as it was similar to the orders pages. The main challenge came from creating complex message order types where the customers only had to fill in the names and other parameters in a template message that the managers created. Multiple methods were attempted with the base Bubble.io functionality but they were either extremely slow or did not work. Instead we looked into creating our own plugin for this task. Initially we decided to create a page for the staff to view financial data on the message order but then decided that was too much of a problem and that Stripe already has a dashboard that tracks payments. We also planned to improve the customer experience by showing a list of supported teams and stadiums along with the search bar. In addition, we realized that the lookup time for the games was too long so we updated the ERD so that the teams and stadiums stored a list of their games instead of looking through all the games each time. We also planned to begin integrating the Stripe API, but did not have time to finish it.

Similar to the previous sprint, we are happy with our sprint. We knew there are going to be challenges as we developed more complex features and that all the user stories will not be completed. Instead of being stuck on a problem alone, there was good communication between the Computer Science majors to quickly and efficiently solve the challenges. We also realized that we need to do a better job of prioritizing the important features and drop the lower priority features like our own financial analysis page.

Sprint #3		
User Story	Point Allocation	Status
<b>As a Developer I want to</b> Split the staff into admin, manager, and staff pages <b>So I can</b> restrict access to specific functionality	2	Complete
<b>As a Developer I want to</b> Integrate the Stripe API <b>So I can</b> ensure safe transactions for all users, display financial analysis for admins and allow third party transactions	7	Complete
<b>As a Developer I want to</b> integrate google maps API <b>So I can</b> users to see nearby stadiums	5	Complete
<b>As a User I want to</b> access my profile <b>So I can</b> change my profile settings and view order history	3	Complete
<b>As a Manager I want to</b> Create message types with specific restrictions and template <b>So I can</b> set restrictions based on message type	7	Complete
<b>As a Developer I want to</b> create a plugin <b>So I can</b> create the templates for the message types	2	Complete
<b>As a Developer I want to</b> connect all the pages <b>So I can</b> the website is functional	1	Complete
Total Points	27	

**Table 5:** Sprint #3 User Stories, Point Allocations, and Completion Status

Our main goal for Sprint 3 was to get the minimum viable product completed before Thanksgiving break. This included finishing up the payment system and custom message types from the previous sprint. These two user stories took up the bulk of the work. We tried multiple stripe plugins including a paid one but faced problems with the authentication. We ended up just using the Stripe system that was built into Bubble.io. The main challenge with the custom message types was learning how to create a Bubble.io plugin and how the data types are passed and returned. Once we learned how, writing the JavaScript to do the task was simple. To complete the MVP, we also created a profile page for the customer to change their setting and

view their order history, split the staff user into admin, manager, and staff to restrict access to specific functionality and integrated Google Maps API so customers can see their nearby stadiums. As the final step, we connected all the pages together so the website is fully functional.

Overall, we are very happy that we completed the MVP before Thanksgiving break. We were able to overcome two major challenges with the payment system and message types. One thing we realized was that we should have been creating stricter deadlines. Having everything be remote makes us lazier especially on such an open ended project. For the entire term, we had the goal of completing the MVP before Thanksgiving and that was what allowed us to finish the MVP and complete all 27 user stories points.

Sprint #4		
User Story	Point Allocation	Status
<b>As a Manager I want to</b> add a meta page before the order form <b>So I can</b> tell the users any info they need about the order specifically for their stadium	5	Complete
<b>As a Staff I want to</b> add games from a CSV file <b>So I can</b> quickly add games for an entire season	3	Complete
<b>As a User I want to</b> Login/Sign up with Google or Facebook <b>So I can</b> do not have to create a new account	2	Complete
<b>As a Developer I want to</b> create a footer <b>So I can</b> include contact info, help, and add a different method to navigate the website	2	Complete
<b>As a User I want to</b> see how much money has been donation to each stadium’s charity foundation <b>So I can</b> see the impact of the scoreboard donations	3	Complete
<b>As a Staff I want to</b> download games/orders as a CSV file <b>So I can</b> use the data elsewhere	3	Complete
<b>As a User I want to</b> request a refund <b>So I can</b> get my money back in case there was a problem	3	Complete
<b>As a Developer I want to</b> have an aesthetic landing page <b>So I can</b> make users more likely to order a message from the website	5	Incomplete
Total Points	21	

**Table 6:** Sprint #4 User Stories, Point Allocations, and Completion Status

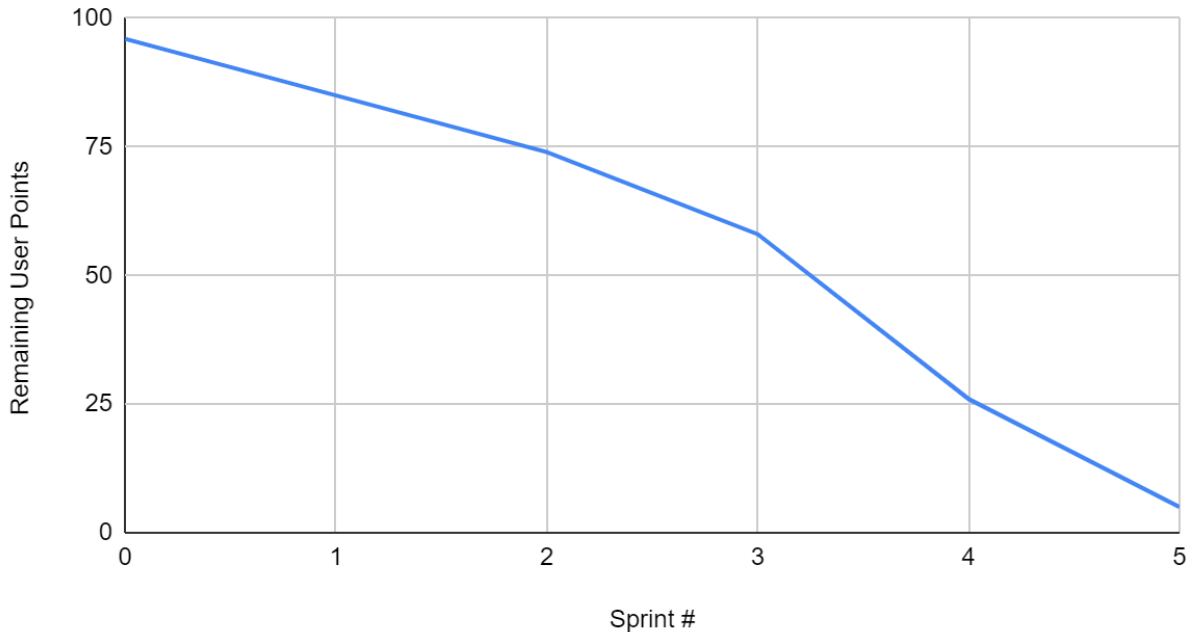
With the MVP done, our goal for this sprint was to add whatever features we believed customers and staff members would like to have. The main features for the customers that we wanted to add were creating an aesthetic home page, allowing them to request refunds and a simpler way to login via Google or Facebook authentication. The main challenge was faced for these features was creating a homepage that we all agreed would be aesthetic enough for the customers. Also due to the term coming to an end, we had to focus on finishing the paper over working on the aesthetics. The main features we wanted to accomplish this sprint for the staff was to allow them to upload and download games to and from a CSV file. In addition, we wanted to allow stadiums to have a personalized metapage that is shown to the customer before making an order for their stadium. The main challenge for these features was ensuring the file could be uploaded correctly even with differently formatted field names in the files. To complete this task, we created an interface that allows the staff member to match the field names from their file to the fields names in the database to correctly upload the data.

Having already accomplished our goal of creating a functional system last sprint, we did not have any major goals for this sprint and were happy with any extra features we could complete this week.. We accomplished most of the user stories while also getting a lot of work done on finishing the paper as the term comes to a close. Since it is the last sprint, everyone knew their roles so the sprint went smoothly.

## **8.2 Product Burndown Chart**

For the entire software development process, we had a total of 96 user stories points we wanted to accomplish for the term. Ideally, we would have wanted to accomplish roughly 19 user stories during each of the 5 sprints, but realistically there are many challenges or other factors when developing software that will affect the pace. While the product burndown chart is not a perfectly straight downwards sloped line, the slope of the line mostly gets steeper as time went on, which is exactly what we wanted. It shows that as we worked on the project, our efficiency using Bubble.io and ability to work as a team increased, which increased the amount of user stories we could accomplish for each sprint. In the end, we were able to accomplish all the user stories with the exception of an aesthetically pleasing home page user story and the financial page user story which we decided to remove.

## Product Burndown Chart



*Figure 8: Product Burndown Chart*

### 8.3 Software Security Implementation

Bubble.io is built on Amazon Web Services, which is compliant to a list of security certifications including SOC 2, CSA, ISO 27001. Bubble.io encrypts all traffic to hosted applications using the Secure Socket Layer (SSL) over hypertext transfer protocol secure (HTTPS). Bubble.io also uses Cloudflare's network to provide fast and secure responses globally. All user passwords are stored, salted and encrypted on Bubble.io servers. Lastly, Bubble.io has built-in code and vulnerability testing (“Bubble Security” n.d.).

All user payments are done through a Stripe hosted encrypted portal. Stripe is a Level 1 Payment Certified Industry (PCI) Service Provider, which is the highest level of certification available in the payment industry. Stripe encrypts all card numbers using AES-256 and transmits data using Transport Layer Secure (TLS) and HTTPS (“Security at Stripe | Stripe Documentation” n.d.).

### 8.4 Testing Strategy

Our main testing strategy was user-level testing. We tested each feature as they were created along with other features that may be affected when creating the features. Bubble.io does not support unit tests, so we could only rely on user testing. For the user-level testing, we tested

all the features with each of the user types, admin, manager, staff, and customer. We tested to ensure that users were only able to have access to their restricted functionalities and that there was no security issue. If a user somehow found a page that they should not have access to, the page automatically detected it and redirected them to the home page. We also performed simultaneous user testing where both a customer and staff are using the website at the same time to test that the orders were added for the staff to process in a timely manner.

## 9.0 Assessment

### 9.1 General Assessment

We were able to create a site that the WooSox will use for the sale of scoreboard messages at the start of the 2022 season. This is what we set out to accomplish from the beginning and our sponsor is thrilled to be able to bring this work to Polar Park.

With only a couple weeks of having a reasonable product to show other teams and stadiums, we did not have enough time to lead a large sales campaign for this product. We were able to speak to the Red Sox foundation and Matt is in a good position to be able to form a team and use connections in an attempt to convince other stadiums that this site will generate more money for teams and their charitable efforts in the future.

Among the most valuable things we learned as a team during this project came on day one of the project. Our project changed completely. At our first meeting of the term with Matt, we were introduced to the new project that was completely different from what we were planning for throughout A term. The original purpose of this project was focused on one particular area of Polar Park: the WooSox Market. The end goal for the stadium is to fulfill the vision of an autonomous/frictionless marketplace. The nature of the project was to assist the WooSox organization move along the cultivation of a relationship with the current mobile application developer, Crowdbotics, and become familiar with the current code repository on GitHub and the analytics regarding current user registration. Then we were going to work on implementing the Standard Cognition features into the Polar Park mobile application and assess the utilization of the mobile app by ballpark patrons. Data analysis would help us create a business strategy to take advantage of consumer trends for streamlining financial efficiency. However, day 1 of the project brought a major unforeseen challenge: the project changed completely. Standard Cognition was experiencing delays so our sponsor changed our project to the development of a scoreboard messaging application.

Another valuable lesson we have learned as a team is that you never know what sort of skills a project may require. The Computer Science majors on our team were ready for an intensive 7 week stretch of coding. Although there was coding required and involved in the project, the most important part of the project was using Bubble.io to create the website. This required us to learn a new interface we had never used before and learn how to integrate all of the desired features into one spot.

### 9.2 Business Learnings

#### *9.2.1 Leadership*

As a team, we learned that the role of leader can be and sometimes needs to be a fluid concept. Although situations and groups should only have one leader, we learned that on a



multidisciplinary team especially it is imperative that anyone can assume leadership. If our task at hand was coding or revolved around the creation of the website, Tyler or Denver needed to take over and lead us. When we needed to design a wireframe for our website and focus on the process improvement for displaying scoreboard messages, Spencer would step up. When we needed to think of how to market and sell this product, Theo would take the lead. Perhaps the concept of leadership would look different for other MQP groups, but on this multidisciplinary team where skill sets and abilities vary as much as they do, passing the torch of leadership was necessary and effective. This lesson is important because once we enter the workforce we will surely be responsible for communicating and working across people of different educations and responsibilities.

### *9.2.2 Market and Industry*

We learned that the market of selling innovations to other teams can be difficult. Appropriate contact information is often not easy to find or not available. Matt told us how once the sale of a new innovation gains traction across different teams and venues it has the potential to snowball, but it is difficult to reach that point. He showed us this example with a point of sale company that was recently purchased by every MLB team for a large sum of money. So although the first few clients can be hard to acquire, it is just the nature of the market.

We learned that even though teams have a long off season, the sports industry is always busy. During the season, employees of the teams are busy with day-to-day tasks revolving around the maintenance of the stadiums, schedules, events, and everything else that occurs during a season. This means that interest in innovation may be quite low during the season because most resources are spent on the current season. This means that renovations or considerations for change may be taken most seriously during the off season.

### *9.2.3 Work Environment and Culture*

Nearly all of our work was done remotely. Individually, it could be a struggle to maintain focus on the task at hand when you are on your own and not in an environment where work is the only option. In the future, we would bring these difficulties up earlier and more frequently to allow time for scheduling in-person sessions. This is an important lesson because the pandemic has made remote work more ubiquitous than ever, and we need to have strategies to stay productive and personable while working remotely throughout our careers.

We learned a few things about time management along the way. Being WPI students on the brink of graduation, we are familiar with what a 7-week work cycle feels like. It is fast paced and requires long hours to stay on track. The Trello board we constructed at the beginning of every week kept us accountable to the project and each other during this project. Work that needs to get done such as coding or integration of a program can be budgeted accordingly for a Sprint. We learned that creative work such as designing a website or developing marketing techniques need time to develop and mature, so the short timeframe can be a detriment. Also, we learned

that waiting for replies and other events outside of our control can halt certain project aspects to a standstill. In these situations, it is necessary to find a new task in our control so we do not fall behind.

In regards to team management, we learned that it is best to keep an environment where open communication is valued and emphasized. It also seems that getting to know your teammates better goes hand in hand with the quality of the team's work. The better an individual knows his or her teammates, the more likely they are to do great, timely work because they are more invested and want to help the team as much as possible. Sprint Planning Events and Sprint Retrospectives have been a great way to make sure that we are pulling our weight as a team and assigning appropriate tasks to the right team members. Trello has been a great organizational tool to use in conjunction with our Daily Scrums and meetings with Matt. This is an important lesson because it is easy to focus on the tasks relating to advancing the project while neglecting the maintenance and organization that also takes up a lot of time.

In regards to culture, it is apparent that the professional sports industry in this country is primarily a business. Franchise owners are seeing the value of their teams grow at an extremely high rate. Having winning teams can be a driving force for owners, but win or lose, teams across the MLB, NFL, NBA, and NHL are always profitable. This fact opened our eyes to possibilities related to this project. We realized that if we can offer a service that will increase revenue, it has a higher likelihood of being adopted. That is a trait shared by the sports industry and the United States economy; if there is an opportunity for money to be made, it will be taken.

### **9.3 Industrial Engineering Learnings**

In order to identify problems and solutions within the industrial engineering context, we spent some time looking at the current state of the system in place at the Worcester Red Sox (see [6.0 Process Analysis](#)). We were tasked with understanding the primary pain points of the current system, and to do so, we had to take the time to understand the broader implications of the process itself. By looking into the manual, human component, we were able design a solution that would optimize the system for all parties involved.

A large part of creating and implementing a new system is adapting to the needs of the environment, as those change as well. Working in the real world, outside of standard coursework, we were given a chance to learn about the pressures and unpredictability of industry. From the very beginning, our team experienced a shift in goal, and was tasked with adapting our learning on all fronts, including a shift in the way we identified the processes and systems to be analyzed and optimized. Through communication with our sponsor and work as a team, we were able to adapt to the changes brought on by the uncertainty of the real world, and optimize our own work to produce the best possible product in the time allotted.

## 9.4 Technical Learnings

At the start of the term, software diagrams including user stories, use cases, ERDs, website flowcharts and context diagrams were revisited, relearned and implemented. Every diagram previously listed was constantly being updated throughout the term. For example, the ERD underwent many changes so the application could store and retrieve data efficiently.

Both software developers started the term with no prior Bubble.io experience. At first, Bubble.io felt similar to SceneBuilder, the only drag and drop software development tool used previously; however, Bubble.io also had a powerful backend that complimented the easy-to-use front-end development user interface. In order to quickly get acclimated to the Bubble.io environment; documentation, manuals and interactive lessons were used. However, even more was learned by simply exploring the user interface and trying new components and inputs. We also learned how to create our own plugins, integrate already existing plugins and integrate external APIs.

Another phase of this project involved integrating the Stripe payment system. More specifically, third party transactions. In other words, connecting a consumer to a provider and allowing the platform owner to take a transaction fee.

Lastly, feature prioritization was difficult at first. Starting a project from scratch is exciting, and with excitement comes many ideas. It is up to you as a developer to clearly communicate with the team which features to prioritize and constantly analyze the balance between effort and reward to maximize the efficiency of your time.

## 10.0 Business and Project Risk Management

### 10.1 Risk Management Assessment

The risks affiliated with this project were limited. Stadiums including Polar Park already have an existing way of selling scoreboard messages to customers. If this project was not successful for the company, then the only resource lost is the time the WooSox spent working with our team. Costs of programs and functions we used have a negligible cost for the WooSox as we were using programs they already pay for. The labor of our WPI MQP team costs the WooSox nothing, so it was a great decision on our sponsor's part to have us focus on this in order to make the risk as close to \$0 as possible.

This project reduced the amount of time and people that need to be involved in the sale of a scoreboard message, therefore reducing costs. The success of this project decreases the cost in Polar Park. There is also an opportunity to increase the bottom line by way of increasing revenue if we are able to sell this technology to other stadiums. If the website becomes the hub of scoreboard messages for stadiums across the country, there is a lot of money to be made and additional dollars going to the charities that this stadium feature usually generates.

The value of this project has the potential to stem from a few different areas. Like discussed above, reducing employment cost and generating revenue by selling this technology to other stadiums are the more easily measurable benefits. However, there are intangible benefits that add value to the company. Successful adoption of this project would help the WooSox continue to be a hub of innovative financial technology. This has the potential to build momentum for other projects the organization is planning.

It is hard to say exactly where the current risk culture exists in the WooSox organization. Building a brand new stadium that goes nearly \$60 million over budget sounds like a huge risk. However, the reason the move happened was to be able to consistently fill up the stadium better which was not a risky decision. It seems that when it comes to relatively safe bets, this organization is willing to throw a lot of money at an opportunity that may give off an illusion of risk when in reality the predicted success rate is high. The WooSox are such a new addition to the city of Worcester that it may be too early to tell how risky or risk averse they are.

We did not get to see risk controls at the WooSox. It could be interpreted that the fact there was free labor going into this project from our WPI MQP team is a form of risk control itself. Worst comes to worst for the WooSox over these seven weeks, this project fails and they were unable to implement or shop around this website.

In a meeting with Tim Q. of the WooSox videography team, we learned that one of the concerns about this feature of the ballpark is making sure that it does not interfere with the live scoreboard or pitch count. If the scoreboard does not reflect the correct score or count, there is a huge operational risk of the stadium having the wrong count on the scoreboard. The scoreboard

message feature of any stadium is intended to improve fan engagement. It must not interfere with the game in any way.

Change in financial technology often carries reputational risk. On an individual scale, us students have no reputational risk as this project is part of our education. Matt Levin however, does have some level of reputational risk since his name is attached to our product. Being the CFO and CTO of the WooSox, Matt has established a reputation within the Red Sox organization as someone who can lead innovation. Also, the reputation of the WooSox and Polar Park could have been affected by the success or failure of this project. Polar Park is a brand new stadium that seeks to be a hub of financial technology innovation.

Although not pressing, there are change management risks. Traditionally, scoreboard messages have worked one way at stadiums. Although our solution automates much of the process, change can be a difficult thing for employees. In this scenario, employees will have to learn a new system and ditch the nested forms or phone systems that currently operate the sale of scoreboard messages. Fortunately, the training risks are virtually nonexistent.

## **10.2 Market Research**

Before creating a platform that would serve as a hub of scoreboard messages, we first had to research how this process was being done by other teams and venues across professional sports. We pooled together scoreboard message information from several of the country's big four (MLB, NFL, NBA, NHL) including the team's venue, how they currently accept messages, character limits or word counts, types of messages offered, submission deadlines, minimum donation amount, the name of the benefiting charity, and any constraints specific to the team. This information allowed us to analyze the competition we are up against so we can design a site that solves issues venues have as well as notice what features work well so we can incorporate them into our design.

### *10.2.1 The Good*

It is apparent that some teams take their scoreboard message process more seriously than others. We found some of the great features across all four sports. The WooSox had among the most straightforward processes from a consumer point of view with a nested form, clear constraints, and an easy process (WooSox Foundation n.d.). The Red Sox site shows a preview of what the message will look like on the New Balance Scoreboard (Red Sox Foundation n.d.). Climate Pledge Arena, home of the Seattle Kraken redirects customers to purchase messages on Ticketmaster. (Seattle Kraken n.d.). Perhaps the Kraken have an easier way to do this since they are a brand new franchise and therefore had no antiquated system in place. The Brooklyn Nets have an enticing interface with all of the different price options that could easily upsell a customer to a more expensive package. It is impressive marketing that makes upsells seem like no-brainers for interested customers (Brooklyn Nets Community n.d.). Dodger Stadium and SoFi

Stadium (for Chargers only) emails a picture of the message on the banner 4-6 weeks after the game. Although this timeline leads us to believe this process is not automated, it is a great feature (Dodgers Foundation n.d.). The Milwaukee Brewers offer non-game day scoreboard messages that are emailed. This allows for more sales opportunities for people that cannot catch a game or want to send a message to a relative or friend (Milwaukee Brewers n.d.). The Cleveland Cavaliers have you make a donation via PayPal first. Then you use your Payment Transaction ID to submit your message request form. These steps may seem unnecessary, but it has merit. Customers feel they are making a generous donation and are recognized for it with the opportunity for a scoreboard message. The customer might feel better about their purchase if it feels more like a donation rather than a transaction. Verbiage used on our site is important (Cleveland Cavaliers n.d.).

### *10.2.2 The Bad*

On the other hand, it is apparent that plenty of teams treat this feature of their venues as a low priority. This could be a great opportunity to sell teams a way to automate this process and remove the hassle for them, since some of their current operations are of very poor quality. The Boston Bruins at TD Garden have the WORST system and layout we encountered. It takes over 2 weeks, costs \$200, and requires a lot of back and forth. It is obvious that the Bruins don't mind discouraging fans from wanting to pay for a message, so the process is way harder than it needs to be (Boston Bruins Foundations n.d.). Some teams such as the Boston Celtics at TD Garden only offer scoreboard messages sales to season ticket holders. This eliminates the majority of potential customers (Boston Celtics n.d.). The New York Islanders at UBS Arena require payment and message before the customer is told when and where the message will appear. This surely deters customers from following through if they do not know what exactly they are purchasing (New York Islanders n.d.). The Charlotte Hornets at Spectrum Center has a banner announcing they are not currently offering scoreboard messages followed by a functional nested form for them. The layout is confusing and contradictory (Charlotte Hornets n.d.). This message is pulled from Auburn's website "Due to NCAA Rules & Regulations, children must be in 6<sup>th</sup> grade or younger to receive a video board message. Grades 7 through 12 are of recruitable age and are ineligible to receive a video board message." This should be investigated further (Auburn Tigers n.d.). This is no doubt a roadblock in scoreboard message sales. The Georgia Bulldogs require mail in requests that need to be fully processed no later than 7 days before the game. The timeline combined with the need to send paper mail is surely going to deter many customers from following through (University of Georgia n.d.).

### *10.2.3 More Observations*

Neither good nor bad, there were some features we came across that were noteworthy as we moved forward deciding what features we would want to incorporate. The WooSox were the only team we encountered with a donation recommendation for a message (WooSox Foundation

n.d.). The Staples Center is home to 3 major sports teams (LA Lakers, LA Clippers, and LA Kings) however the scoreboard messaging process for each team is completely different. This tells us that the team employees are responsible for scoreboard operations, not employees of the Staples Center. Several teams including the Dallas Cowboys at AT&T Stadium do not offer scoreboard messages with announcements on their website saying "Unfortunately, due to the number of requests received, and the use of the boards for live game coverage, personal messages are not displayed on the stadium video board." (Dallas Cowboys n.d.). This could be an opportunity for us to offer teams like this a simple automated system. The Brewers checkout sends a customer to sign in to their MLB account. We looked into this and saw how this website is set up (Milwaukee Brewers n.d.). It is worth checking out how the Kraken and some other teams are doing things through Ticketmaster. This is likely due to the teams being either new or recently relocated. It is certainly more efficient than what other stadiums are using, but there may be difficulty if they think to purchase a message closer to or on the day of the game (Seattle Kraken n.d.).

## 11.0 Future work

Continuation of this project would entail additional sales to other teams and venues. With more time and resources, we would be able to design a page for each team and cater it to the exact specifications of what the team currently offers for messages. This ready-to-go format for each team would make a sales pitch much more persuasive and lead to more adoption of our service. The process of reaching out to and selling this service to other teams and venues could take years to pay off.

Also, replicating how the WooSox are able to sell as many messages as desired by their fans, once we are contracted by other teams, we could attempt to get them to switch to this practice too. Most teams limit the number of messages per game to a small amount, but the limit puts a hard cap on how much money a team can raise for their charities. A more efficient process would mean more purchases and more revenue.

With more time and resources, it would be great if we could automatically generate a picture of the customer's message on the video board and send it to them right after their message is displayed. This will reduce stress of fans who are trying to take a picture of their message on the board. For similar reasons, it would be a great addition to the service if we could tell the customer exactly when their message would be played so they know when to pay attention. We learned in our interviews that there are frequent complaints from people who missed their message.

It would be beneficial for the customer and the team if a purchase of a scoreboard message granted a coupon or discount of some sort. This would encourage further spending once the customer arrived at the stadium and would generate more revenue.

Another feature we could add with more time is a payment option for customers to cover fees so they donate their full round number to the charity. This usually only adds a couple dollars onto the purchase and people feel good about adding this small amount onto their purchase as it means the charity gets more money.

A potential advanced feature would be a way to enable venues to add pictures of how the message will look like on the board. With more people and more money at our disposal, a fan could input where their seats are and then the site would automatically generate what their message will look like on the board from their seat during the game.

Allowing a team to go to our website and link possibilities for upselling would be timeworthy. These options could either be added by the individual team on our site or link back to the team's site for bundles and upsells. See the site of the Brooklyn Nets for how enticing this can look (Brooklyn Nets Community n.d.).



## 12.0 Conclusion

Working under our sponsor at the WooSox, we created a central platform that the WooSox and later other teams could use as a hub of selling scoreboard and video board messages. This project addressed a problem with the inefficient and outdated systems professional sports teams have had in place for years.

Given this opportunity, we knew that successful completion of this platform would mean that the WooSox would use it at Polar Park. The opportunity and scalability did not stop there. Most professional teams and stadiums have a tedious and antiquated means of selling and displaying scoreboard messages. The grand vision for this project was to prepare the site for other teams and stadiums so the company could later shop this product around and get other teams to pay for its use and features.

Using Bubble.io we were able to complete an advanced final product that will be used at Polar Park when the 2022 season begins. Integrated with Stripe payment capabilities and custom plugins coded by our team, this site is able to run smoothly and automate much of the process that wasted labor hours at Polar Park.

During the last two weeks of the project, we reached out to other teams and venues in an attempt to learn more about their current means of selling scoreboard messages and show them how our site would help videography operations at their stadiums. Although the project has concluded, the company can carry on this effort.

Working remotely was a challenge, but structured morning meetings with our helpful and passionate sponsor made the seven-week project exciting. We held Weekly Sprint Planning Events, Daily Scrums, Weekly Sprint Reviews, and Weekly Sprint Retrospectives to ensure we were connected and proceeding as a team.

Now that this project is complete, Polar Park has a new site to manage scoreboard messages and ultimately generate more revenue for the WooSox Foundation. Also, the WooSox have a site for which they can hire help, expand its capabilities, and market to other professional sports teams.

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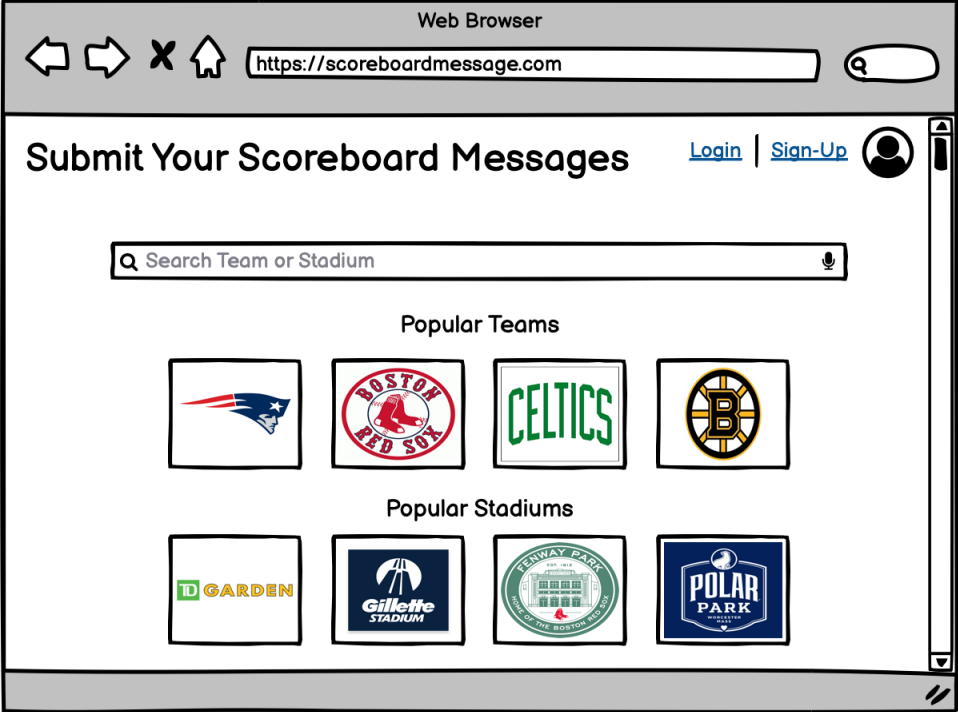
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14. Appendices

Appendix A: Wireframe

Pre-Login/Sign-Up Landing Page:



Login For Existing Customers:



Forgotten Password:

Web Browser

https://scoreboardmessage.com

Login | Sign-Up

## Password Reset

Email:

New Customer Sign-Up Page:

Web Browser

https://scoreboardmessage.com

Login | Sign-Up

## Create an Account

\* Name:

\* Email:

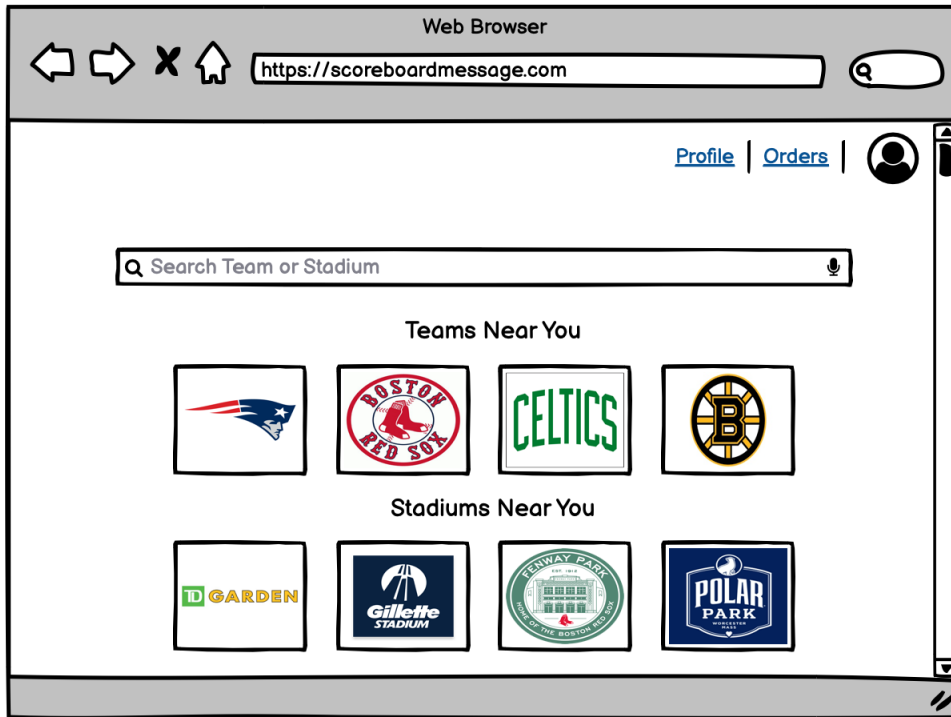
\* Password:  ?

\* Re-type password:

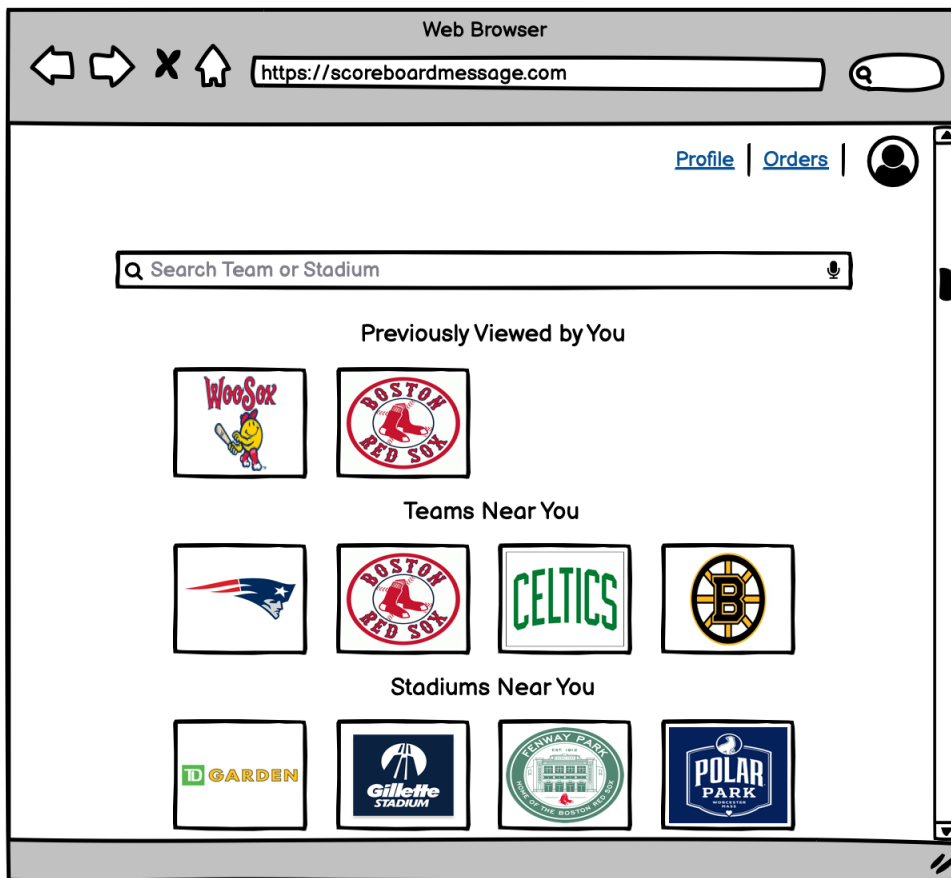
I agree to the [Terms of Use](#) and [Privacy Policy](#).

[Learn more](#)

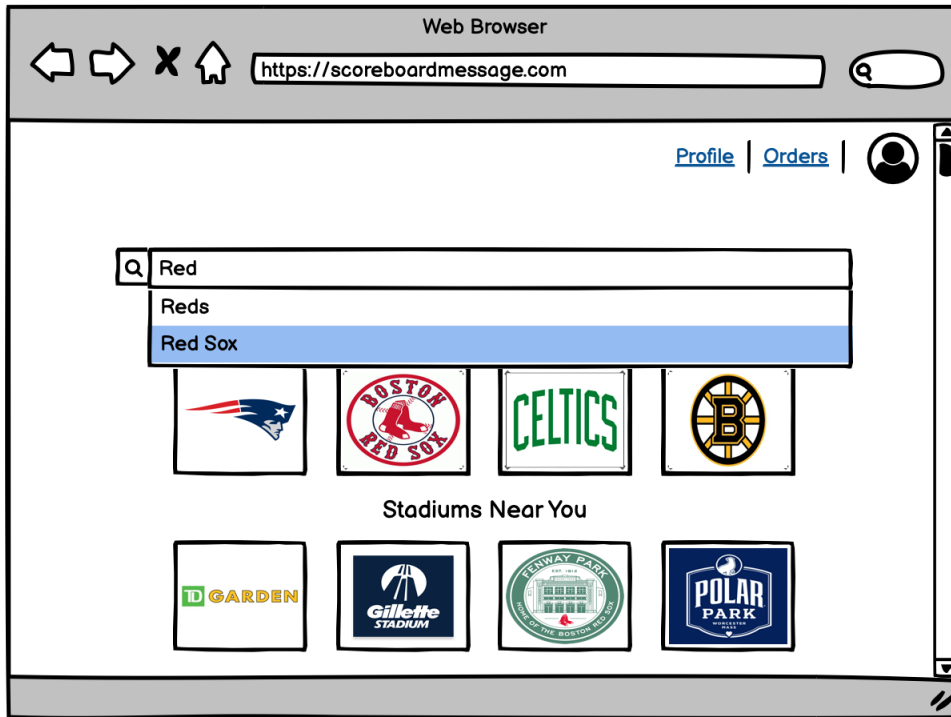
Post Sign-Up Landing Page:



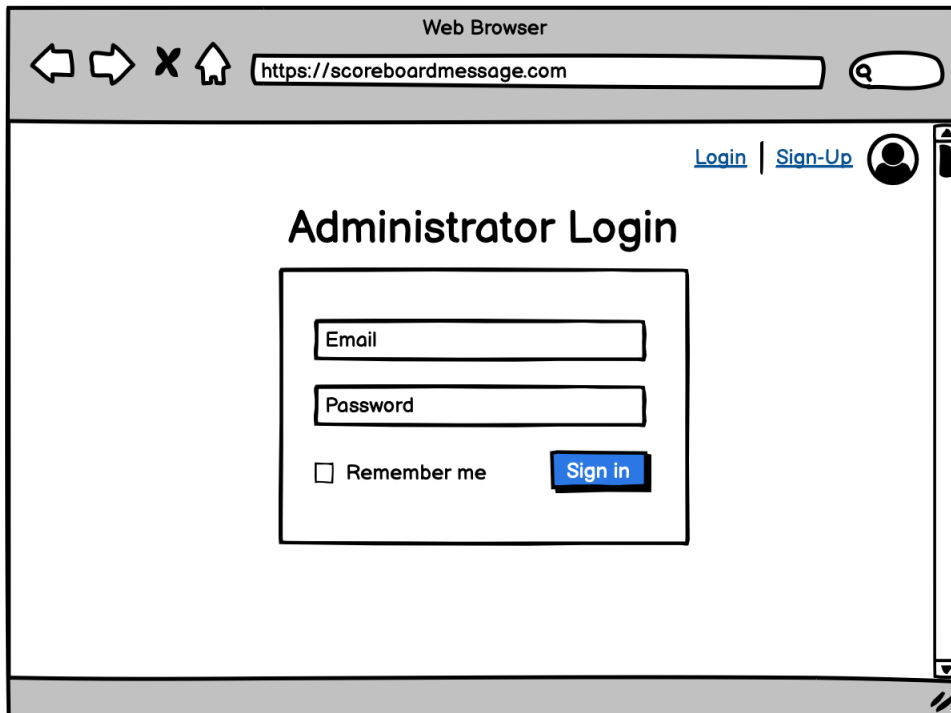
Post Login Landing Page:



Predictive Search Functionality:



Administrator/Staff Login:





Staff View, Current Orders:

Web Browser

https://scoreboardmessage.com

Orders

Game Order Date Order Type Donation Status

Game	Order Date	Order Type	Donation	Status
TB@Sox	11/11/21	Happy Birthday	\$50.00	Verified

Staff View, Edit Order:

Web Browser

https://scoreboardmessage.com

Orders

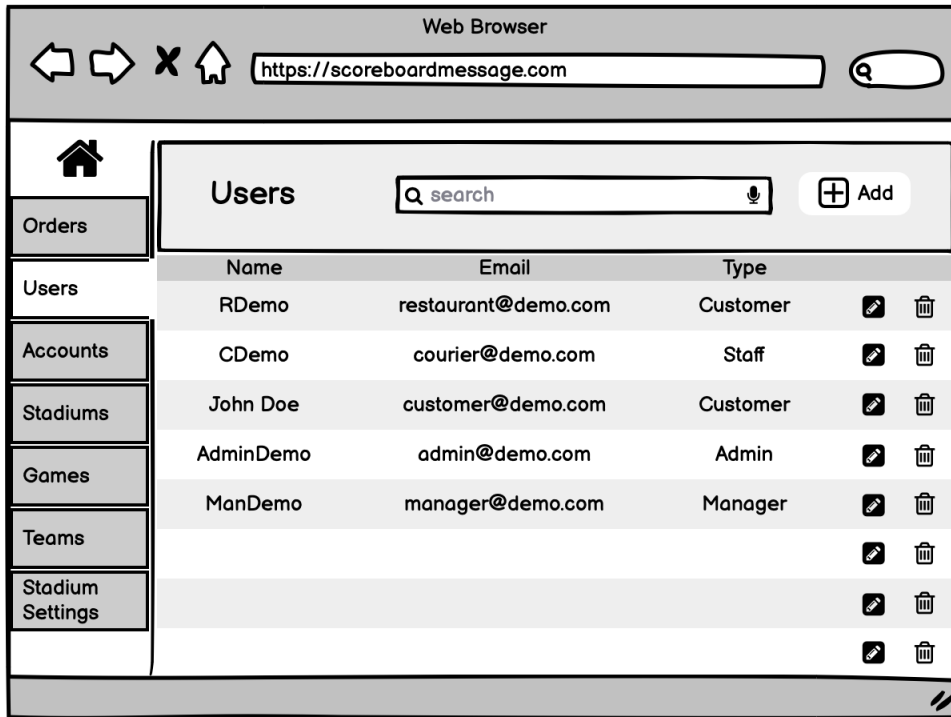
Game Order Date Order Type Donation Status

Game	Order Date	Order Type	Donation	Status
TB@Sox	11/11/21	Happy Birthday	\$50.00	Verified

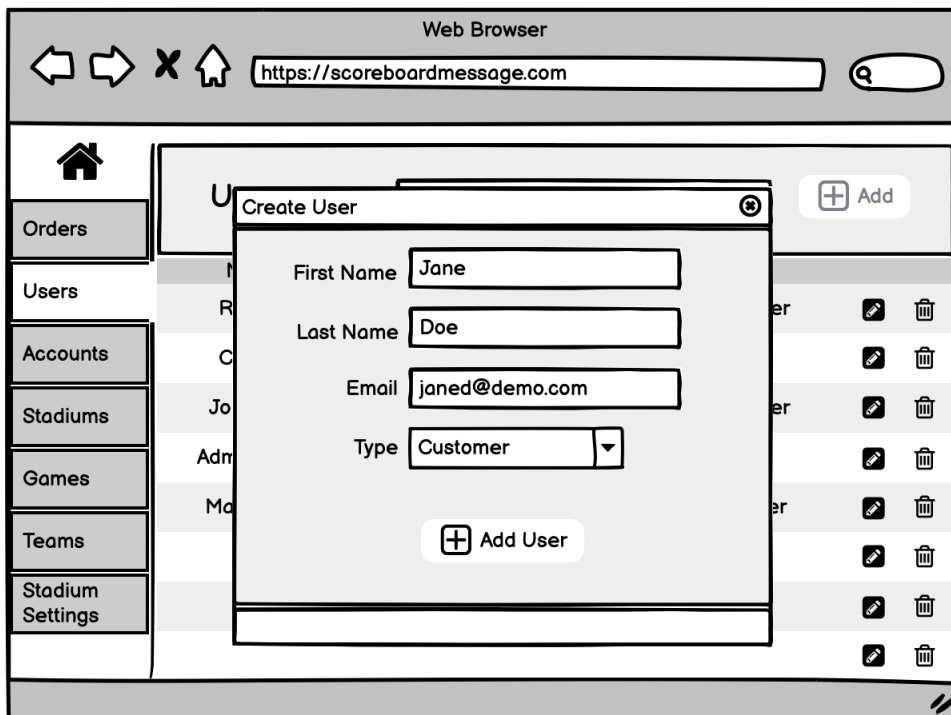
Customer Email: woosox@staff.com

Message: Happy Birthday, Theo!

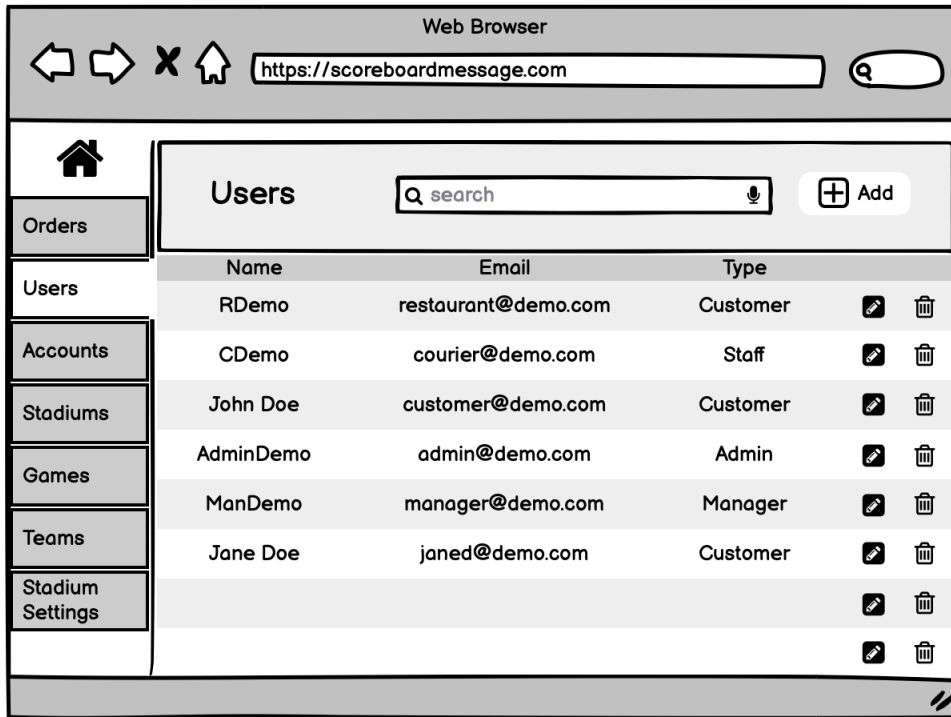
Staff View, User Accounts:



Staff View, Add New User:

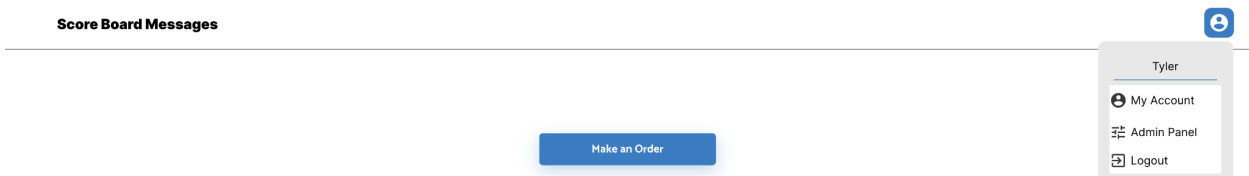


Staff View, Updated User List:




## Appendix B: Application Screenshots

**Home Page:** Displays the home screen logged in as an admin. The admin can make an order, view their account information or manage data in the admin panel.



**Profile Page - Main Tab:** Displays the profile tab logged in as any user. The user can edit their first and last name, and allow the use of their location to find nearby stadiums.

**Score Board Messages** 

---


### Profile

[Profile](#) [Email](#) [Security](#) [Payment](#) [Order History](#)

---

First Name:  Last Name:

**Profile Page - Email Tab:** Displays the email tab logged in as any user. The user can update their email using their current password.

**Score Board Messages** 

---


### Profile

[Profile](#) [Email](#) [Security](#) [Payment](#) [Order History](#)

---

Email:  Current Password:

**Profile Page - Security Tab:** Displays the security tab logged in as any user. The user can change their password using the current password.

**Score Board Messages** 

---

### Profile


[Profile](#) [Email](#) [Security](#) [Payment](#) [Order History](#)

---

Current Password	New Password	Confirm Password
<input type="text" value="Type here..."/>	<input type="text" value="Type here..."/>	<input type="text" value="Type here..."/>

[Change Password](#)

**Profile Page - Payment Tab:** Displays the payment tab logged in as any user. The user can attach a payment option to their account using the Stripe interface.

**Score Board Messages** 

---

### Profile


[Profile](#) [Email](#) [Security](#) [Payment](#) [Order History](#)

---

Your credit card details: visa \*\*\*\* \* 4242

[Edit](#)

**Profile Page - Order History Tab:** Displays the order history tab logged in as any user. The user can view past orders and request refunds.

**Score Board Messages** 


---

## Profile


[Profile](#)
[Email](#)
[Security](#)
[Payment](#)
[Order History](#)

Message Type	Stadium	Game
Thank you	TROPICANA FIELD	
Message		Donation Amount
Thank you Tyler!		30
		Status
		New
		<a href="#">Request Refund</a>

**Admin Panel - Orders Tab:** Displays the orders tab in the admin panel logged in as an admin. The admin can view all orders placed on the website, add new orders, and download a CSV file of all existing orders.



- Orders
- Users
- Games
- Teams
- Stadiums

 Log out

**Orders**

Add

All (122)
New (7)
Verified (1)
Completed(0)
Download

Game	Order Date	Order Type	Donation Amount	Order Status
BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm	12/09/21		\$	
BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm	12/03/21		\$125	New
BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm	12/02/21		\$100	
BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm	12/02/21		\$100	
BOS VS NYY, FENWAY PARK, Sep 26, 2021 7:00 pm	12/02/21		\$	
BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm	12/02/21		\$	
BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm	12/02/21		\$	

**Admin Panel - Users Tab:** Displays the users tab in the admin panel logged in as an admin. The admin can view and edit all users, add new users, and download a CSV file of all existing users.

Name	Email	Type	
Admin	admin@demo.com		
Courier Demo	courier@demo.com	Staff	
Customer Test	customertest@test.com	Customer	
john doe	jo@mail.com	Manager	
John Doe the Demo Customer	customer@demo.com	Manager	
kate test	ole2881sm@gmail.com	Customer	
Kate Demo Restaurant	kate@demo.com	Customer	
Ketrin Cheptini	metallkatea@gmail.com	Manager	

**Admin Panel - Games Tab:** Displays the games tab in the admin panel logged in as an admin. The admin can view and enable/disable all existing games, update the games using SportsData.io, and download a CSV file of all existing games.

Name	Status
BOS VS BAL, FENWAY PARK, Apr 1, 2021 2:10 pm	Enabled
BOS VS BAL, FENWAY PARK, Apr 2, 2021 2:10 pm	Enabled
BOS VS BAL, FENWAY PARK, Apr 3, 2021 1:10 pm	Enabled
BOS VS BAL, FENWAY PARK, Apr 4, 2021 1:10 pm	Enabled
BOS VS TB, FENWAY PARK, Apr 5, 2021 7:10 pm	Enabled
BOS VS TB, FENWAY PARK, Apr 6, 2021 7:10 pm	Enabled
BOS VS TB, FENWAY PARK, Apr 7, 2021 1:10 pm	Enabled

**Admin Panel - Teams Tab:** Displays the teams tab in the admin panel logged in as an admin. The admin can view and enable/disable all existing teams, update the teams using SportsData.io, and download a CSV file of all existing teams.

The screenshot shows the Admin Panel's Teams Tab. On the left is a vertical sidebar with navigation options: Home (house icon), Orders, Users, Games, Teams (highlighted in blue), Stadiums, and Log out (logout icon). The main content area has a blue header with the title 'Teams', a search bar labeled 'Search Teams', and two buttons: 'Update' and 'Download'. Below the header are three filters: 'All (32)', 'Active (9)', and 'Inactive (24)'. The main area displays a list of seven teams, each in a light blue rounded rectangle. Each team entry shows the team name and a 'Status' dropdown menu set to 'Disabled'. The teams listed are ANGELS, ASTROS, ATHLETICS, BLUE JAYS, BRAVES, BREWERS, and CARDINALS.

Name	Status
ANGELS	Disabled
ASTROS	Disabled
ATHLETICS	Disabled
BLUE JAYS	Disabled
BRAVES	Disabled
BREWERS	Disabled
CARDINALS	Disabled



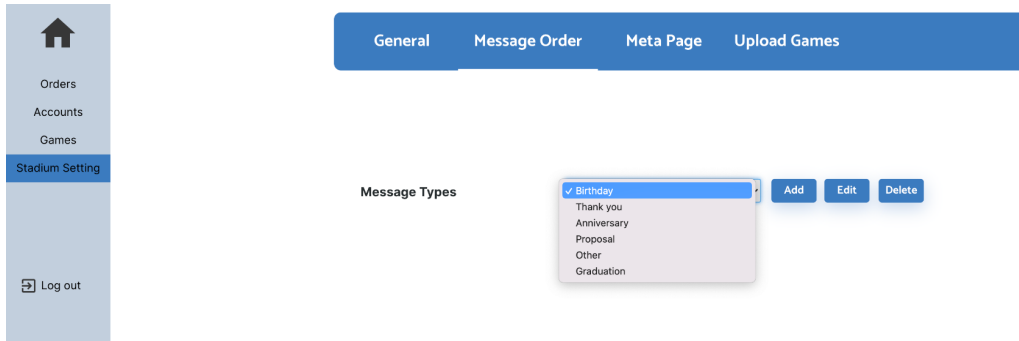
**Admin Panel - Stadiums Tab:** Displays the stadiums tab in the admin panel logged in as an admin. The admin can view and enable/disable all existing stadiums, update the stadiums using SportsData.io, and download a CSV file of all existing stadiums.

The screenshot shows the Admin Panel interface for the Stadiums tab. On the left is a vertical sidebar with a home icon at the top, followed by menu items: Orders, Users, Games, Teams, Stadiums (highlighted in blue), and Log out at the bottom. The main content area has a blue header with the title 'Stadiums', a search bar labeled 'Search Stadium', and two buttons: 'Update' and 'Download'. Below the header, there are three filters: 'All (94)', 'Active (93)', and 'Inactive (1)'. The main area displays a list of stadium entries, each in a light blue box with a white background. Each entry includes a 'Name' field and a 'Status' dropdown menu set to 'Enabled'. The listed stadiums are: ALAMODOME, AL CITY, AMERICAN FAMILY FIELD, AMERICAN FAMILY FIELDS OF PHOENIX, ANGEL STADIUM OF ANAHEIM, AUTOZONE PARK, and BALLPARK OF CAMELBACK RANCH.

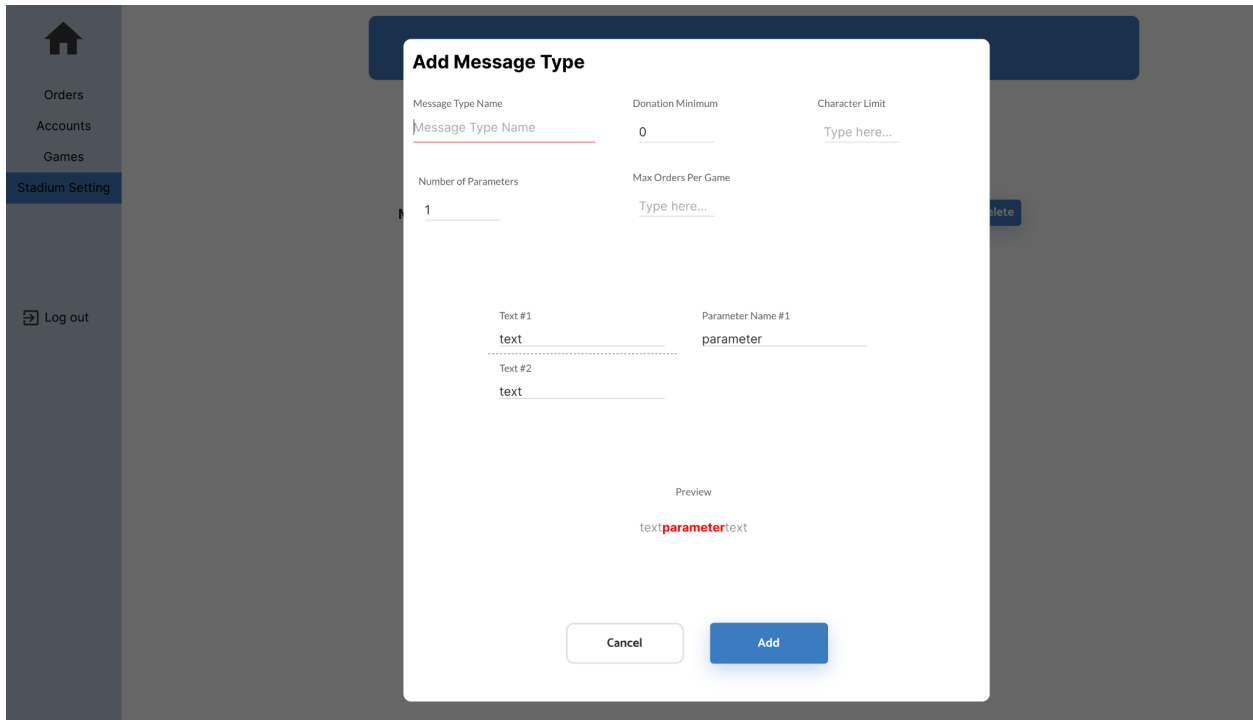
**Manager Panel - General Tab:** Displays the general tab in the manager panel logged in as a manager. The manager can connect their payment account via Stripe, and edit the name, address, phone number and image of their assigned stadium.

The screenshot shows the Manager Panel interface for the General tab. On the left is a vertical sidebar with a home icon at the top, followed by menu items: Orders, Accounts, Games, Stadium Setting (highlighted in blue), and Log out at the bottom. The main content area has a blue header with four tabs: 'General' (active), 'Message Order', 'Meta Page', and 'Upload Games'. Below the header is a blue button labeled 'Connect Payment Account'. The main area contains a form with four fields: 'Name' (with the value 'FENWAY PARK'), 'Address' (with a placeholder 'Start typing...'), 'Phone Number' (with a placeholder 'Type here...'), and 'Image' (with a large empty square box).

**Manager Panel - Message Order Tab:** Displays the message order tab in the manager panel logged in as a manager. The manager can add, edit, or delete message types for their assigned stadium.



**Manager Panel - Adding Message Type:** Displays the popup for adding a message type in the manager panel logged in as a manager. The manager can set the name, donation minimum, character limit, number or parameters, and the maximum orders per game for the added message type. The manager can add text before and after the parameter, and also edit the parameter name.



**Manager Panel - Meta Page Tab:** Displays the meta page tab in the manager panel logged in as a manager. The manager can add any information about the stadium, which will be displayed to any user before placing an order.

**BEFORE YOU ORDER:**

- All orders must be placed through the Red Sox Foundation Website by **11:59 pm the day before the game. Late messages will not be accepted.**
- Messages must fit on **four (4) lines, 24 characters on each line including spaces.**
- Payment is by **credit card only.**
- **Quotation Marks in the message** may result in the message getting cut off.
- Messages require a minimum tax-deductible donation of \$100. All proceeds benefit the Red Sox Foundation, the official 501(c)3 team charity.
- Messages are displayed on the New Balance Scoreboard above the right-field bleachers. If you are unsure whether you will be able to see the message from your seat location check the Seat Visibility listing below. If you have any further questions please **email your seat location to [scoreboard@redsox.com](mailto:scoreboard@redsox.com)**
- All Red Sox Foundation Scoreboard Messages run alphabetically according to the **FIRST** name in the message once during our time slot: **Mid 2<sup>nd</sup>, End 2<sup>nd</sup>, Mid 3<sup>rd</sup>, End 3<sup>rd</sup>**
- Before these paid messages begin, the New Balance scoreboard will read "Red Sox Foundation Messages."
- Marriage Proposals: we offer "Live" marriage proposals in addition to our traditional in-game proposals. For more information on any of our proposal options please contact Red Sox Fan Services at (617) 226-6000

**Manager Panel - Upload Games Tab:** Displays the upload games tab in the manager panel logged in as a manager. The manager can upload a CSV file of their schedule with the same format on Stanza.

**Order Form Main Page:** Displays the order form main page logged in as any user. The user can either use the search bar or click on any team or stadium displayed below the search bar.

**Score Board Messages**



Customer

My Account

Logout

Search for a team or stadium

**Recently Selected:**

RED SOX



**Popular Teams:**

RED SOX



REDS

ROYALS

RAYS

**Popular Stadiums:**

PETCO PARK

TURNER FIELD

SALT RIVER FIELDS AT  
TALKING STICK

CUBS PARK

**Order Form Main Page - Search Functionality:** Displays the search functionality on the order form main page logged in as any user. The search form autofills the input. The user can select any team or stadium in the dropdown, or the user can select

**Score Board Messages**



re|

**Teams:**

REDS

**RED SOX**

Worcester Red Sox

**Stadiums:**

REGIONS FIELD

**Popular Teams:**

RED SOX

REDS

ROYALS

RAYS



**Popular Stadiums:**

PETCO PARK

TURNER FIELD

SALT RIVER FIELDS AT  
TALKING STICK

CUBS PARK

**Calendar View Page:** Displays the calendar view page logged in as any user. The user can select any game in the calendar. The user can also view games by month, week, or day.

**Score Board Messages**



RED SOX Schedule:

today < > September 2021 month week day

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	31	1	2 7:1 TB vs BOS at TROP	3	4
5	6	7	8	9	10	11
12	13	14 4:1 SEA vs BOS at T-M	15	16	17 7:1 BOS vs BAL at FEN	18 1:1 BOS vs BAL at FEN
19 1:1 BOS vs BAL at FEN	20	21 7:1 BOS vs NYM at FE	22 7:1 BOS vs NYM at FE	23	24 7:1 BOS vs NYY at FEN	25 4:1 BOS vs NYY at FEN
26 7:1 BOS vs NYY at FEN	27	28 7:1 BAL vs BOS at ORIO	29 7:1 BAL vs BOS at ORIO	30 7:1 BAL vs BOS at ORIO	1 7:0 WSH vs BOS at NA	2 4:0 WSH vs BOS at NA
3 3:0 WSH vs BOS at NA	4	5	6	7	8	9

**Calendar View Page - Ordering a Message:** Displays the popup after selecting a game on the calendar view page logged in as any user.

**Score Board Messages**

RED SOX Schedule:

today < > week day

**BOS vs BAL**  
at  
**FENWAY PARK**  
Sep 17, 2021 7:10 pm  
[Order Message](#)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30					4
5	6					11
12	13		4:1 SEA vs BOS at T-Mi		7:1 BOS vs BAL at FEN	4:1 BOS vs BAL at FEN
19	20	21	22	23	24	25
1:1 BOS vs BAL at FEN		7:1 BOS vs NYM at FEN	7:1 BOS vs NYM at FEN		7 BOS vs NYY at FEN	4:1 BOS vs NYY at FEN
26	27	28	29	30	1	2
7 BOS vs NYY at FEN		7 BAL vs BOS at ORIO	7 BAL vs BOS at ORIO	7 BAL vs BOS at ORIO	7 WSH vs BOS at NA	4 WSH vs BOS at NA
3 WSH vs BOS at NA	4	5	6	7	8	9

**Meta Page:** Displays the meta page logged in as any user. This is the content added by the stadium manager.

## 2021 SCOREBOARD PROGRAM

### BEFORE YOU ORDER:

- All orders must be placed through the Red Sox Foundation Website by **11:59 pm the day before the game. Late messages will not be accepted.**
- Messages must fit on **four (4) lines, 24 characters on each line including spaces.**
- Payment is by **credit card only.**
- **Quotation Marks in the message** may result in the message getting cut off.
- Messages require a minimum tax-deductible donation of \$100. All proceeds benefit the Red Sox Foundation, the official 501(c)3 team charity.
- Messages are displayed on the New Balance Scoreboard above the right-field bleachers. If you are unsure whether you will be able to see the message from your seat location check the Seat Visibility listing below. If you have any further questions please **email your seat location to [scoreboard@redsox.com](mailto:scoreboard@redsox.com)**
- All Red Sox Foundation Scoreboard Messages run alphabetically according to the **FIRST** name in the message once during our time slot: **Mid 2<sup>nd</sup>, End 2<sup>nd</sup>, Mid 3<sup>rd</sup>, End 3<sup>rd</sup>**
- Before these paid messages begin, the New Balance scoreboard will read "Red Sox Foundation Messages."
- Marriage Proposals: we offer "Live" marriage proposals in addition to our traditional in-game proposals. For more information on any of our proposal options please contact Red Sox Fan Services at (617) 226-6000.
- Red Sox Foundation reserves the right to approve and edit any message if necessary. Messages that are obscene, offensive, include foul language or refer positively or negatively to any other Major League organization will be not accepted. They also may not include the name of any MLB player. The message cannot be used for commercial purposes; however, you may welcome a group or company that is attending the game.
- We regret to inform you that there are **no refunds** unless the game is not played.
- If you have any questions, you may email [scoreboard@redsox.com](mailto:scoreboard@redsox.com)

### SCOREBOARD VISIBILITY:

- You can always check your view of the New Balance scoreboard here: [www.mlb.com/redsox/ballpark/seat-map](http://www.mlb.com/redsox/ballpark/seat-map)
- The following sections **DO NOT OFFER** a view of the New Balance Scoreboard:
  - Grandstand 1, Rows 14-17
  - Grandstands 2-7
  - Grandstands 26, Rows 17-18, Seats 9-24
  - Grandstands 29, 30, 31 and 32, Rows 16-18
  - Grandstand 33, Rows 15-16
  - Bleacher Sections 37, 38, 39, 41, 42, and 43 – Rows 25+ are directly under the New Balance Scoreboard
  - Monster Sections 1 – 2 Row 3
  - Monster Section 9 Rows 3-4

Next



**Order Form Page:** Displays the order form page logged in as any user. The user can select the type of message, the donation amount, and the name.

## Scoreboard Message

BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm

---

Type of Message:

Thank you ▼

Donation Amount

\$125.00

Name

Tyler

Message

Thank you Tyler!

Checkout

**Checkout Page:** Displays the checkout page logged in as any user. The user can view the order details and choose a payment method.

## Scoreboard Message Checkout

BOS VS BAL, FENWAY PARK, Sep 17, 2021 7:10 pm

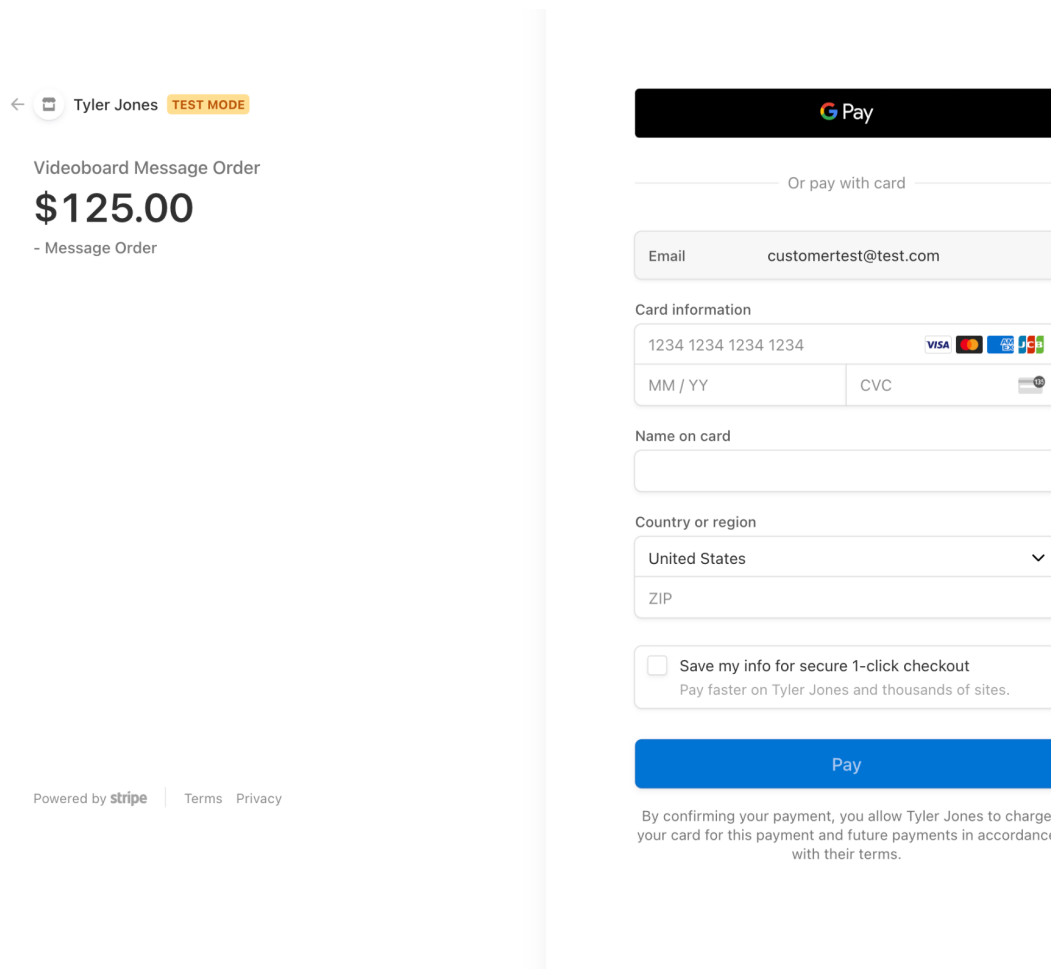
First name	Last Name	
Customer	Test	Thank you Message
		Thank you Tyler!
		<b>Total</b> <b>\$125.00</b>
Email		
customerstest@test.com		

Use a new card

Use card ending in: 4242

Pay

**Stripe Payment Portal:** Displays the stripe payment portal. The user can securely add and pay for the order.



## Appendix C: Primary Research

Chaudhry, Sabriya. Interview. By Denver Blake, Tyler Jones, Spencer McClellan, Theo Solomonides. November 5, 2021.

Petropulos, Tyler. Interview. By Denver Blake, Tyler Jones, Spencer McClellan, Theo Solomonides. December 3, 2021.

Quitadamo, Tim. Interview. By Denver Blake, Tyler Jones, Spencer McClellan, Theo Solomonides. November 2, 2021.

Venue Method Research. Excel Sheet. By Spencer McClellan and Theodore Solomonides

Venue	Team	Link	City	State	Form Desc.	Character Limit	Message Types	Submission Deadline	Min Cost	Charity	Email	Constraints	
Fenway Park	Boston Red Sox	<a href="https://www.redsox.com">https://www.redsox.com</a>	Boston	MA		96	range of preset options, but only able to insert names	Submission by 11:59 pm before game	\$100.00	Red Sox Foundation	<a href="mailto:scoreboard@redsox.com">scoreboard@redsox.com</a>	24 characters/line no quotation marks	RSF reserve the right to refuse message
Citi Field	New York Mets	<a href="https://www.mlb.com">https://www.mlb.com</a>	Queens	NY		96	birthday, anniversary, congratulations	staggered, 48-72 hrs. prior	\$50.00	Amazon' Mets Foundation	<a href="mailto:scoreboard@nyjets.com">scoreboard@nyjets.com</a>	32 characters/line no proposals	first 25 received/approved to be displayed
Angel Stadium	Los Angeles Angels	<a href="https://www.mlb.com">https://www.mlb.com</a>	Anaheim	CA		30	birthday, anniversary, congratulations, in remembrance of, welcome	First come, first served, until max submissions prior to game	\$30.00	Angels Baseball Foundation		Name only	Customizable message available
Dodger Stadium	Los Angeles Dodgers	<a href="https://www.mlb.com">https://www.mlb.com</a>	Los Angeles	CA		68	Custom available	5 hrs. prior to first pitch	\$150.00	Los Angeles Dodgers Foundation	<a href="mailto:ribbonboard@dodgers.mlb.com">ribbonboard@dodgers.mlb.com</a>	34 characters/line 5x7 emailed after home stand	Ribbon board, not big screen 25/game - accepted in order of purchase
Globe Life Field	Texas Rangers	<a href="https://www.mlb.com">https://www.mlb.com</a>	Arlington	TX	<a href="http://mlb.com">mlb.com</a>	12 words	custom available	Advanced purchase (non specific)	\$100.00				\$10 option only allows happy birthday or welcome
Yankee Stadium	New York Yankees	<a href="https://www.mlb.com">https://www.mlb.com</a>	Bronx	NY	email	80 or name	welcome, birthday, or custom available for more money	36 hours before	\$100 or \$10	New York Yankees Foundation	<a href="mailto:scoreboard@yankees.com">scoreboard@yankees.com</a>	\$100 option allows 80 characters and is read out loud site not up in the off season. Does offer non game day messages system down for post/off seasons	10 messages per game
American Family Field	Milwaukee Brewers	<a href="https://www.mlb.com">https://www.mlb.com</a>	Milwaukee	WI	through MLB login		custom available	2 days before game	\$100 or \$10	Brewers Community Foundation	<a href="mailto:intern@brewers.com">intern@brewers.com</a>		
Truist Park	Atlanta Braves	<a href="https://www.mlb.com">https://www.mlb.com</a>	Cobb County	GA						Atlanta Braves Foundation	<a href="mailto:fanmessages@atlbraves.com">fanmessages@atlbraves.com</a>		
Oracle Park	San Francisco Giants	<a href="https://www.mlb.com">https://www.mlb.com</a>	San Francisco	CA	through MLB	60	custom available	5 hours before game	\$125.00				
Great American Ball	Cincinnati	<a href="https://www.mlb.com">https://www.mlb.com</a>	Cincinnati	OH	through MLB	50	custom available	2 days before game	\$35.00	Reds Community Fund	<a href="mailto:singram@reds.com">singram@reds.com</a>		20 per game
Comerica Park	Detroit Tigers	<a href="https://www.mlb.com">https://www.mlb.com</a>	Detroit	MI		72	custom available	2 days before game	\$75.00	Detroit Tigers Foundation			15 per game
T-Mobile Park	Seattle Mariners	<a href="https://www.mlb.com">https://www.mlb.com</a>	Seattle	WA									Down for off season
PNC Park	Pittsburgh	<a href="https://www.mlb.com">https://www.mlb.com</a>	Pittsburgh	PA									Down for off season

## MLB

Venue	Team	Link	City	State	Form Desc.	Character Limit	Message Types	Timeline	Min Cost	Charity	Email	Constraints
Giants Stadium	New England Patriots	<a href="https://www.patriots.com">https://www.patriots.com</a>	Canton	MA	nested form	80	custom available	2 days before game	\$200.00	New England Patriots Foundation	<a href="mailto:scoreboard@patriots.com">scoreboard@patriots.com</a>	In corner banner will run in 3rd quarter for 5-8 seconds
AT&T Stadium	Dallas Cowboys	<a href="https://www.dallascowboys.com">https://www.dallascowboys.com</a>	Arlington	TX	nested form	10 words	custom available	Tuesday before game	\$100.00	Cardinals Charities		*Unfortunately, due to the number of requests received, and the use of the boards for live game coverage, personal messages are not displayed on the stadium videoboard
State Farm Stadium	Arizona Cardinals	<a href="https://www.azcardinals.com">https://www.azcardinals.com</a>	Glendale	AZ	nested form	10 words	custom available	Tuesday before game	\$100.00	Cardinals Charities		No commercials, profanity, politics, or rooting for a different team
Levi's Stadium	San Francisco 49ers	<a href="https://www.49ers.com">https://www.49ers.com</a>	Santa Clara	CA	Nested AND phone	75	welcome, birthday anniversary, congratulations	5-7 days in advance	\$199.00	49ers Foundation	<a href="mailto:foundation@49ers.com">foundation@49ers.com</a>	Play before giving them the message
Sofi Stadium	Los Angeles Rams and Los Angeles Chargers	<a href="https://www.rams.com">https://www.rams.com</a>	Inglewood	CA	Login wall	150	custom available	4 days in advance	\$400.00	Chargers Impact Fund	<a href="mailto:chargersimpactfund@chargers.com">chargersimpactfund@chargers.com</a>	Proposals are \$1000
Empower Field at Mile High	Denver Broncos	<a href="https://www.denverbroncos.com">https://www.denverbroncos.com</a>	Denver	CO	Nested form	12 words	custom available	Thursday before game	\$150.00	Denver Broncos Charities	<a href="mailto:broncoscharities@denverbroncos.com">broncoscharities@denverbroncos.com</a>	Happy birthday or 12 word message
Arrowhead Stadium	Kansas City Chiefs	<a href="https://www.chiefs.com">https://www.chiefs.com</a>	Kansas City	MO	nested form	60	custom available	Tuesday before game	\$250.00	Tennessee Titans Foundation		Cannot find scoreboard messages. Probably not offered unless you call and ask
Nissan Stadium	Tennessee Titans	<a href="https://www.titans.com">https://www.titans.com</a>	Nashville	TN	nested form	60	custom available	Tuesday before game	\$250.00	Tennessee Titans Foundation		*limited number of messages with no number given
Casimiro Superdome	New Orleans Saints	<a href="https://www.saints.com">https://www.saints.com</a>	New Orleans	LA	nested form	60	custom available	Tuesday before game	\$250.00	Tennessee Titans Foundation		Cannot find scoreboard messages. Probably not offered unless you call and ask
Mercedes-Benz Stadium	Atlanta Falcons	<a href="https://www.falcons.com">https://www.falcons.com</a>	Atlanta	GA	nested form	60	custom available	Tuesday before game	\$250.00	Tennessee Titans Foundation		Cannot find scoreboard messages. Probably not offered unless you call and ask

## NFL

Venue	Team	Link	City	State	Form Desc.	Character Limit	Message Types	Timeline	Min Cost	Charity	Email	Constraints
TD Garden	Boston Celtics	<a href="https://www.celtics.com">https://www.celtics.com</a>	Boston	MA	nested form	9 words	Custom available	2 days before game	\$50.00	Boston Celtics Shamrock Foundation		Need to be a season ticket holder
Staples Center	Los Angeles Lakers	<a href="https://www.lakers.com">https://www.lakers.com</a>	Los Angeles	CA	nested form	40	birthday, anniversary	2 days before game	\$50.00	Los Angeles Lakers Foundation	<a href="mailto:lopez@lakers.com">lopez@lakers.com</a>	Very limited options for a message. see link
Staples Center	Los Angeles Clippers	<a href="https://www.clippers.com">https://www.clippers.com</a>	Los Angeles	CA	pdf		birthday, anniversary	2 days before game	\$75.00	LA Clippers Four Kcarr@clippers.com		Not specified
Spectrum Center	Charlotte Hornets	<a href="https://www.hornets.com">https://www.hornets.com</a>	Charlotte	NC	nested form		birthday, anniversary or more	2 days before game	50 or 175.00	Charlotte Hornets Foundation		Confusing
United Center	Chicago Bulls	<a href="https://www.bulls.com">https://www.bulls.com</a>	Chicago	IL	nested form	60	Custom available	5 days before game	75 - 500	Chicago Bulls Ct fantasy@bulls.com		Does not list price or difference between packages
Bardays Center	Brooklyn Nets	<a href="https://www.nets.com">https://www.nets.com</a>	Brooklyn	NY	nested form		custom available			Brooklyn Nets Foundation		Does not have message details
Fiserv Forum	Milwaukee Bucks	<a href="https://www.bucks.com">https://www.bucks.com</a>	Milwaukee	WI	nested form		birthday, anniversary	4 days before game	\$25.00	Milwaukee Bucks Foundation		Name only
Paycom Center	Oklahoma City Thunder	<a href="https://www.thunder.com">https://www.thunder.com</a>	Oklahoma City	OK	nested form		birthday, anniversary, welcome	3 days before game	\$25.00	Cavaliers Community Foundation		Cannot find
Rocket Mortgage FieldHouse	Cleveland Cavaliers	<a href="https://www.cavaliers.com">https://www.cavaliers.com</a>	Cleveland	OH	nested form	35	birthday, anniversary, welcome	3 days before game	\$25.00	Cavaliers Community Foundation		Cannot find scoreboard messages. Probably not offered unless you call and ask
State Farm Arena	Atlanta Hawks	<a href="https://www.hawks.com">https://www.hawks.com</a>	Atlanta	GA	nested form							Cannot find scoreboard messages. Probably not offered unless you call and ask

## NBA

Venue	Team	Link	City	State/Province	Form Desc.	Character Limit	Message Types	Timeline	Min Cost	Charity	Email	Constraints
TD Garden	Boston Bruins	<a href="https://www.bruins.com">https://www.bruins.com</a>	Boston	MA	nested form	8 words	custom available	>2 weeks before	\$200.00	Boston Bruins Foundation		Ridiculous process!
Staples Center	Los Angeles Kings	<a href="https://www.kings.com">https://www.kings.com</a>	Los Angeles	CA	Phone				\$50.00	Kings Care Four royalservice@lakal.com		all over phone
Climate Pledge Arena	Seattle Kraken	<a href="https://www.kraken.com">https://www.kraken.com</a>	Seattle	WA	ticketmaster	35	custom available	1 day before game	\$125.00	One Roof Foundation		
T-Mobile Arena	Las Vegas Knights	<a href="https://www.knights.com">https://www.knights.com</a>	Paradise	NV	nested form	75	custom available	1 day before game	\$75.00		702-790-2663	Greeting only. No custom message
UBS Arena	New York Islanders	<a href="https://www.islanders.com">https://www.islanders.com</a>	Elmont	NY	nested form		custom available	3 days before game	\$75.00	New York Island communityrelatio		Time and location of message is communicated later via email
Rogers Arena	Vancouver Canucks	<a href="https://www.canucks.com">https://www.canucks.com</a>	Vancouver	BC	nested form	60	custom available		CA \$20			Little information given about message
United Center	Chicago Blackhawks	<a href="https://www.blackhawks.com">https://www.blackhawks.com</a>	Chicago	IL	nested form	250	birthday, welcome	2 days before game	\$100.00	Chicago Blackhawks Foundation		
Centre Bell	Montreal Canadiens	<a href="https://www.canucks.com">https://www.canucks.com</a>	Montreal	QC	nested form		custom available		\$200.00	Montreal Canadiens Children's Foundation		
Enterprise Center	St. Louis Blues	<a href="https://www.blues.com">https://www.blues.com</a>	St. Louis	MO	nested form	50	birthday, anniversary	1 week before game	\$25.00	Blues for Kids	communityrelatio	System not updated since 2015
Scotiabank Arena	Toronto Maple Leafs	<a href="https://www.leafs.com">https://www.leafs.com</a>	Toronto	ON	nested form		name only	birthday	\$0.00			

## NHL

Venue	Team	Link	City	State	Form Desc.	Character Limit	Message Types	Submission Deadline	Min Cost	Charity	Email	Constraints
Ohio Stadium	Ohio State Bucke	<a href="https://ohiostate.com">https://ohiostate.com</a>	Columbus	OH								Currently unavailable
Bryant-Denny St	Alabama Crimso	<a href="https://rolltide.com">https://rolltide.com</a>	Tuscaloosa	AL	Nested form		Birthday					Available through children's birthday party package only
												<b>Due to NCAA Rules &amp; Regulations, children must be in 6th grade or younger to receive a videoboard message. Grades 7 through 12 are of recruitable age and are ineligible to receive a videoboard message.</b>
Jordan-Hare Sta	Auburn Tigers	<a href="https://auburntigers.com">https://auburntigers.com</a>	Auburn	AL	Phone or email		birthday	3 days before ga	\$200.00			Cannot find
Tiger Stadium	Louisiana State Tigers		Baton Rouge	LA								Cannot find
Beaver Stadium	Penn State Nittar	<a href="https://gopsusport.com">https://gopsusport.com</a>	Centre County	Pennsylvania								Cannot find. There is a birthday package you must email about
Sanford Stadium	Georgia Bulldogs	<a href="https://georgiabo.com">https://georgiabo.com</a>	Athens	GA	<b>Mail in</b>		birthday, anniver: 1 week before ga		\$100.00			Mail in. 15 messages per game
Kyle Field	Texas A&M Aggies		College Station	TX								Cannot find
Steve Surrier Fie	Florida Gators	<a href="https://floridagators.com">https://floridagators.com</a>	Gainesville	FL								No, we do not do any special requests due to the extremely high volume of requests.
Vaught Heminge	Ole Miss Rebels	<a href="http://olemiss.com">http://olemiss.com</a>	University	MS								Birthday party package only
Neyland Stadium	Tennessee Volunteers		Knoxville	TN								Cannot Find

## NCAA

Venue	Team	Link	City	State	Form Desc.	Character Limit	Message Types	Timeline	Min Cost	Charity	Email	Constraints
Polar Park	Worcester Red Sox	<a href="https://forms.redsox.com">https://forms.redsox.com</a>	Worcester	MA	Nested form	125	Custom available	Submission 24 hr. prior to game	\$50.00	WooSox Foundation		

## AAA