A Major Qualifying Project for Angelo, Gordon & Co., New York City

SOFTWARE DESIGN OF

A NEW ANGELO GORDON CORPORATE

PORTAL

Submitted to the faculty of the

WORCESTER POLYTECHNIC INSTITUTE

In partial fulfillment of the requirements of the

Degree of Bachelor of Science

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ABSTRACT

In conjunction with the technology department of Angelo, Gordon & Co., we built a new AG corporate portal. The portal runs internally and encompasses a number of tools: a company calendar, file upload, AG Facebook and AG Ticketmaster.

Starting with reverse engineering the previous company portal that ran on Microsoft Sharepoint, we moved on to create a comprehensive tool which is modern, efficient and quick. It is intended for use by the HR department, which updates company policies and events on the calendar, but also by company employees who use AG Facebook to view and contact other employees as well as AG Ticketmaster which is used to request tickets for sporting events specifically reserved for Angelo Gordon employees.

The final product satisfies all the above goals and will promptly be put into use by Angelo Gordon.

AKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Angelo, Gordon & Co. is an alternative investment manager with assets under management in the tens of billions of dollars. The technology department utilizes many Microsoft products. Consequently, the corporate portal of Angelo Gordon ran on Microsoft Sharepoint. The portal included company policies, employee benefits, a manually-updated corporate calendar, a company Facebook with pictures and contact information of all full-time employees, and a tool called Ticketmaster which is used to request tickets for different sporting events in New York City.

The portal worked acceptably on a basic level but did have certain obvious weaknesses which reduces its functionality and efficiency. First of all, the calendar was static and manually-updated which made the process of updating it slow. Additionally, the Facebook search malfunctioned in such a way that the user had to scroll down and find the person they were looking for themselves. Aesthetically, Facebook was rather archaic with small, not clearly visible pictures for the employees.

Our task was to address the above issues, creating an internal tool, while keeping the basic structure and aesthetics. We automated the calendar update process, making it dynamic so that the HR department does not have to download the current version, modify it and reupload it. We also created AG Facebook with a functional type-in search, as well as the ability to filter employees by department and by location. We added a feature under each employee whereby one can click contact, click on that employee's email and get a pop-up window from Microsoft Outlook to send that person an e-mail. AG Facebook includes all full-time employees of Angelo Gordon, not only those located in New York, so it will be used by Angelo Gordon employees globally. AG Ticketmaster is another tool which we incorporated in the new portal. Any full-time employee in the New York office can request tickets for events, which are shown on a calendar with the same format as the company calendar, and pending approval from an external party receive the tickets for sporting events. The process is initiated internally but requires external authorization. Once a ticket has been approved, the number of available tickets for that particular event is updated.

> **Commented [MJC1]:** You will submit the final report as a PDF, but it is customary to also upload a ZIP file with any supplemental files, such as the Word version of the report and source code (if it is released to the public). Any place where there is a Word warning, such as grammar or spelling, it should be either fixed or marked to ignore.

The portal is likely to include other features in the future, such as integration with the New York office telephone center so that any employee can contact any person through clicking their office phone number and picking up their office telephone. Additionally, Workday, an on-demand financial management and human capital management software vendor, may be incorporated in the new AG corporate portal we built.

1. INTRODUCTION

1.1 Hedge Funds

Hedge funds are business structures which work as investment vehicles with pooled funds from sophisticated investors or high net worth individuals. They aim to generate alpha or active return for their investors, namely their goal is to achieve high returns regardless of the direction of the overall market. Hedge funds are characterized by a 2 and 20 fee structure; that is, they typically charge a 2% management fee (nowadays closer to 1%) and a 20% performance fee of the profits on an annual basis. Investment terms, including portfolio construction parameters, massively differ from fund to fund but the majority of hedge funds have a strict and clear investment process. Potential investors evaluate hedge funds based on a number of metrics, the most popular of which is the Sharpe ratio which indicates the risk-adjusted return profile of the fund. Hedge funds employ a variety of strategies including bottom-up or value investing, global macro, event-driven (which deal with mergers and acquisitions), fund of funds investing, quantitative and growth.

1.2 Angelo, Gordon & Co.

Angelo, Gordon & Co. (AG) is a privately-held registered alternative investment manager founded in 1988 and has approximately $27 billion in assets under management. It is based in New York City but has multiple offices in Europe and Asia. The company has expertise in a broad range of absolute return strategies for both institutional and high net worth investors, including distressed debt, private equity, real estate, energy and risk arbitrage. The greatest part of the investment processes is not real-time market driven investing. The investment process is thoroughly analytical with portfolio risk parameters set so as to add to investment disciple. As is the case with most hedge funds, Angelo Gordon is less regulated compared to investment banks due to the fact that it manages assets for high net worth individuals. AG's technology department supports the main investment business of the fund in many different ways, including software support, maintenance and new initiatives like the one our project was part of.

1.3 Project Introduction and Motivation

Prior to our work at Angelo Gordon, the company already used a corporate portal which was run on Microsoft SharePoint. The portal was not obsolete. Almost all full-time employees used it fairly regularly. However, the portal had certain weaknesses that rendered user experience inferior to what it could be. It became evident to Scott Burton that the need for a new portal run on modern technology existed. Considerations and problems that led to this need included low speed, mediocre efficiency and functionality of the Microsoft SharePoint portal. Hence, our sponsor decided that this year's project focused on replacing that portal.

2. BACKGROUND

2.1 Technical Background

In order to meet Angelo Gordon's needs of embracing modern web technology, we first started researching best practices of building a modern web application.

2.1.1 Single-page Web Application

A Single-Page Web Application (SPA) is a web application that operates in a single page and the code behind it is retrieved with a single page. There is no automatic redirection from that page to another page at any stage. The User Interface (UI) moves from page to page without the need for an HTML roundtrip through the server. This is achieved by having a model layer which handles the data and a view layer which reads from the model layer. As a result, SPAs tend to remind the user of an app.

2.1.2 Model-View-Controller

Model-View-Controller (MVC) is a software architecture for implementing UIs according to which an application is divided into the aforementioned 3 parts in order to distinguish between the different ways to represent information. MVC has recently become extremely popular for web applications, so we felt it was an appropriate choice. Specifically, model implies data, view implies visual representation, and controller implies the interface between the model and the view. If one would like to make changes to one layer, the others remain unaffected, which is one of the advantages of MVC.
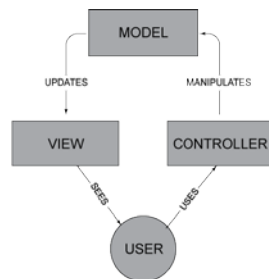

Figure 1: MVC architecture[1]

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[1] "Real-world applications using developerWorks Premium, Part 1 - IBM." 15 Jun. 2016,
https://www.ibm.com/developerworks/library/mo-assist-stray-dogs-1-premium/. Accessed 20 Jan. 2017.

3. TECHNOLOGY

After researching some best practices from the industry, we decided on using the following technologies to build new AG Portal.

3.1 Javascript

Javascript is a very popular programming language and along with HTML and CSS, it is the backbone of web application development. The language is high-level, untyped, interpreted and dynamic. High level means that the language does not involve low-level, software-friendly elements which are prominent in C, for instance. Untyped means that the language does not involve different data types. Interpreted implies that most of its implementations execute instructions directly, without previously compiling the program into machine language instructions. Finally, dynamic implies that many common programming behaviors are present at runtime, not due to prior compilation. Javascript is used with node.js for server network programming.

3.2 Node.js

Node.js is an open source, cross-platform runtime environment for developing server-side runtime applications. It is written in Javascript. Node.js' primary function is the support of modules that handle core functionality, including file I/O, binary data networking and data streams. The node.js environment bears similarities with PHP in that it is used to build web servers. Since our application is an SPA that runs in real-time, we need a server that can cater to multiple requests. Node.js is capable of handling a large number of requests which is the main reason we considered it tailor-made for our needs.

3.3 AngularJS

AngularJS is a web framework for building dynamic web apps, especially single page applications. It is designed to simplify both the development and the testing of such applications by providing a framework for client-side MVC (Model View Controller) architecture.[2]

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[2] "AngularJS Documentation for introduction - Angularjs.org."
https://docs.angularjs.org/guide/introduction. Accessed 20 Jan. 2017.

Data-binding is one of the essential designs in AngularJS. It is the automatic synchronization of data between the model and view components. The view is a projection of the model at all times. When the model changes, the view reflects the change, and vice versa.
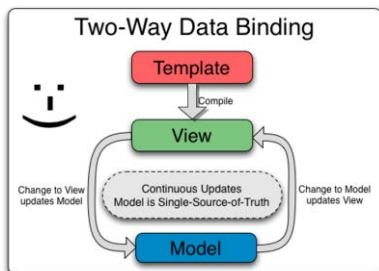
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The controller is completely separated from the view and unaware of it. This makes testing in Angular much easier, also speeding up the development process when building a single page application. Due to these reasons, we decided to use AngularJS as our front-end framework.

3.5 Express.js

We want to follow the MVC architecture not only on the front-end, but also on the server side, and using Express.js is one of the best options to achieve the goal.

Express.JS is a lightweight web application framework to help organize web application into an MVC architecture on the server side. [4] It simplifies development and makes it easier to write secure, modular and fast applications. It serves as a middleware in the application and handles the connectivity tasks among different components.

Another advantage that Express.js brings is the combination of ExpressJS and AngularJS – a complete JavaScript paradise. We can handle front end JavaScript coding with AngularJs

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[3] "AngularJS Documentation for data binding." https://docs.angularjs.org/guide/databinding. Accessed 23 Jan. 2017.
[4] "Express.js." http://expressjs.com/. Accessed 23 Jan. 2017.

framework and leave all backend worries for ExpressJS framework, in the same programming language!

3.6 SQL Server

Microsoft SQL Server is a relational database management system that is a software product with the primary function of storing and retrieving data as requested by other software applications.

SQL Server comes with great capability of storing data. It supports different data types, including primary types such as Integer, Float, Decimal, Char, Varchar, Text, etc. Storage space allocated to a database is divided into sequentially numbered pages. SQL Server allows multiple clients to use the same database concurrently with its pessimistic concurrency and optimistic concurrency features. [5]

SQL Server uses SQL as its query language. SQL (Structured Query Language) is a special purpose programming language that is designed for managing data held in a Relational Database Management Systems (RDBMS). The scope of SQL includes data insert, query, update and delete, schema creation and modification, and data access control.

In order to make our database maintainable in the future, we decided to use SQL Server as our database system, since it is Angelo Gordon's main database management system.

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[5] "SQL Server 2016 Technical Documentation - MSDN - Microsoft." 16 Dec. 2016, https://msdn.microsoft.com/en-us/library/ms130214.aspx. Accessed 24 Jan. 2017.

4. PREVIOUS AG PORTAL

4.1 Microsoft SharePoint Portal Aesthetics

The previous portal ran on Microsoft SharePoint. Its homepage appeared as seen below:
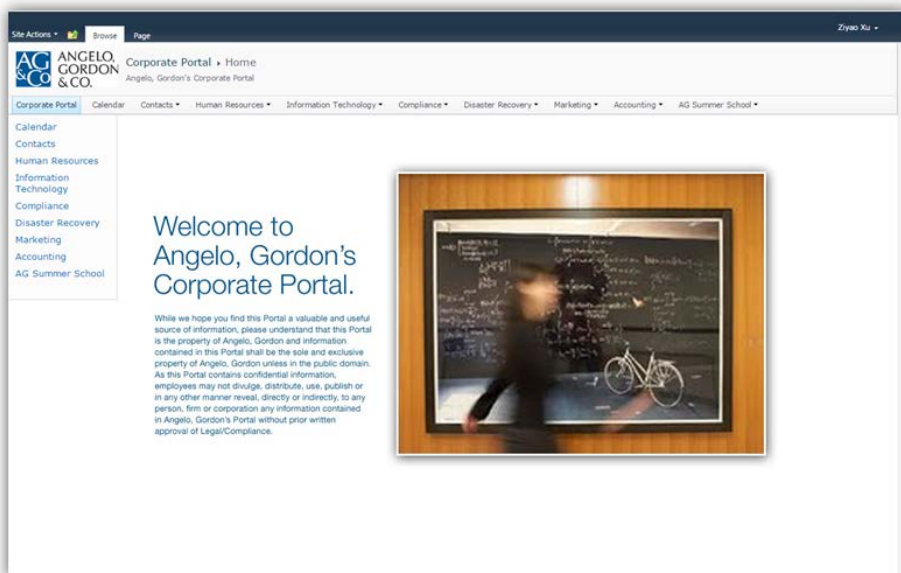

Figure 1: Homepage of previous Angelo Gordon portal

One issue we notice is the fact that SharePoint automatically creates a left side tab menu which is rather redundant. This is an issue which had to be addressed.
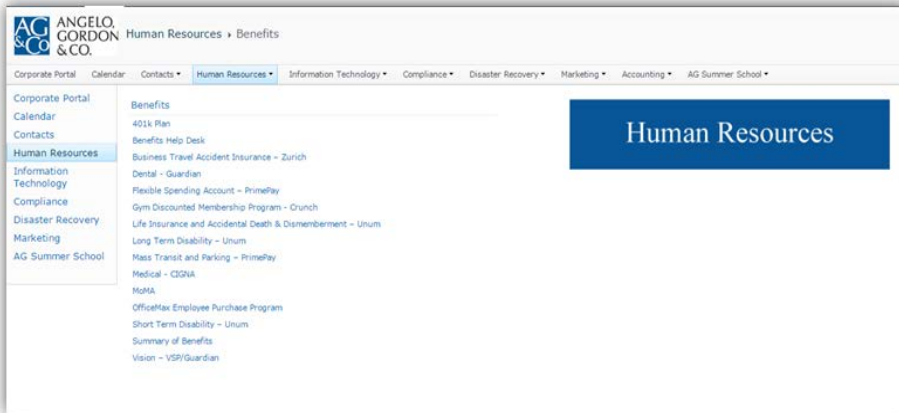
Figure 2: Basic Structure of Website with AG policies, benefits, etc.

Another major component of the portal was the AG Facebook, which included full-time employee pictures and personal information, such as department and phone number.
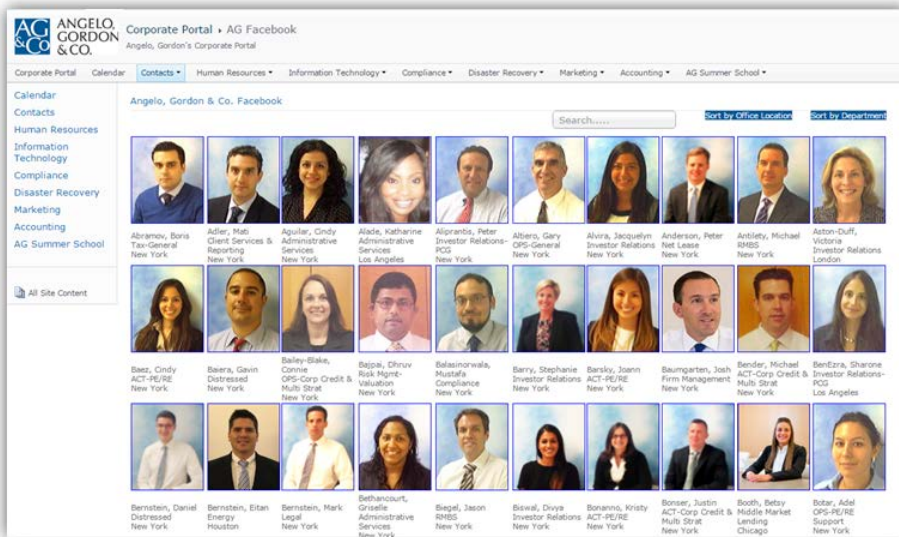

Figure 3: Angelo Gordon Facebook

One feature which we needed to maintain was the sorting functions. Sorting by department and office location are important functions. AG employees worldwide use this portal, so these features would have to be present in the new portal.

The goal was to improve user experience by

- enabling a proper search function;

- enlarging employee pictures on AG Facebook;

- creating an integrated tool which will include employee contact information on AG Facebook;

- Optimizing the Ticketmaster tool.

The Ticketmaster is an internal Angelo Gordon tool that is used to request and eventually receive tickets for various sporting events around NYC in places such as the Madison Square Garden and the Yankee Stadium. The ticket requests are monitored at and approved by a third party administrator depending on availability. We worked on integrating this tool in our new portal and improving its aesthetics and functionality.

5. NEW AG PORTAL

5.1 General Goal

After our analysis of the current AG Portal, we had a better understanding of the application and decided on setting general goals for the new AG Portal first.

5.1.1 Reliability

Reliability is a key feature to the success of AG Portal. The site is the first stop for most new Angelo Gordon employees during their on-boarding process, and it provides hundreds of internal documents, as well as all employees' information. All this information has to be delivered to the end user accurately and effectively from the most reliable data source. We want to eliminate the needs of manual input as much as possible.

5.1.2 Productivity

We envisioned the new AG Portal as a productivity tool. It should serve all employees' needs as a corporate portal effectively. One of the goals for the new AG Portal is to improve productivity in general.

Most of Angelo Gordon's employees are already familiar with the old AG Portal and use it as a daily tool, which means we need to avoid any radical changes to the workflow of the current app. Instead, we incorporated the current workflow into our new design and bring improvement to the details through good user interface design.

We also want to improve the productivity by improving the performance of the site. As we discussed in Chapter 2, the single page application (SPA) is a great option for building a dynamic web application. By adopting SPA, we can decrease the page loading time dramatically which will also improve the productivity.

5.1.3 Maintainability

We set our goal for this application to be production-ready. So making sure the software is maintainable after we left is one of the priorities.

We want to integrate our database into Angelo Gordon's SQL Server system in order to reduce the complexity and inefficiency for Angelo Gordon's IT department to maintain the database in the future. We also want to reduce the amount of efforts when a normal user wants to edit information inside of the app without changing the code.

5.2 User Interface Design

We started designing the user interface by drawing out our brief idea of the basic layout, then we decided to use Sketch, a user interface design software, to create a set of low-fidelity prototype to show our sponsor the basic ideas we have in order to gather feedbacks before implementation. The actual design of the application varied from the mockup design where more functionalities were added to the application.

5.2.1 Home Page
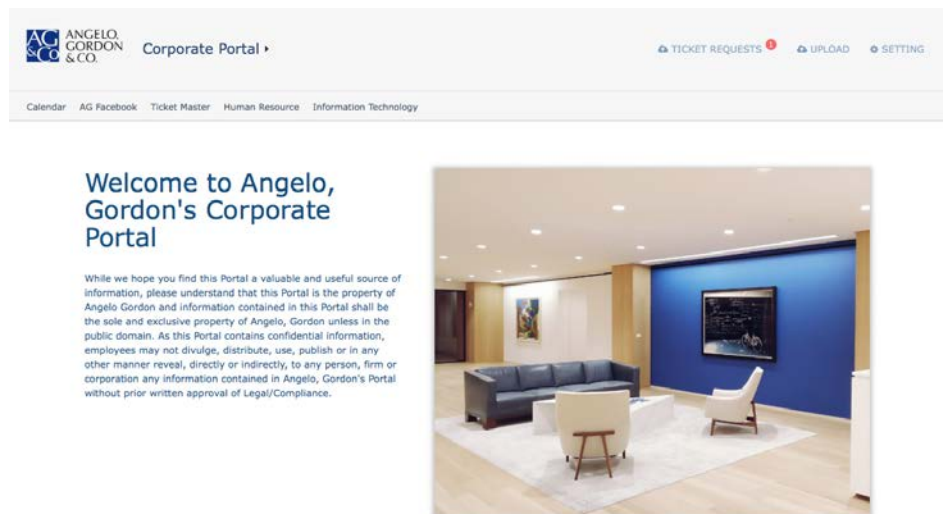
Figure 4: Home Page of new AG Portal

When users first enter the app, they will not be asked to sign in. It will automatically authenticate through the user's Angelo Gordon Windows account and detects the user's role, whether he/she is an admin or normal user.

We keep the same layout in the old portal but take off the left-hand side navigation bar, which duplicated the top navigation bar in the old portal. (Figure 4)

The top navigation bar serves as an entry point for navigating into other components of the app, such as AG Facebook and AG Ticketmaster.

5.2.2 File Explorer
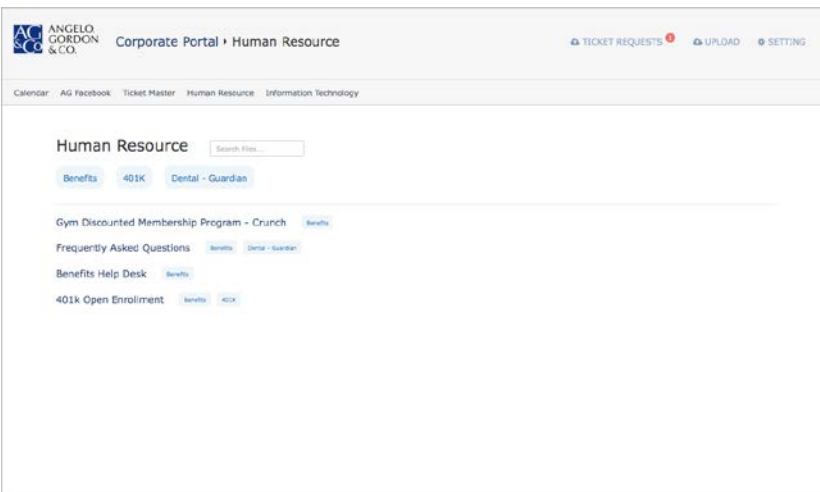
Figure 5: File Explorer of new AG Portal

The old portal organizes documents around the hierarchy structure. This is a good way to organize information until there are too many hierarchy levels, which is the case for the old portal. We change documents structure into a tag-based system. Each file belongs to a category, such as HR, IT,etc. Each file also belongs to different tags. Under each category page, users can view tags that are associated with files in this category. (Figure 5)

We also provide the functionality of searching files, which does not require refreshing the entire web page.

5.2.3 AG Facebook
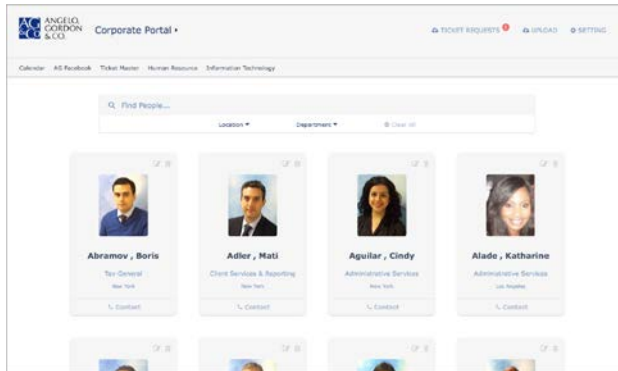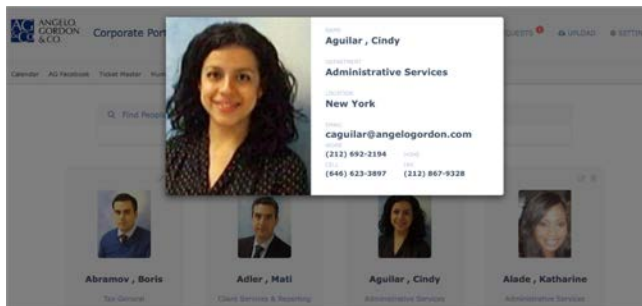
Figure 6: Facebook of new AG Portal
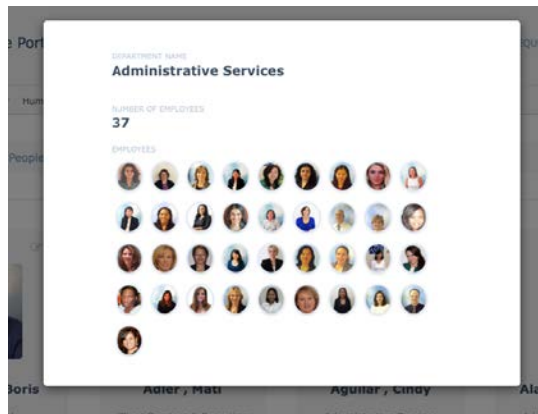

Figure 7: Facebook Contact Page of new AG Portal

Figure 8: Facebook Department View of new AG Portal

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A new AG Facebook was our sponsors' most required feature since the beginning of our project. We redesigned the entire AG Facebook

When users enter the AG Facebook, the first thing that will draw their attention is the search bar. (Figure 6) We improved the search experience by using filtering-out method when showing the employee results, instead of the highlighting the searching in yellow in the old AG Portal. Users are also able to toggle different departments and locations.

We use ID card as a metaphor to show employee information visually. (Figure 7) Admins are able to edit any employee's information directly from this page. After clicking the "Contact" button on the employee info card, a larger view of employee's information is generated. (Figure 7) with more detailed information such as email and phone numbers.

Users can also see the overview of a specific department or location after they click the department or location name. (Figure 8)

5.2.4 AG Ticketmaster

Figure 9: AG Ticketmaster Workflow

AG Ticketmaster is a standalone app inside AG Portal and it's used frequently by employees to request tickets for various sporting events around NYC in places such as the Madison Square Garden and the Yankee Stadium. The process involved two different roles in the system, regular employees and ticketmaster admin. The complete workflow of requesting a ticket is shown in Figure 9. We designed the app in such way that it incorporates the whole workflow in a user-friendly way.

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To start requesting a ticket, an employee will first go to the Ticketmaster page and look at the events calendar. The calendar's cell uses different colors to denote various dates. Blue cell represents the date that has events, green cell represents the current selected date. When user clicks on the desired date, a list of events on that date will be shown underneath the calendar. (Figure 10). Information for all these events is dynamically generated through a third-party API called Eventful.

Figure 10: AG Ticketmaster of new AG Portal
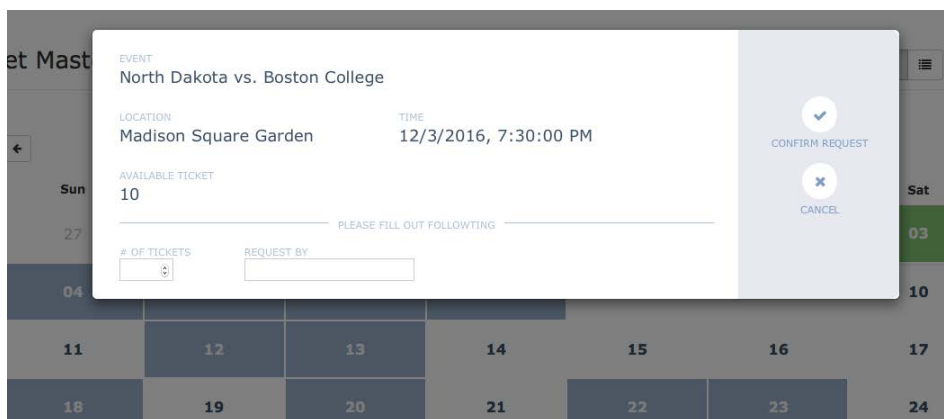
Figure 11: Ticket Request of new AG Portal

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When a user selects on the desired event, a modal window will pop out with related information, such as event location and event url. The number of available tickets will also be shown here. It was generated from our database based on ticket admin's information which we will discuss later. To make sure the user does not create the request by accident, we add another confirmation modal after this step. (Figure 11) The user will fill out the number of requested tickets and his/her name in this modal and submit the request from here.
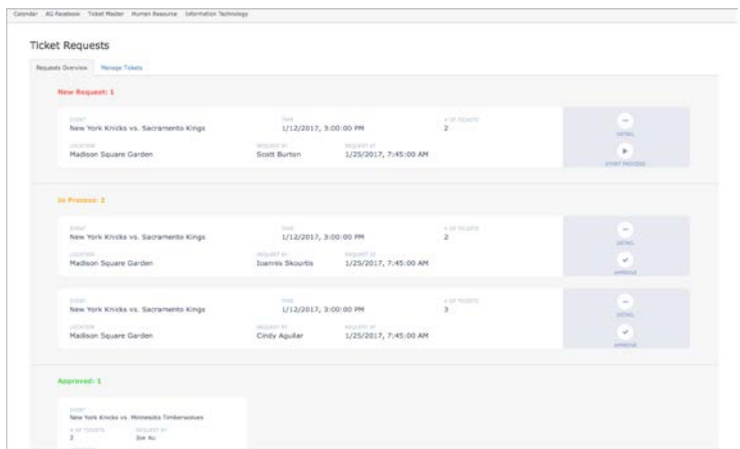
Figure 12: Request Admin of new AG Portal

After the employee's ticket requests goes into our system, the admin for ticketmaster will receive an email notification with requests information. The admin also has a dedicated page in the app just for monitoring all ticket requests, which is shown in Figure 12. In this overview page, all ticket requests are divided into 3 categories: New Request, In Progress and Approved. Admin is able to make different actions based on requests' category. For example, after admin reserved a ticket for an employee on a ticket website, admin can move that employee's ticket request into "Approved" categories. This enables the admin to monitor all requests and prioritize the most urgent one.

Admin also has the ability to update the available ticket number in the events overview (Figure 13). All future events that havebeen requested for tickets are shown here. This way we can still keep the page simple and clean and enable admin to focus on the events that need to pay attention to. Any updates on the number of tickets will be directly reflected on the employees' events calendar page.

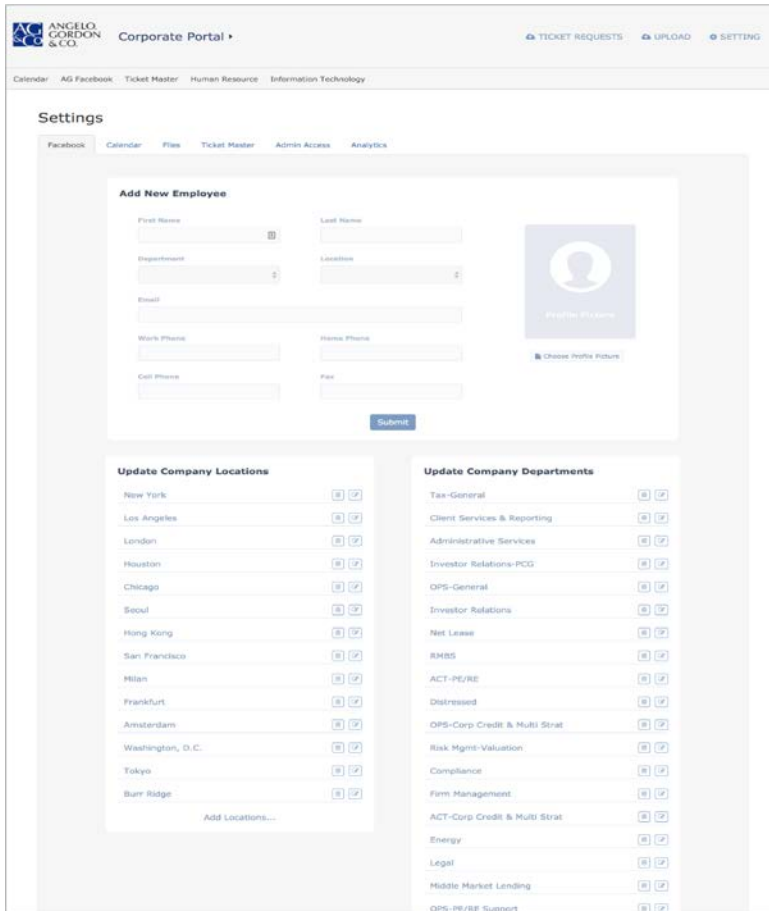*Figure 13: Admin Events View of new AG Portal*

Figure 14: Admin Panel of new AG Portal

5.2.5 Admin Panel

As we mentioned in Section 5.1.3, one of our general goals of this new AG Portal is to improve the maintainability of the website. We achieved this goal by building an admin panel page.

Previously when employees want to make changes to any information on the website, they have to email to one of the admin and wait for them to change manually, which is not efficient and is very easy to lose track of what changes has been made to the page.

In the new AG Portal, we implemented an admin panel in such a way that admin can edit most of the data in our SQL Server directly through the panel in a efficient way. (Figure 14) Any changes that were made in admin panel will be shown immediately across the entire AG Portal. Admins can also grant and revoke admin panel access to a normal user.
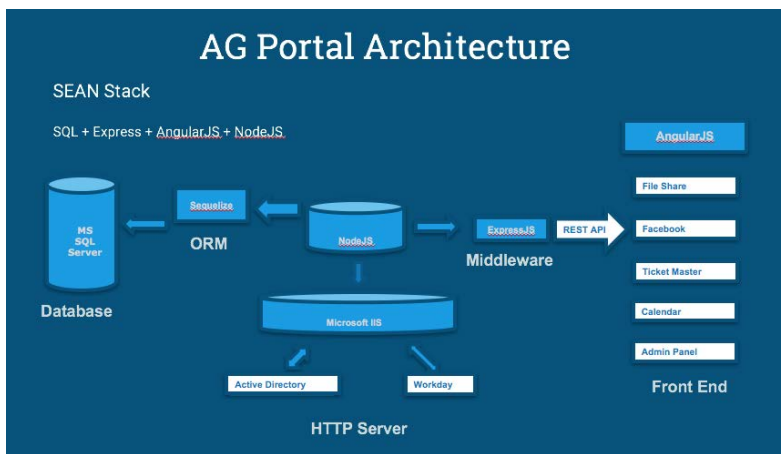
5.3 Implementation

Figure 14: New AG Portal Architecture

As we discussed in Chapter 3, we decided on using SQL Server, Express.js, AngularJS and NodeJS to build out the new AG Portal with the Model-View-Controller architecture. This provides us a solid foundation for implementing our Single Page Application with extensibility and flexibility.

The centerpiece of the entire app is a NodeJS server. It handles all HTTP requests from outside and connect all the components inside the system together. We use SQL Server as our database and connected it through Sequelize, which provides a straight-forward, schema-based solution to model the application data from object. With Sequelize, we are able to create a JSON object with javascript and convert it to SQL query command automatically.

We developed the entire application on top of the ExpressJS, which is a web application framework built on NodeJS. We created a set of RESTful api in the backend using ExpressJS and exposed them to the front-end of AG Portal.

In the front-end, we use AngularJS to create 5 components, each of them serves as an standalone module that handles different tasks, such as file uploading and requesting tickets. Each of these components contains HTML, CSS and Javascript files that are needed in order to render the page.

We use Microsoft IIS server to host our application. This allows us to integrate Windows Authentication into the new AG Portal, as well as gain access to Active Directory, which is Angelo Gordon's employee's data source.

6. RECOMMENDATIONS AND FUTURE WORK

The new AG corporate portal has incorporated a number of very useful functions. There are, however, a few recommendations we did discuss with our sponsor at Angelo Gordon and they are likely to be implemented in the future.

First, in the employee view on AG Facebook we saw it was possible to click on the employee's email and get a pop-up window on outlook to directly contact them via email. Another feature which would also be very useful is to do essentially the same thing on the telephone center of the company, so that any full-time employee is able to contact any other employee by calling them just by clicking on their company extension. That would require a connection of the telephone center of Angelo Gordon with the database where that information is held.

Second, Angelo Gordon intends to incorporate Workday, a financial management and human capital management software to help optimize its HR processes through the analytical tools it provides. Workday should be able to work nicely in conjunction with the already existing functions of the new AG corporate portal. The company intends to integrate it within a 6-12 month time horizon.

Angelo Gordon

Corporate Portal

User Guide

Ioannis Skourtis, Ziyao Xu, Mingkun Ma

**ANGELO, GORDON & CO. 245 Park Ave, New York City. NY 10167**

Homepage

First please log into the system to view the portal. Then open the browser to view the corporate portal homepage. If the user is on any subpage, click the Corporate Portal tab on the upper left corner of the homepage near the logo to return to the home page.

Calendar

To view the calendar, click Calendar tab in the navigation bar. On the left top of the calendar, there are three modes to view the calendar. Click Month, Week, or Day button to select the view mode. On the right top, click Today button to view the events on that day.

When the user opens the calendar page for some day, that day shows as green by default. Then if the user selects other date, that box will change to green. Dark blue means there are events on that day in this month. Light blue means that there are events on these dates last month. Click the arrows to move to last time period or next time period.
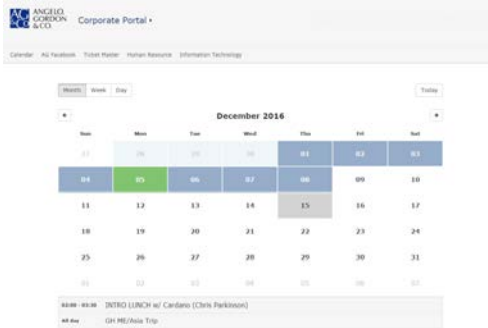

Step 3: AG Facebook

In Facebook, enter the name to search a person. Click the Location filter under the search bar, then the drop-down list of all locations pops out. Select a location; all employees working in that place will display. The filter works the same way for the department. Click the Department filter and choose the one needed; all employees in that department will display. To clear the filter, click clear in the bottom of the drop-down list.
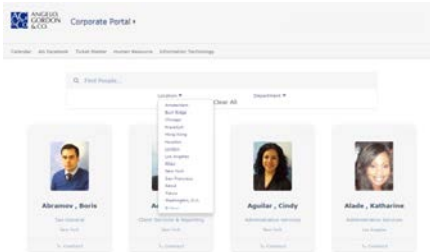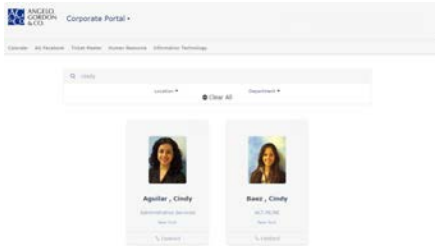
Every employee has a personal profile. To view the profile and personal photo, click the employee name or Contact tab, then the window with personal information pops out. The information contains the employee's name, department, location, email address, phone number and fax number. Click the Angelo Gordon email address to send an email to the person selected.
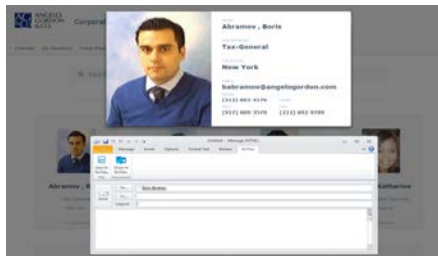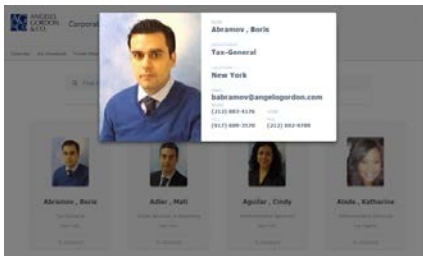

Under the employee's' name, the user can see their departments and locations. Click the department, the information box of that department pops out. The box consists of the department name, number of employees in that department and photo list of all employees in that department. This also works for the location tab. Click any circular photo in the box, and then the corresponding personal profile window will pop out. The user can view the employee profile in this way.
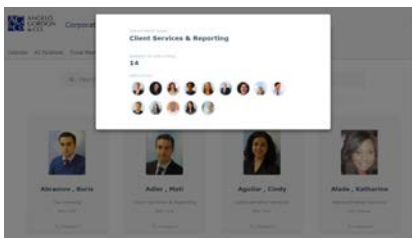
Step 4: Ticket Master

To view the ticket master, click Ticket Master in the navigation bar. The calendar in Ticket Master looks like the one in Calendar page. Select the date to see the events on that day. The events are listed under the calendar. Click the one to attend, and then a window with event information will pop up. Click Request Ticker or Cancel to continue or stop. After clicking Request Ticket button, the request window pops out. Enter the number of tickets requested and requestor name. Then click Confirm Request or Cancel to complete the process or cancel the demand.
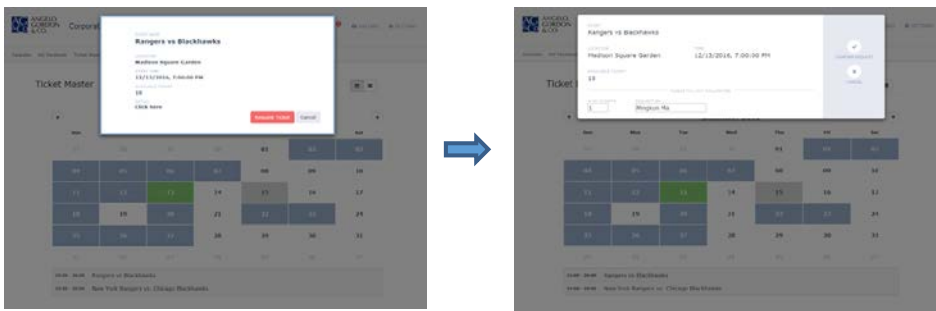
Step 5: Files

To view the files, select the specific file type in the navigation bar. For example, click Human Resource, then the files under this type display. Click the file name to read it.

The user can find a file by using filters. The tags are listed as follows. Click a tag, then the files under this tag display. For example, click 401K, then the file "401k Open Enrollment" shows up. The user can only choose one tag each time. One file can have multiple tags. The user can also enter the keyword in search bar to find the file needed.

Appendix B: Code
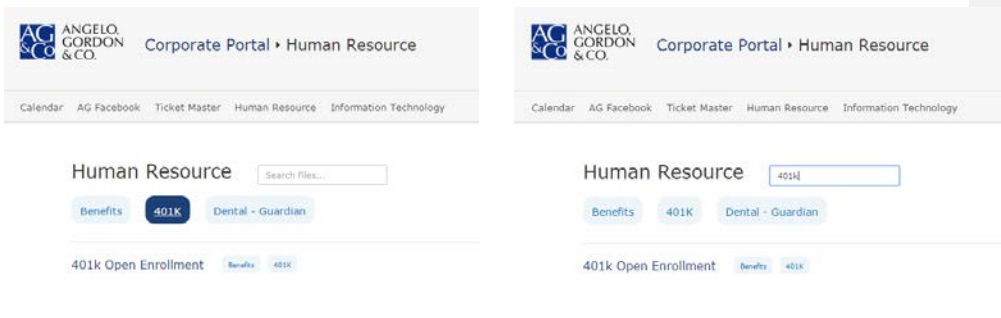
https://gitlab.com/MrJoeXu/portal-prototype

Please contact authors in order to obtain access to this repository.

Appendix C: Data analysis for new AG Portal

Note: Appendix C will be published as a separate document.