REVALUME: CONFIGURABLE EMPLOYEE EVALUATIONS IN THE CLOUD

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ABSTRACT

Revalume: Configurable Employee Evaluations in the Cloud

Terrence Li

The software industry has seen a shift from annual to more frequent quarterly and even weekly employee reviews [27]. As a result, there is a high demand for employee evaluations to be less costly and less time-consuming, while providing key insights for richer interactions between employees and their employers or managers. Tech companies are constantly looking for methods of producing high quality evaluations to prevent costly turnover. In an industry where software engineers are in high demand, tech companies face a challenging problem. Issues with employee evaluations typically include the lack of performance transparency, unhelpful feedback, lack of metrics, lack of time, and lack of resources. This thesis addresses these challenges through the implementation of an employee evaluation tool. Revalume is a cloud-based web application that provides a stream-lined solution of creating, routing, completing, and viewing evaluation forms. Revalume allows users to use pre-existing and configurable templates, third-party APIs, and a friendly UI to ease the evaluation process. Revalume was evaluated with a longitudinal, semi-controlled study that demonstrates meaningful improvements over existing solutions.

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INTRODUCTION

The number one reason people give for quitting, according to the U.S. Department of Labor, is that they don't feel that their efforts are recognized or appreciated by their direct bosses [17]. On the flip side, supervisors often have a difficult time finding quantitative measurements of employee performance. The current method of measuring employee value is through employee evaluations. Besides the mentor-to-employee evaluations, there also exists self evaluations and peer-to-peer evaluations. It is during the evaluation process that an employee can demonstrate their achievements and accomplishments.

Nearly 90 percent of companies do formal evaluations at least once a year, according to the Society for Human Resource Management [16]. That being said, there are many companies including Accenture, Adobe, and Gap moving away from the traditional annual performance review. In other words, the demand for employee evaluations will increase as annual evaluations are slowly shifting to weekly to quarterly performance reviews. "Given the increased number of direct reports, the average manager spends 210 hours a year on performance-review-related activities, including filling out forms and giving evaluations" [16]. Therefore, there is a need for an efficient way of conducting performance appraisals while providing adequate content.

In the following sections I provide a background on the history of performance appraisals and the varying traditional methods. Then I examine the various bottlenecks in the evaluation process that prevent the employees or mentors from obtaining or providing quality feedback. In summary, my contributions are that I developed and designed a new cloud-based solution called Revalume that looks to present a novel employee evaluation process and provide a more accurate heuristic of past and present achievements through integration with third-party applications. This paper also aims to demonstrate whether Revalume addressed the various bottlenecks of current employee evaluation processes.

Chapter 2

BACKGROUND

2.1 History of Performance Reviews

As technology advanced during the Industrial Revolution, the need for improved methods, productivity, and quality arose. It was during this time that Adam Smith, in his book *The Wealth of Nations*, pushed for the division of labor. During the 1900's, Frederick Taylor, often called "the Father of Scientific Management", published a book *The Principles of Scientific Management*. He pioneered efficiency techniques designed to address work design, work quality, and production control. It was also during this time that he discovered that employee satisfaction leads to greater work productivity [21].

During the 1920's to 1930's, studies done by Elton Mayo measured the relationship between productivity and work environment. His study had such an impact that the government also pushed for reforms such as the *Performance Rating Act* and *Incentive Awards Act* which provided a three summary rating level for federal employees and authorized recognition or cash payments for recognized government employees [21].

It was during the 1960's that the scientific management system began shifting to a personable relationship between the managers and their employees, passing pay-for-performance reforms such as the Salary Reform Act [21]. During the 1980's management by objectives become a popular form of management, where managers and employees work together to set goals and achieve objectives together [21].

However, by the early 2000's, attitudes toward performance evaluations pivoted again. The attempts to automate reviews through software left employees dissatisfied with their job reviews. In fact, a study done in 2009 by Reuters showed that 4 out of 5 employees are dissatisfied with their job performance reviews and would like to have them better reflect their work [21].

2.2 Performance Evaluation Cycle

According to the Office of Performance Management, performance management is a continuous cycle that involves planning, monitoring, developing, rating, and rewarding [9].

Planning involves setting goals and expectations for the work that lies ahead. Usually, it is during this stage that the criteria for the performance appraisals are established. By planning with the employees, it allows for the employee to have an understanding of the expectations for the project. During this phase, the performance elements are established. These elements must be measurable, understandable, verifiable, equitable, and achievable [9].

Although the background for these areas are addressed in this paper, we focused strictly on the employee evaluation progress.

2.3 Measuring Performance

There's been a long debate on how performance could be measured quantitatively. However, most agree that performance must be judged by the quality, quantity, timeliness, and/or cost effectiveness of the work against a set of standards [9]. Developing an effective means of measuring such performance results in a better understanding of the role the employees. According to OPM, or the Office of Performance Management, the measurement for an employee's performance is defined by three elements: critical elements, non-critical elements, and additional performance elements.

The critical elements are defined as elements of such importance that unacceptable performance in these categories mean that the overall performance of the employee is unacceptable. Every employee must have at least one critical element in their performance plan, although most experts agree that three to seven critical elements are appropriate [9].

Non-critical elements include non performance-based action and group-performance, meaning that an employee's performance cannot be assessed *Unacceptable* for failure to uphold the non-critical elements. However, these criteria could affect summary levels above *Unacceptable.*

Additional performance elements are elements that aren't used as summary level of performance. In other words, these include new work assignments, group performance, or awards. Employees handling new work assignments should not be assessed right away because of the amount of time it takes to adjust to the new work load.

2.4   Roles of an Organization

The roles of an individual can vary in an organization.

In software companies, many have adopted the agile methodologies of creating scrum teams. A scrum team consists of a product owner, a ScrumMaster, and the team. The product owner is responsible for prioritizing the product backlog by emphasizing the return on investment (ROI) [11]. The ScrumMaster role is to "removes any impediments that obstruct a teams pursuit of its sprint goals" [11]. The team collectively work together to determine what and how work gets done [11].

In traditional companies, a team usually consists of the manager and the employees. The manager's responsibility is to ensure that the overseeing and leading the employees. The employees role is to achieve the goals set before them, most of the time by their managers.

For simplicity, this paper looks to address three main user roles: self, peer, and mentor. We used the 360-degree feedback model to choose these three user roles, leaving out the employee's subordinates. I will touch on some advantages and disadvantages of each evaluation role.

2.4.1 Self

A self evaluation allows an employee to assess their own performance [7]. According to John Reed, from Robert Half Technology, the companies that are doing it right are using the self-evaluation portion of the review for two reasons [7]:

- It forces employees to evaluate themselves and their performance.

- It helps managers understand whether an employee has an accurate understanding of their job performance.

This is a crucial part of the employee evaluation process by providing employees a voice and an examination of themselves. This opens up a dialogue between the employee and management which in turn creates transparency and feedback. As Reed mentioned, the value of self-evaluations is that it forces an employee to understand the reality of their contributions and also allows for managers to assess the employee's ability to understand their roles in the team [7].

Unfortunately, employees often perceive their own performance stronger than their actual contributions. This misreporting could lead to an increase workload for mentors, as they need to further verify and monitor their employees. This difference in understanding could lead to tensions and miscommunication between mentor and employees.

2.4.2 Peer

Peer reviews allow an employee's colleagues to assess their performance [22]. The value in peer evaluations is that it examines not only the employee's contribution in the team, but how well the employee interacted with their peer. These systems are effective in noting the value of others in the team and noting contributions and attitude. Also, the addition assessment provides a more holistic view of the individual's actual contributions.

As each employee has a different attitude or belief, there's always a risk for a subjective response. Also, there may be a risk of in-group competition if peers are competing with each other for a potential raise or promotion [25]. More often than not, peers are just unaware of each other's contribution, which may lead to inaccurate assessments.

2.4.3   Mentor

Mentor evaluations serve to ensure that the employees and mentors are on the same page on expectations and results. This process provides the employee a chance to receive feedback on performance and future goals. During this process, mentors should focus on results and be direct in areas of improvement. These feedback should be specific, constant, and focus on the overall picture, while taking into account the self evaluations and peer evaluations [19]. An advantage of mentor evaluation is that it can keep an open communication between employees and their mentor. Mentors are able to provide feedback to the employees, so employees know what is expected of them. Mentor evaluations are also valuable in keeping the mentor aware of the current status quo.

Often times, the disadvantages of mentor evaluations continue to be the unawareness of an employee's contributions, the additional workload, and lack of transparency between mentor and employee. A mentor needs to juggle multiple employee evaluations, while ensuring that the evaluations provided by them do reflect their employee's contributions. Many mentors are either dissatisfied or dislike employee evaluations.

2.5 Dissatisfaction With Employee Evaluations

According to Dupress.com, only 8% of companies report that their performance management process drives high levels of value, while 58% said it is not an effective use of time [12]. In addition, according to the Society for Human Resource Management, about 95% of managers aren't satisfied with their organization's performance management method and 90% of HR professionals don't believe their companies' performance reviews provide accurate information [12]. Often times, the review process can suffer from recency bias, or a human tendency to prefer to keep recent memories. This could dramatically affect evaluations as it tends to emphasize recent events.

As for employees, 66% said that performance reviews interfered with their work and 65% said that performance reviews aren't relevant to their job [12]. There have been attempts to employ the "Rank and Yank" type of management, where employees within a team are ranked individually against their peers. The study done by 15Five, demonstrate that the "Rank and Yank" performance management process does not produce results and actually inhibits collaboration and productivity. Also, millenials prefer more frequent check-ins with managers for constant constructive feedback[12].

When we examine the sentiment of employee evaluations in software engineers, we find similar attitudes. Facebook has scrapped the annual reviews and instead adopted the biannual review for the consistent feedback [3]. While, many software industries still use the standard annual evaluation, we have seen growing numbers of company, such as Adobe, evolving toward a more frequent evaluation approach. The transition to more frequent employee evaluations is because performance management is embedded into the scrum framework itself. Often times, during the daily stand-up meeting, each team member presents their achievements since the last scrum and the goals they look to achieve before the next scrum. These achievement and goals are data metrics that are constantly recorded and verifiable. In the software industry, there exists an increasing emphasis in frequent feedback for employees in a team.

Chapter 3

REVALUME

The name Revalume was proposed by Dr. Janzen as a combination of the terms: review, evaluate, value, and me. The domain name revalu.me was registered in January 2016. The motivation for Revalume is to provide a tool for employee reviews and performance evaluations that looks to rediscover the value of people. Revalume is a system designed to empower users to provide assessment of their own performance and receive constant feedback from their peers and mentors. The system is designed to address the discontent that employees feel when they don't feel adequately valued. In addition, Revalume is designed to encourage dialogue through its quick, easy, and valuable way of conducting evaluations. This section will focus on the various design choices for Revalume and present a scenario for beginning and completing an evaluation.
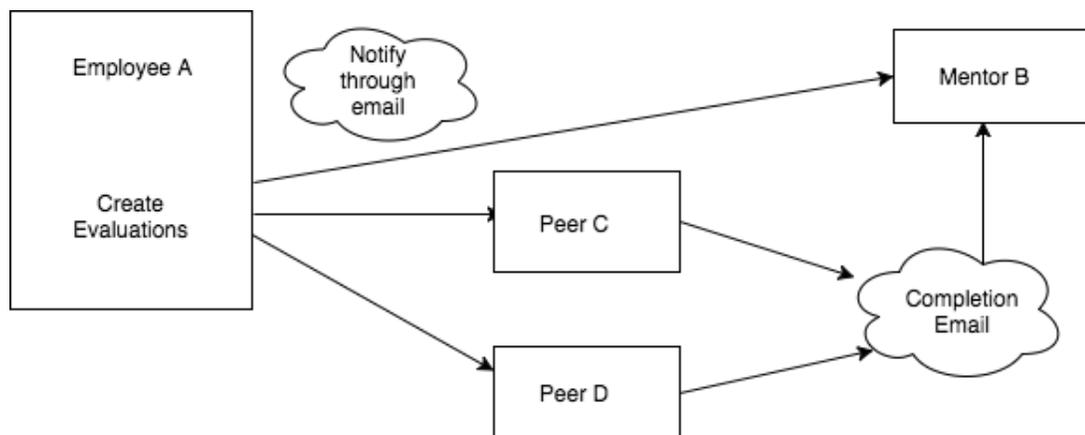
3.1 Employee Evaluation Process

Figure 3.1: Overview of Revalume Evaluation Process

An employee evaluation process follows these steps:

1. Employee A will create evaluation forms for themselves, their peers, and their mentor.

2. Employee A will then send the evaluations to the people in their group by assigning a role to their emails.

3. Mentor B and Peer C and D will receive their respective evaluations to complete through the role assignment.

4. Peer C and D will then complete their evaluation forms.

5. After the peers have completed their forms, the mentor will be notified via email that they need to complete Employee A's evaluation.

6. After Mentor B completes the evaluation, the evaluation for Employee A is now complete and Employee A can view their evaluations.

3.2   Logging into Revalume

When a user first accesses the Revalume web page, the user will have the ability to navigate through the system. However, for the user to enjoy the full features of the evaluation, the user must log in via Google sign-in as shown in Figure 3.2. For Google login to work, users will need to allow Revalume to have permission to user's email address and basic profile. After the user logs in, Firebase will assign a unique ID to the user's email. After logging in, the user can enjoy the full privileges of the system such as saving created forms, filling out assigned evaluations, and reviewing past evaluations.
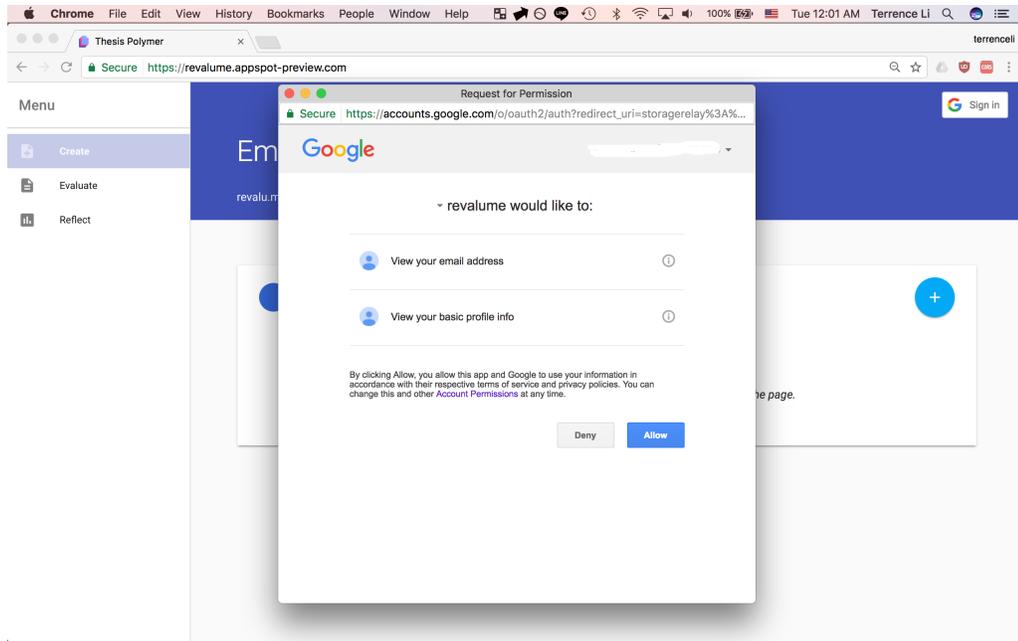
Figure 3.2: Google Sign-In

After the user logs in for the first time, Revalume will prompt a user to join a group. The concept of the group is to represent the collaboration environment in the workplace. A group represents a subset of people within the organization that share a common task or project. A user will then create a group if the group does not exist or join an existing group. Revalume allows for users to join multiple groups. As long as the user is not part of any group, the prompt, shown in Figure 3.3, will continue to appear. The continued persistence of the prompt is to encourage users to join a group for a feature discussed later on.
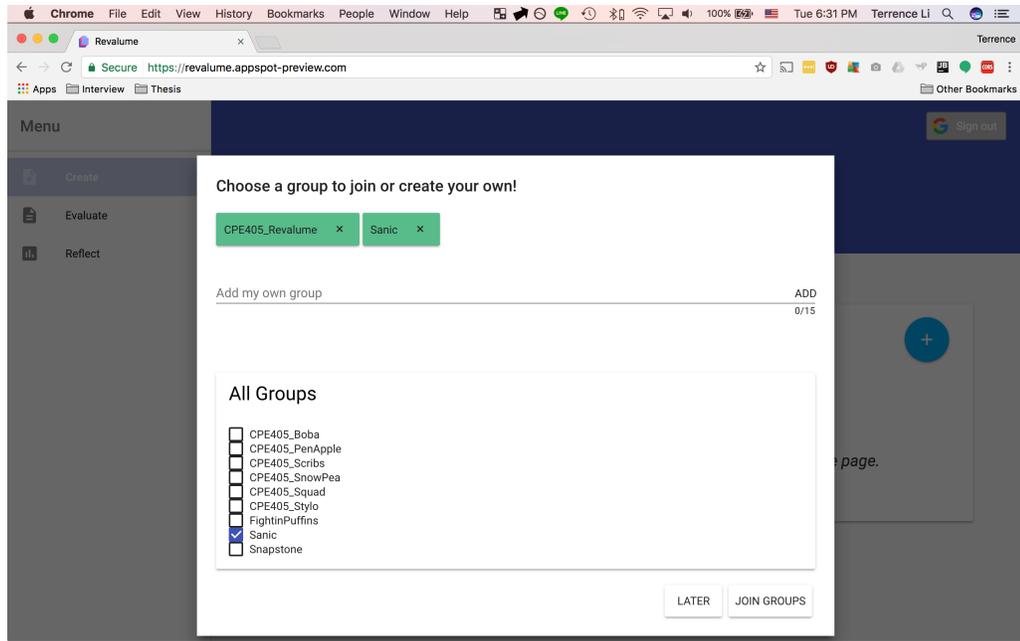
Figure 3.3: Prompt to ask user to join a group

3.3 Creating Evaluations

After the user logs in and joins a group, Figure 3.4 exhibits Revalume's landing page. This landing page is where the creation of the evaluation begins. Initially, the *Create Evaluations About Me* page will be empty and it will prompt the user to create forms to begin the evaluation.
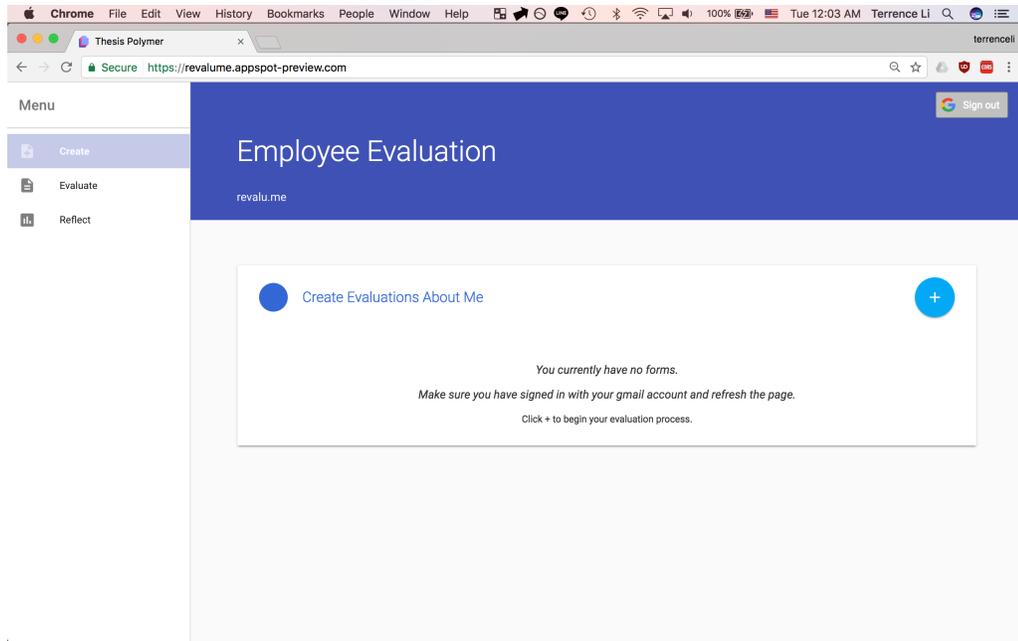
Figure 3.4: Create Evaluations

To encourage frequent communication, we believe that the employees must take ownership of their own evaluations. Employees will have the ability to choose when to conduct the evaluations and the evaluation's content. Therefore, the responsibility of the creation of forms is placed on the user who hopes to receive feedback. The following paragraphs will present a scenario on the evaluation process. As shown in Figure 3.1, a user will create the self, peer, and mentor forms. Figure 3.5 shows the first step in creating a form. Using the add button, the user looks to create a self and peer evaluation using a custom template.
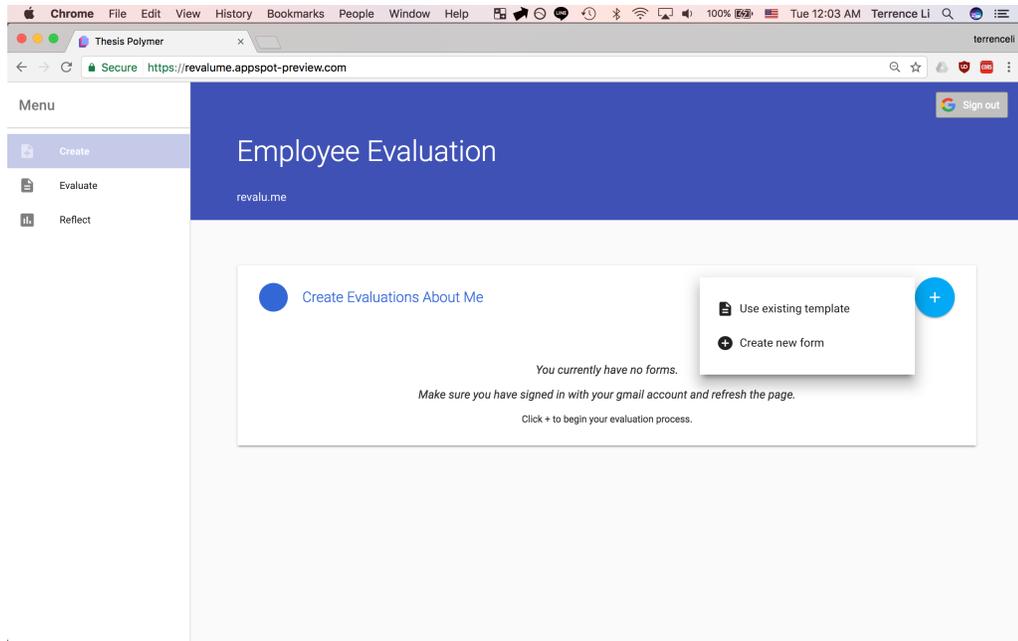
Figure 3.5: Create forms using existing template or new form

Figure 3.6 shows the dialog that will be triggered when the user wishes to choose from existing templates. These templates were created in the system in advance using Dr. Janzen's CSC 405 peer and self evaluation forms to help facilitate the form creation process. After selecting *Capstone Self Evaluation*, the page will be redirected to the form creation stage shown in Figure 3.7.
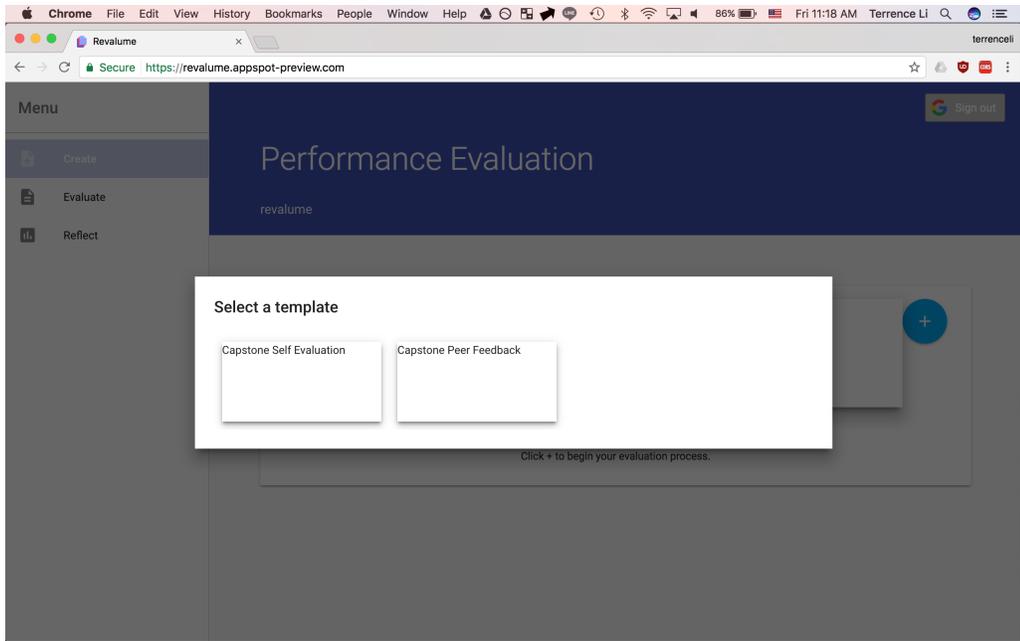
Figure 3.6: Using existing templates
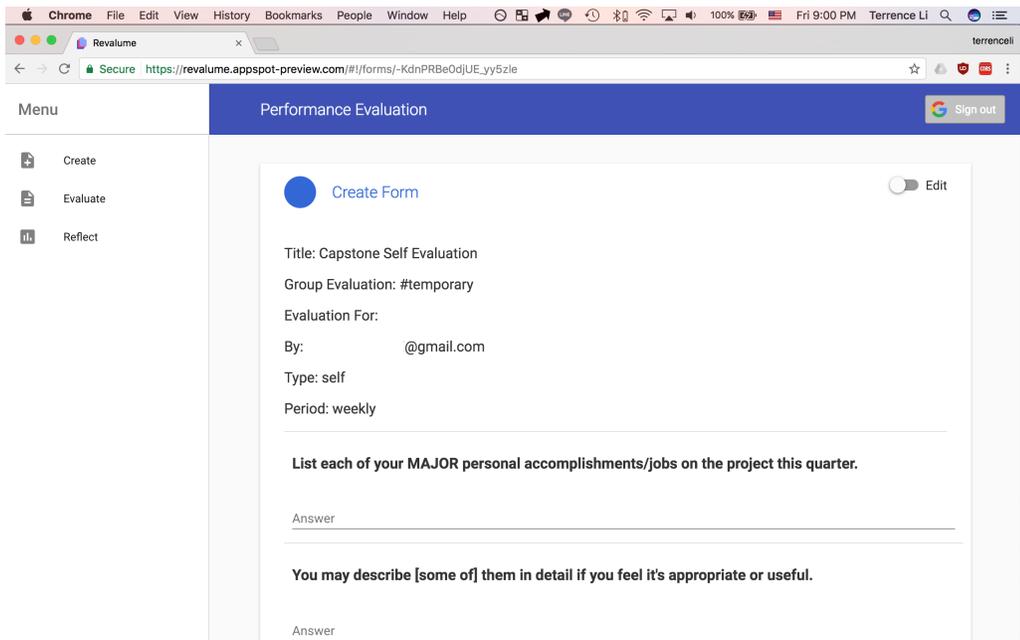
Figure 3.7: Example of an existing self evaluation template

3.4   Revalume Forms

Figure 3.7 shows an example of a typical form that users may create for their evaluations. When landing on this page, an employee is shown a preview of the form. This is the page where the employee can create and edit questions to his or her own liking. By having a custom form within Revalume, the user is empowered to create questions that reflect his or her own contributions. There are a couple of features and design choices embedded into this form creation.

When creating a form, users have the option of toggling between a preview and the editable version of the form through the *Edit* toggle button. This option allows for users to visualize the actual form for when it is to be completed by other users. By allowing users to preview the form, creators of the form will be able to judge the quality and quantity of the evaluation and adjust questions as they see fit.

After previewing the form, the user must change the field labeled *Group Evaluation*. This field is how Revalume associates and organizes the self, peer, and mentor form under one evaluation group. The intricacies will be discussed in Section 4.3 about the database schema. To change the field, the user will click *Edit*. Figure 3.8 shows the form with *Edit* mode turned on. The user must change the *Evaluation Name* to a more meaningful evaluation group name. In this scenario, the user chooses to have the evaluation group name be called "CSC409Q1" after their course title and current quarter.
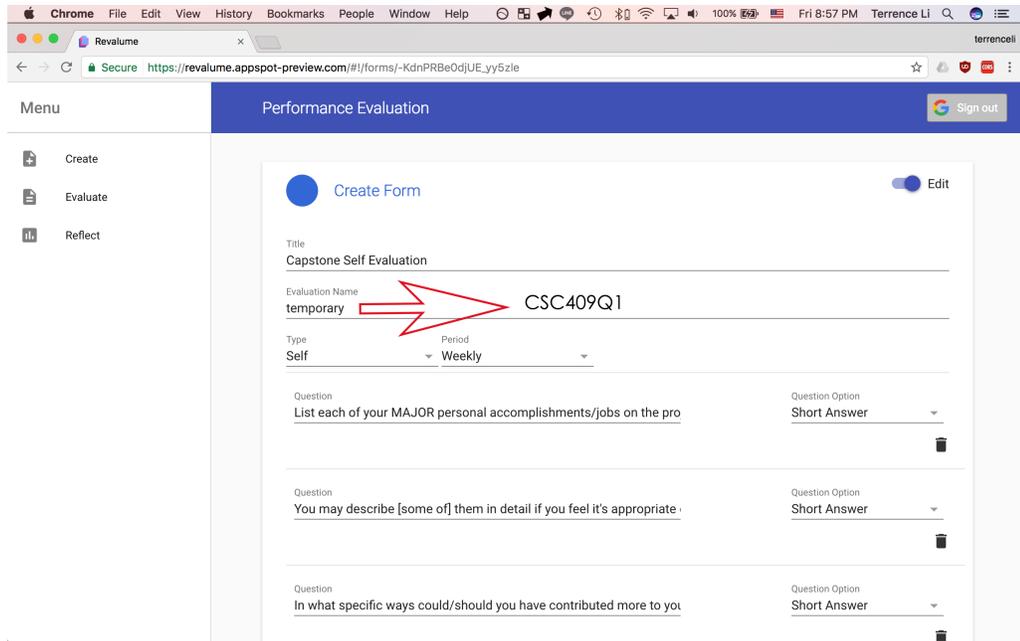
Figure 3.8: Example of an existing self evaluation template in Edit mode

Once in *Edit* mode, the user has the ability to add or edit the question as shown in Figure 3.9 and Figure 3.10. The ability to customize questions allows individuals to gain specific insight from their peer or mentor feedback. During form creation, the user has the option of choosing multiple choice, dropdown, short answer, or rating questions to include in the evaluation. The different options are shown in Figure 3.11
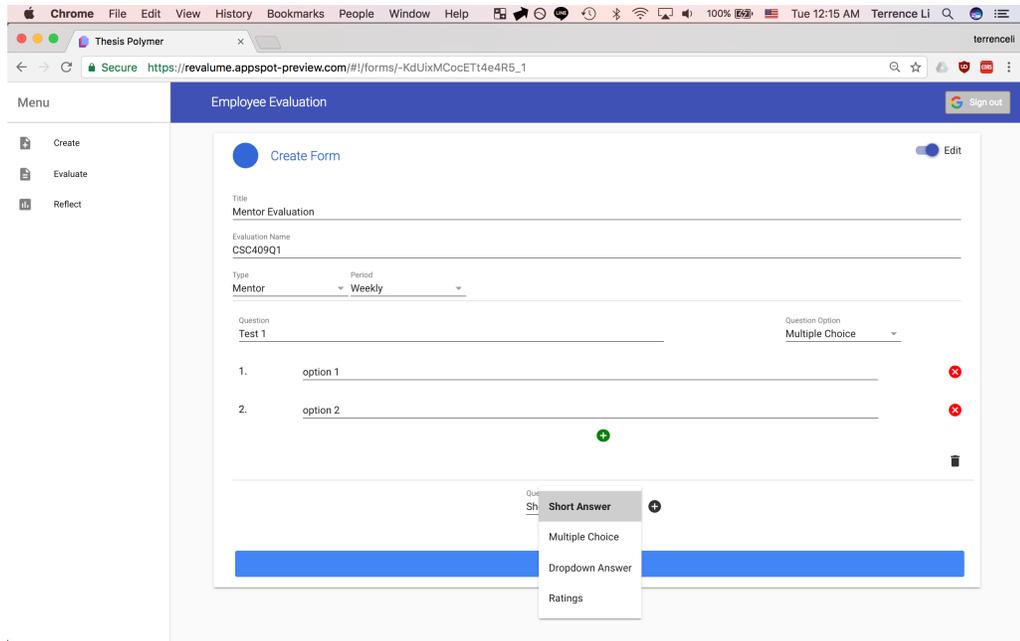
Figure 3.9: Add Question
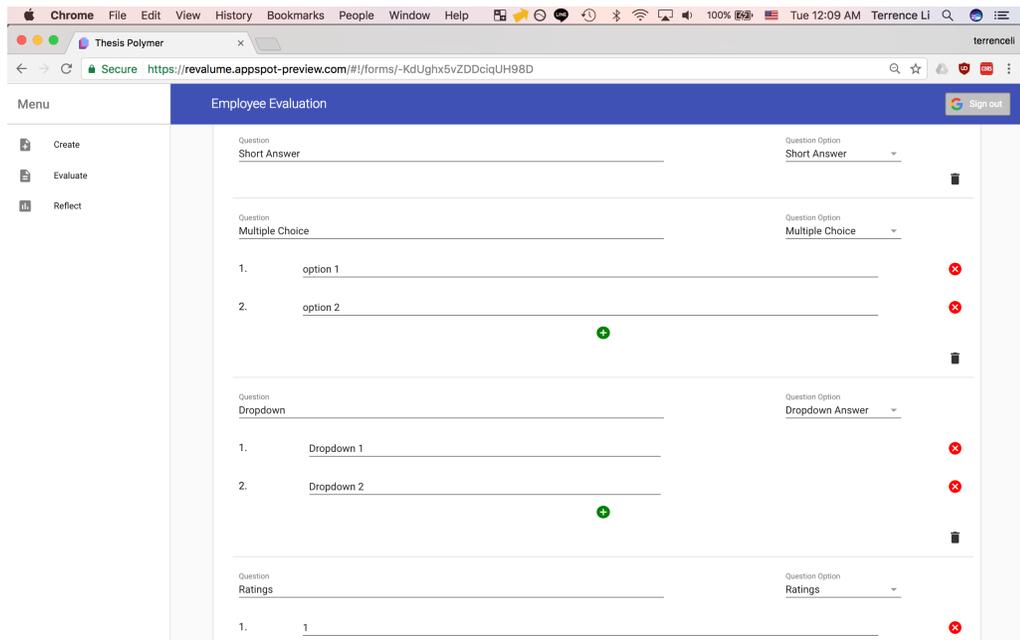
Figure 3.10: Edit Question

After the user is satisfied with the questions and the edits made to the form, they hit *Save Form* shown in Figure 3.11. When the user clicks *Save Form*, the dialog shown in Figure 3.12 will pop up, confirming that the form has been saved.
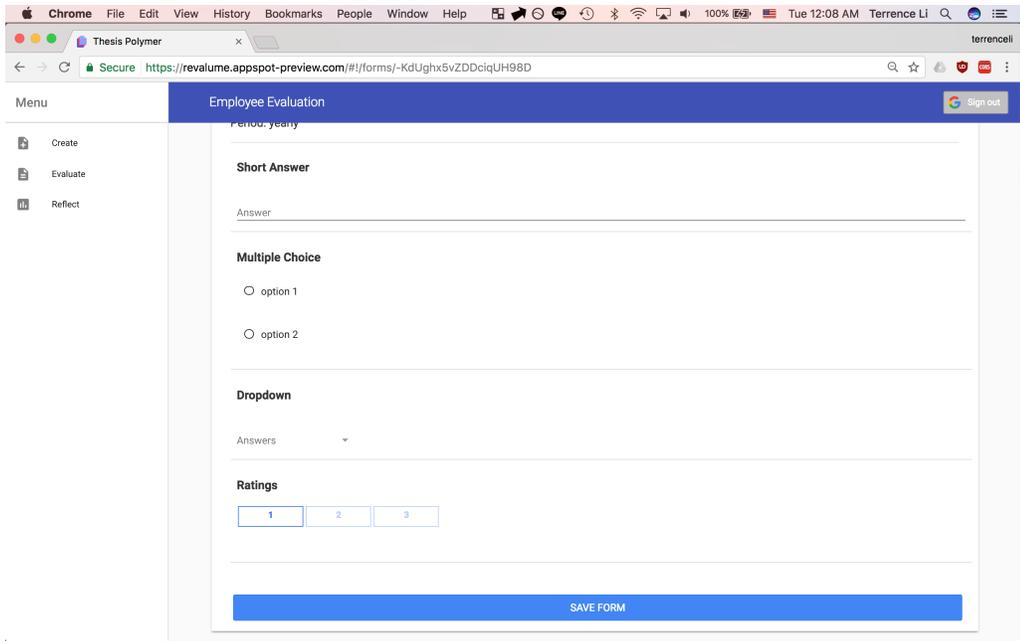
Figure 3.11: 4 Question Types
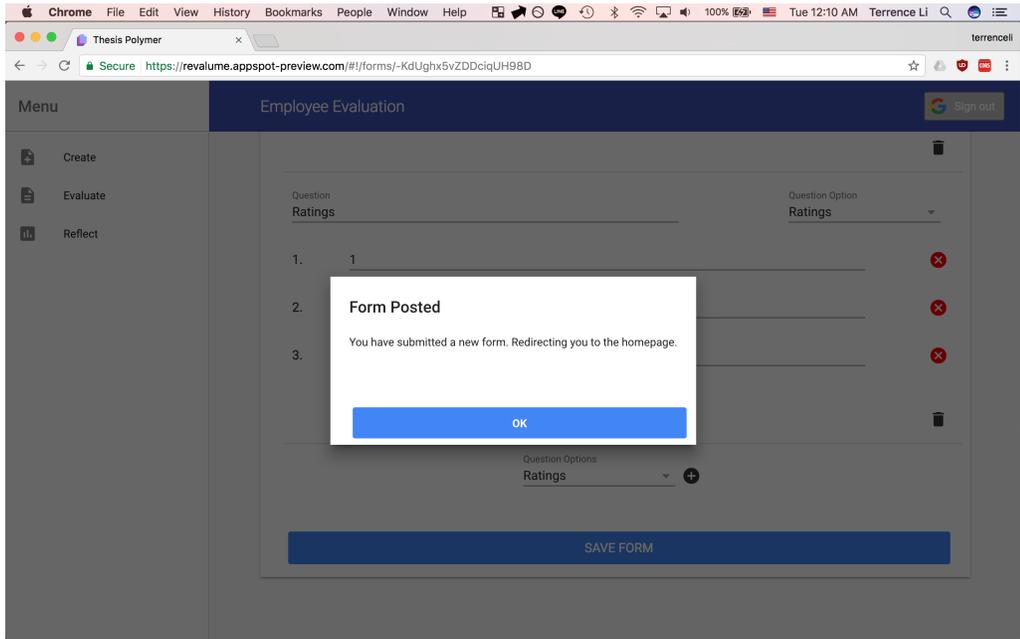
Figure 3.12: Confirming that form is saved

The user would repeat this process for peer and mentor forms. The only difference would be that the user would need to change the form type to the desired type (peer or mentor). Again, the *Group Evaluation* field would need to be the same for all three forms. Once all forms are saved, the evaluation is set to begin.

3.5 Sending Evaluations

Once populated with self, peer, and mentor forms, the user is ready to begin the evaluation progress. Figure 3.13 and 3.14 show the user's dashboard with the three types of forms created. On the top, *#CSC409Q1* represents the group evaluation name that the different forms below belong to. Users have the option of creating multiple self, peer, and mentor evaluations. By creating multiple forms for each role, users who match that role as shown in Figure 3.15 will receive all the forms for that role. Users can also view or edit saved forms, as well as delete them. Each card displays the form name, type of form, and frequency of evaluation (how often the evaluation is conducted).
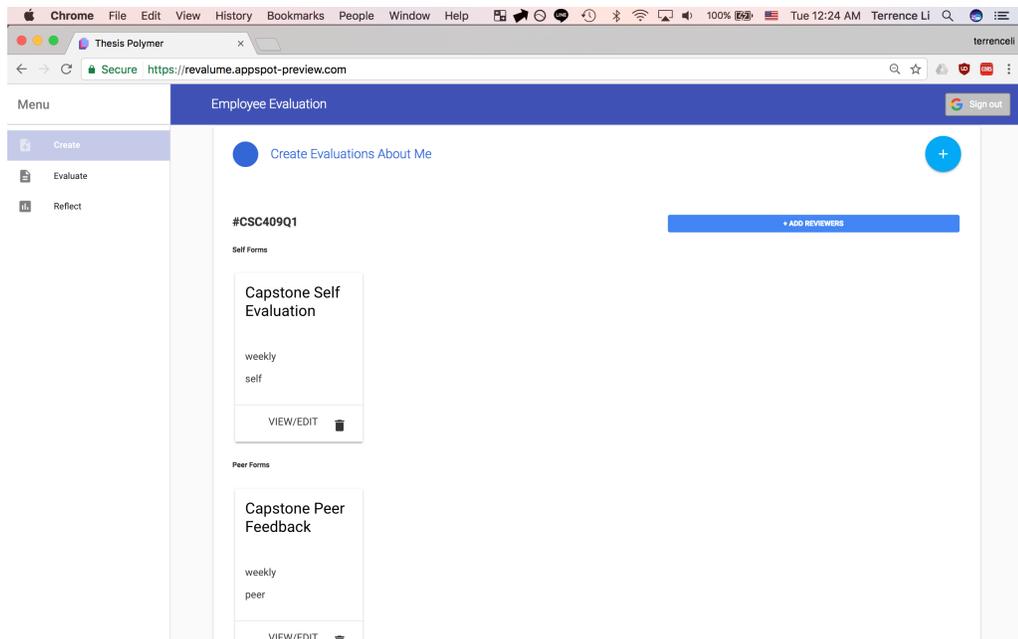
Figure 3.13: Self and peer evaluations ready to be sent
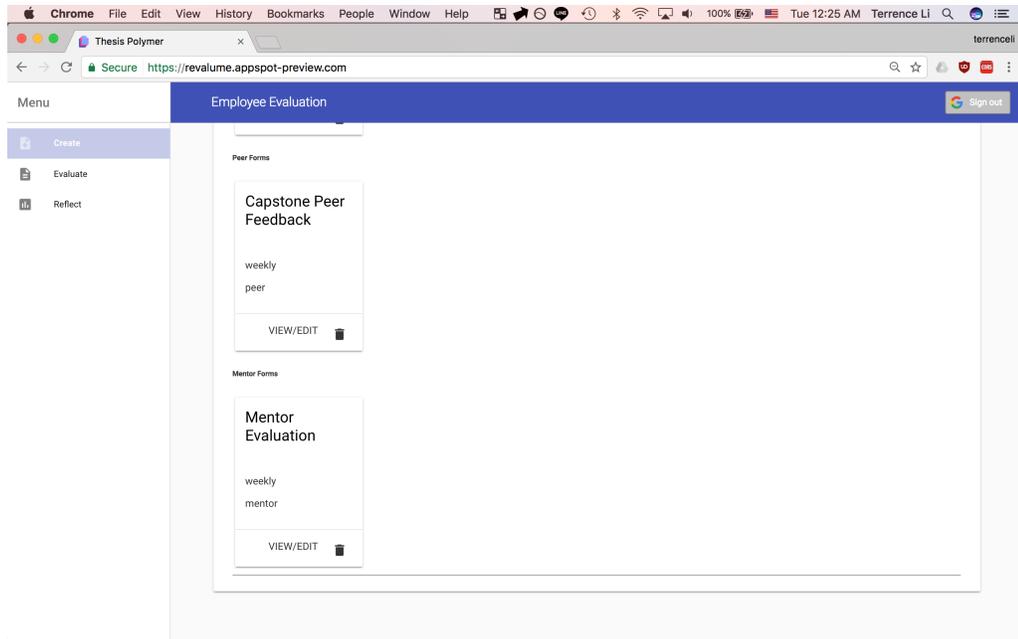
Figure 3.14: Peer and mentor evaluations ready to be sent

After the user is content with their forms, the user will click *Add Reviewers* to choose to whom they will send the evaluation forms. A pop-up dialog will be shown as in Figure 3.15 allowing the user to create a mailing list of users that to whom evaluations will be sent.

As stated previously, when the user first logs in, Revalume will ask for the user to join or create a group. Users who are part of the same team will be in the same group, so when the user selects users for evaluation, selecting the group (e.g., *Admin*) will pre-populate the mailing list with the users who have joined the group. This will ease the burden off of the user to find the emails of the team members in their team and speed up the evaluation process. Note, users could be part of multiple teams or groups. Therefore, the steps to send evaluations are as follows:
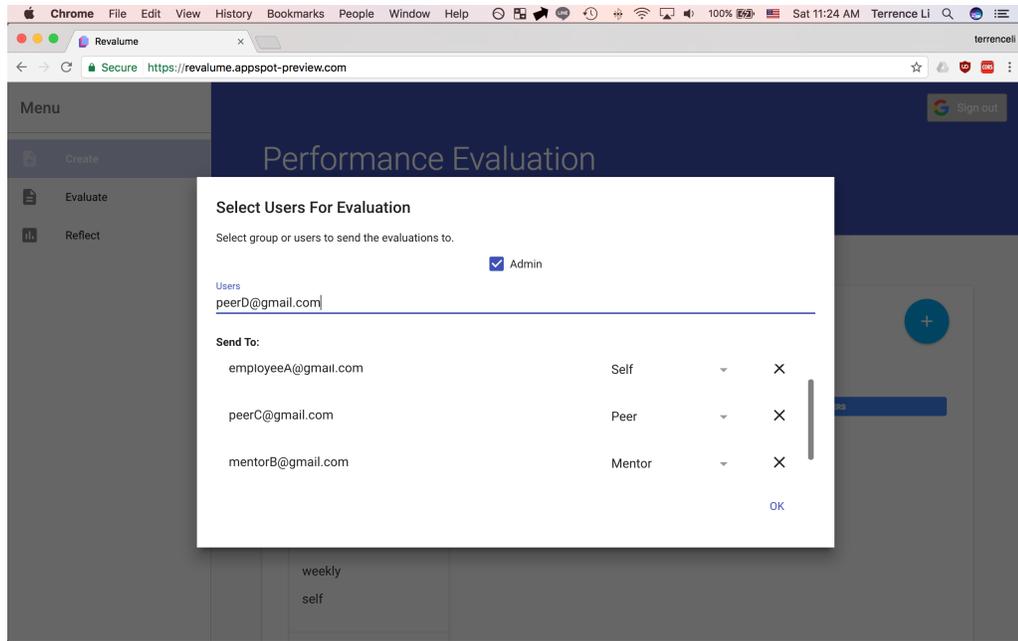
Figure 3.15: Creating a mailing list for evaluations to be sent

1. Select the groups or enter the users for which the evaluations will be sent to.

2. Assign the proper roles for each of the users in the email list.

3. Once all the appropriate users have been included in the mailing list, click *OK* to send the evaluations

4. If a user does not exist in the Revalume system, the error message shown in Figure 3.16

5. Otherwise, the valid users in the mailing list will be notified that they need to complete the evaluations for the user via email. The email that Peer C, Peer D, and Mentor B will receive is shown in Figure 3.17.

Figure 3.16 presents a limitation of Revalume where users must have logged into Revalume before and have an ID stored in the database before they can receive email notifications or begin the evaluation process. Revalume system must be able to identify the user by their email and match it to an ID before storing it into the database.
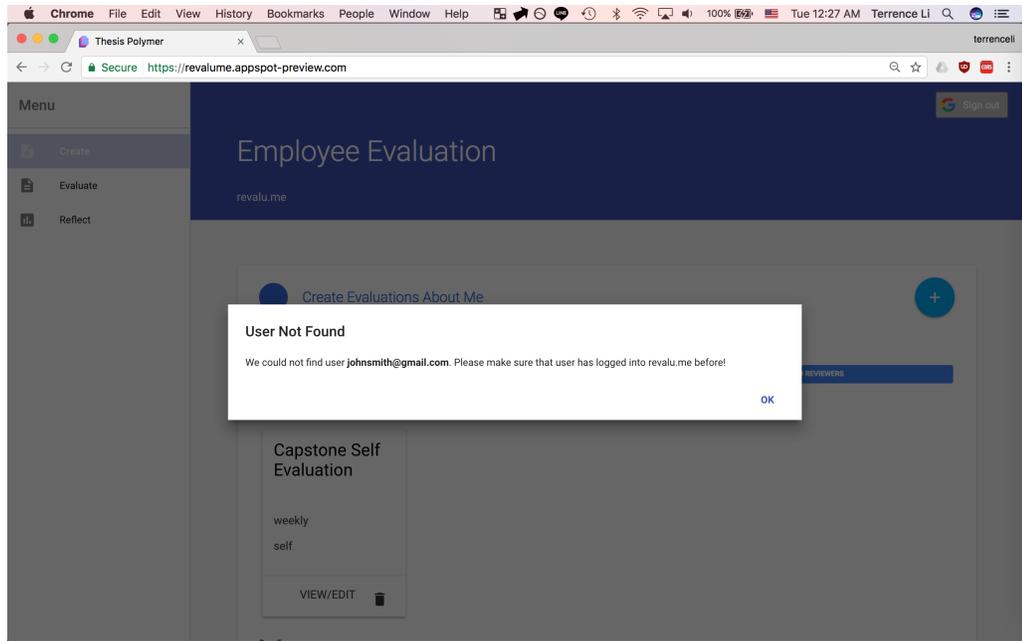
Figure 3.16: User does not exist in the Revalume system

Figure 3.17: Email notification

3.6   Completing Evaluations

After evaluations are sent, the evaluations in progress will show up on the *Evaluate* tab shown in Figure 3.18. Each separate card represents a separate evaluation. The title of the card displays the group evaluation name and the user the evaluations are for. Listed under the title, the evaluations are separated into the different roles. Under each role are the users who fit the role, who are also responsible for completing an evaluation. Figure 3.18 presents the view that the user would see as the creator of the evaluation. The peers would see the *To Do* button assigned to them for their roles as peers. The mentor would see the *To Do* under the mentor group for their role as the mentor.
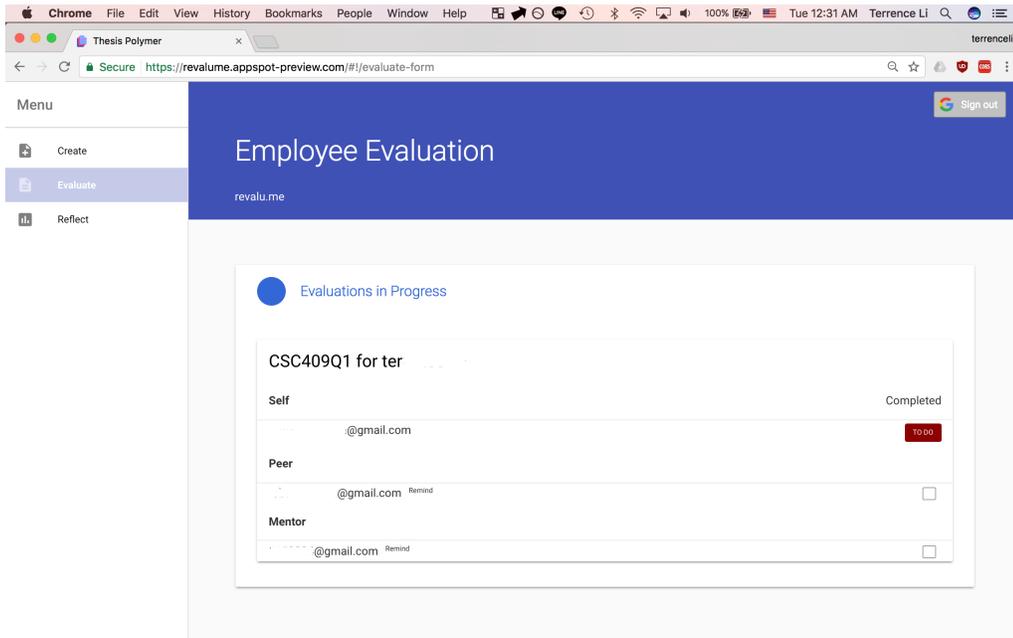
Figure 3.18: Evaluations in progress

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By clicking the *To Do* button, the page will redirect the user to the evaluation form. Figure 3.19 presents an example of an evaluation. As the user fills out the evaluation, they are given the ability to provide a more accurate assessment of their own performance.

Figure 3.19: Evaluation to be completed

Listed on the top right are two features included in Revalume. Revalume has integrated with third-party applications to ease the burden off users when completing their evaluations. By using Google Calendar and Jira, the user can now present a more holistic and accurate assessment of their personal achievements. When the user uses Google Calendar or Jira for the first time, Revalume will ask the user for their permission as shown in Figure 3.20 and 3.21. This implementation choice was to protect user's privacy by requiring them to opt in to using these third-party applications.
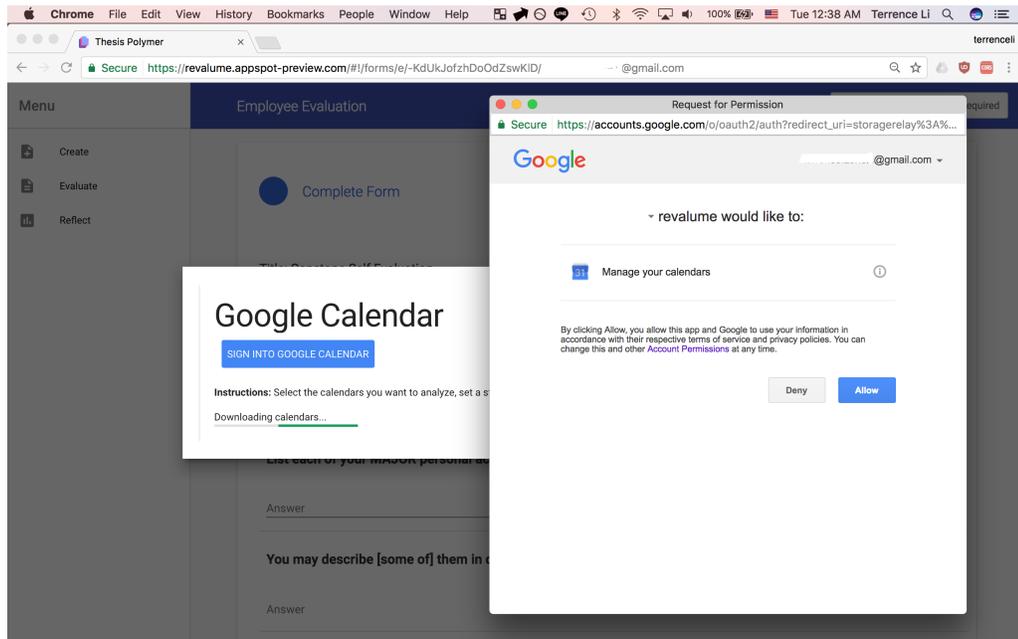
Figure 3.20: Google Calendar permissions
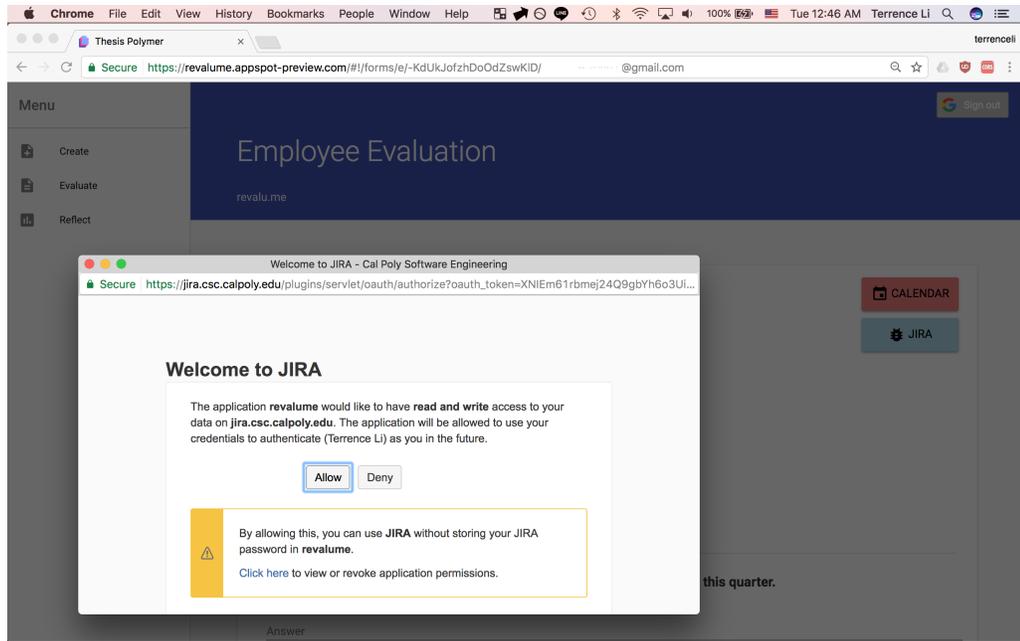
Figure 3.21: Jira permissions

After allowing Revalume to gain permission to make API calls on behalf of the user, the user can now view past events, issues, and time spent on those issues as shown in Figure 3.22, 3.23, 3.24, and 3.25. The data that is retrieved from Jira and Google Calendar is parsed using UNBIASED. UNBIASED parses the content by filtering the raw data using natural language processing. This allows for data relevant to their user's work to be retrieved in an easy to read format.
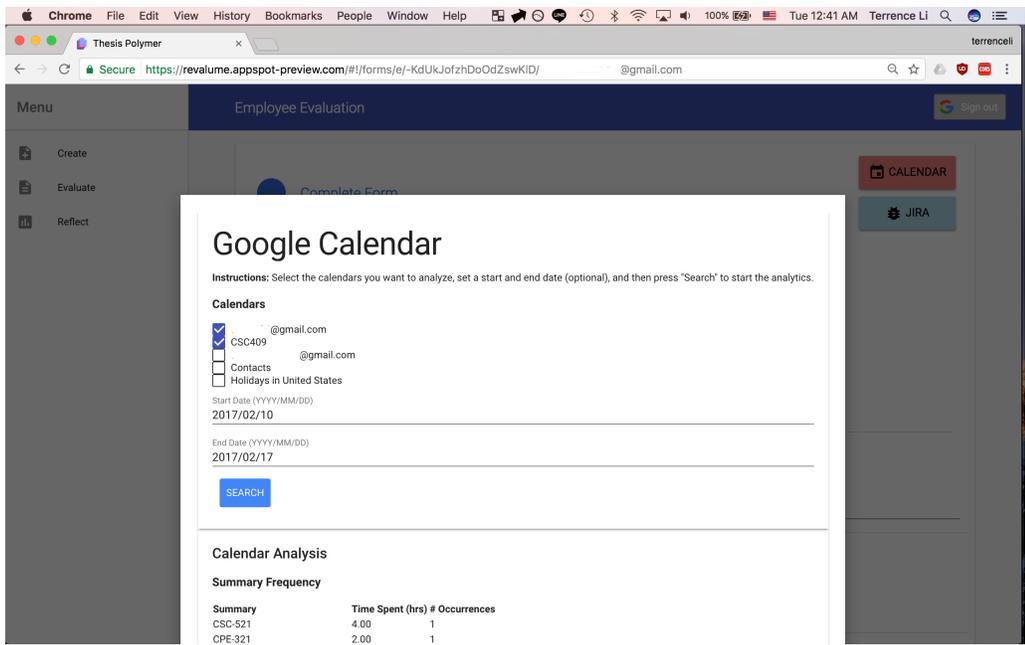
Figure 3.22: Google Calendar Results Part 1
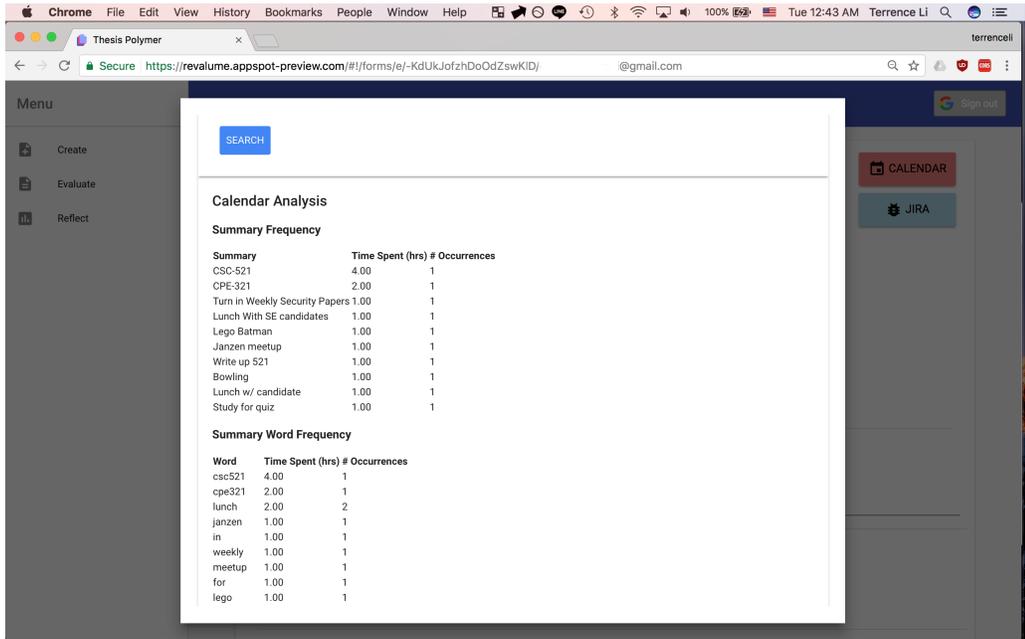
Figure 3.23: Google Calendar Results Part 2
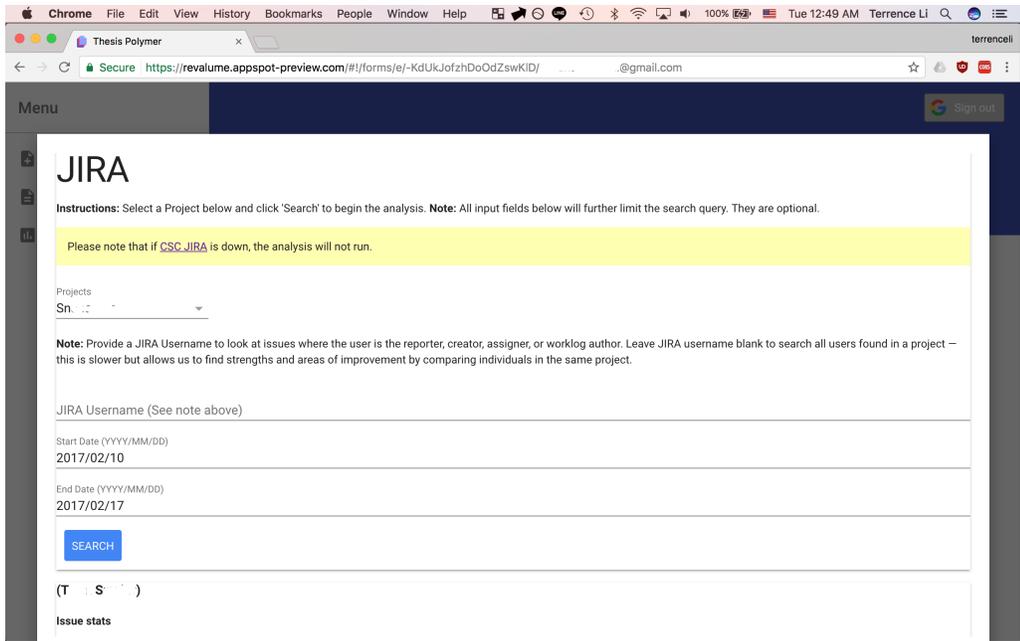
Figure 3.24: Jira Results Part 1
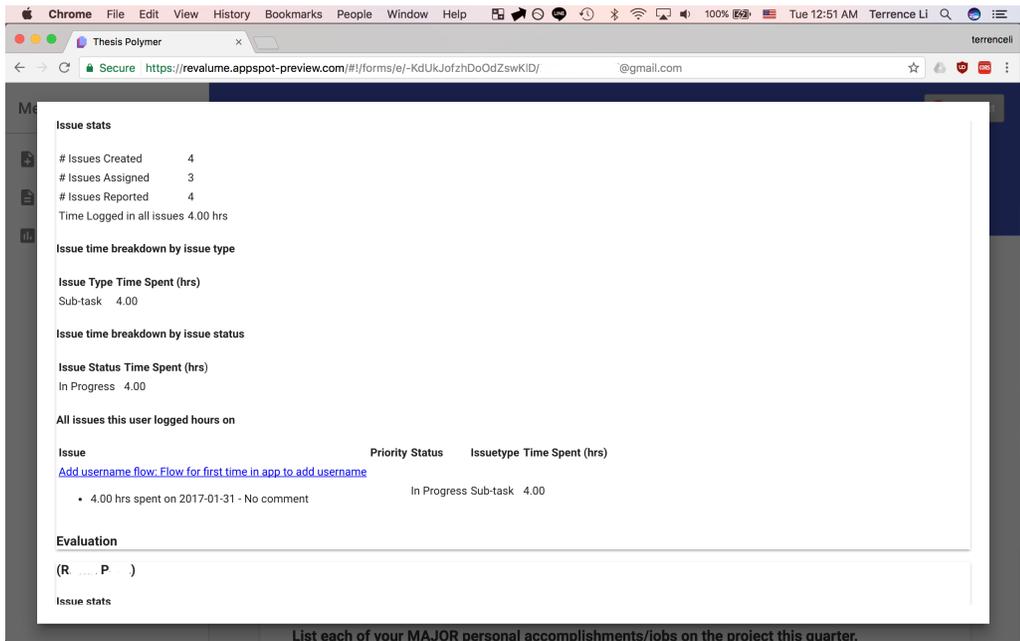
Figure 3.25: Jira Results Part 2

Users will be able to copy and paste the data retrieved from UNBIASED into their evaluations. After using Google Calendar and Jira to assist with the form completion, the user will submit the form. This will trigger a confirmation message stating that the form has been submitted as shown in Figure 3.26.
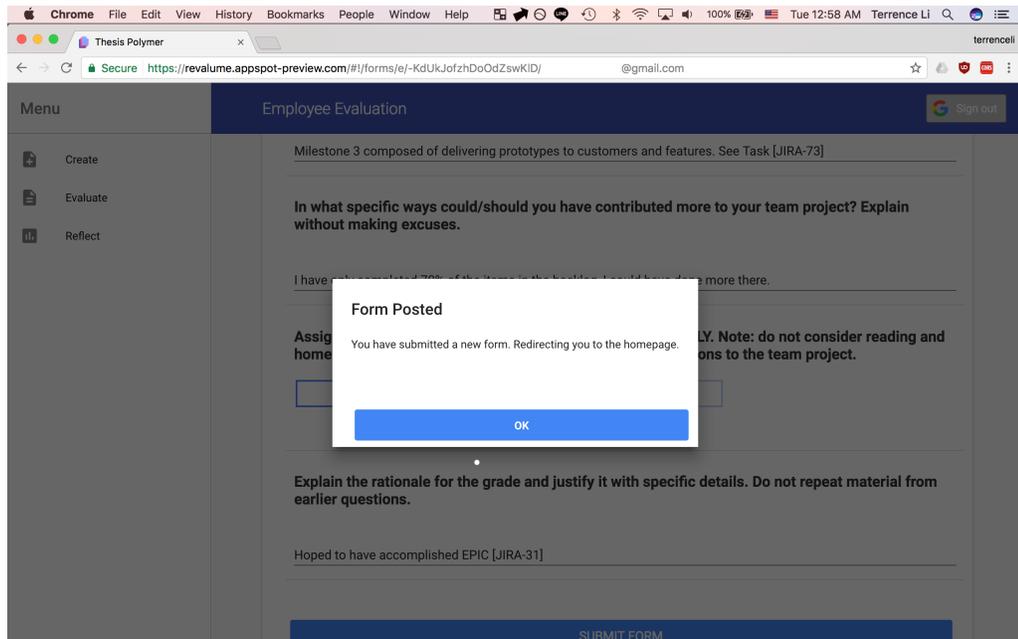
Figure 3.26: Completed evaluation confirmation

Once completing the self evaluation form, the user can continue to view the status of the evaluation as shown in Figure 3.27 or view their own completed evaluation as shown Figure 3.28. The evaluation process will be incomplete as long as there exists at least one member of the team who hasn't completed their evaluation. Therefore, Revalume allows for users to remind their team members who haven't completed their evaluation by clicking *Remind*. Figure 3.29 demonstrates how the user can send emails to a specific user with a custom subject and body.
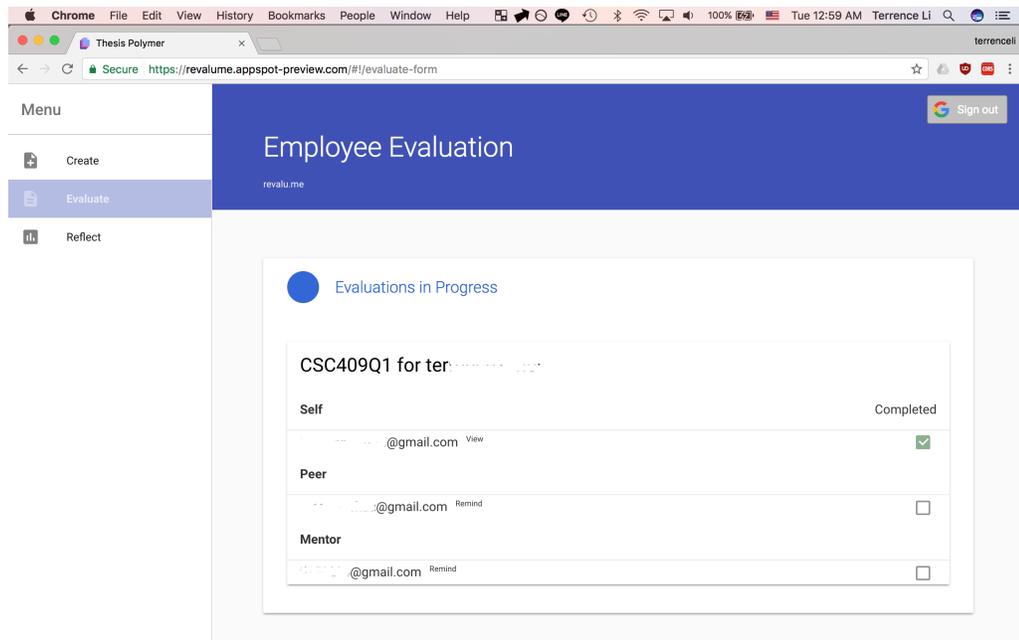
Figure 3.27: Evaluation partially complete
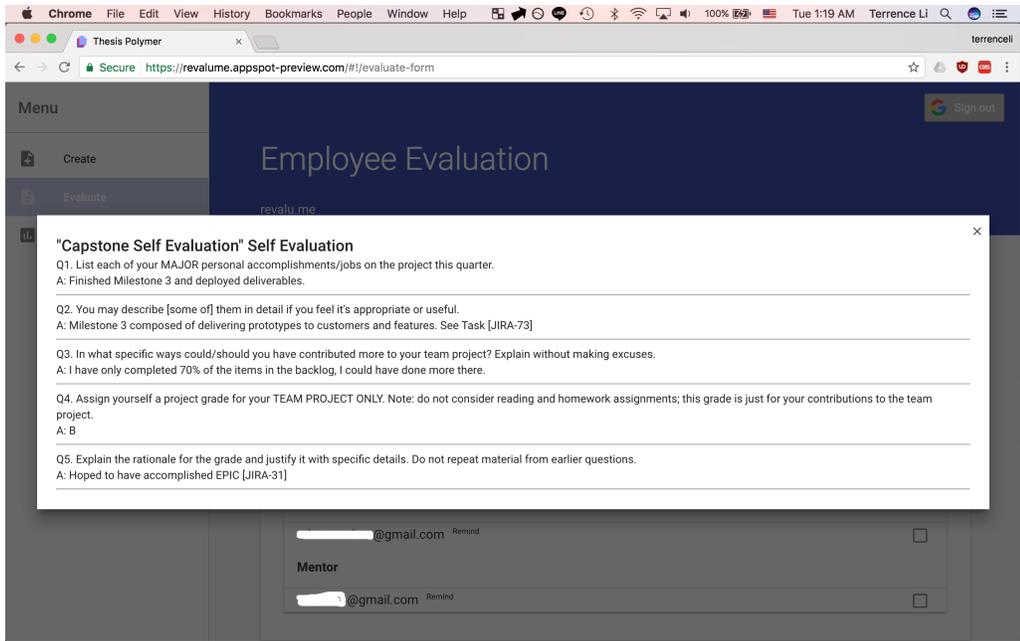
Figure 3.28: View completed self evaluation
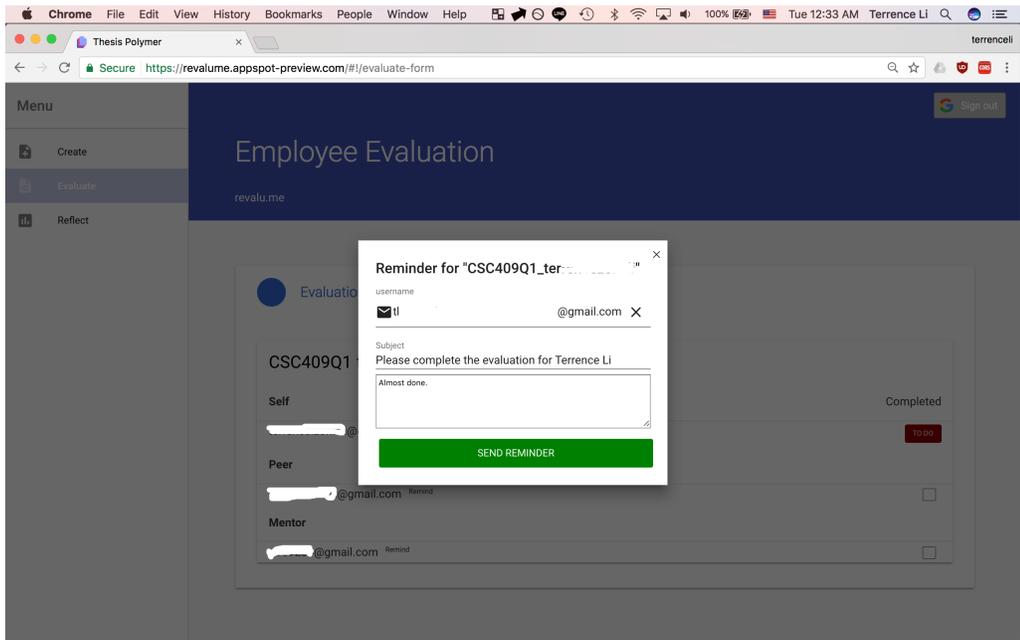
Figure 3.29: Remind users via email

Once the self and peer evaluations are completed, an additional email will be sent to the mentors to notify them of the completion of the evaluations. Mentors can then view the completed peer and self forms. After the mentor completes their evaluation, the evaluation is now complete. Figure 3.30 shows how a completed evaluation will look under the *Evaluation* tab.
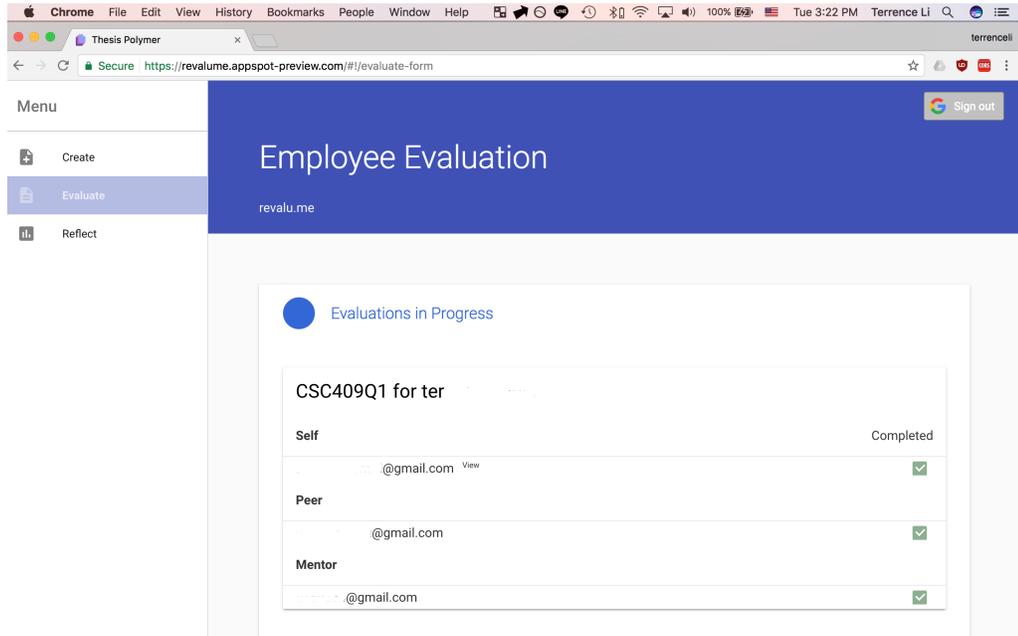
Figure 3.30: Completed evaluation

Once completed, the evaluation is recorded and stored in the *Reflect* tab. The history of a user's evaluations, and evaluations filled out about other users can be viewed under the *Reflect* tab as shown in Figure 3.31. Here, a user can view the feedback if the evaluations are about them. Otherwise, for evaluations about other people, a user can only view the form he or she submitted. The feedback is valuable for users to review past feedback and understand their assessment.
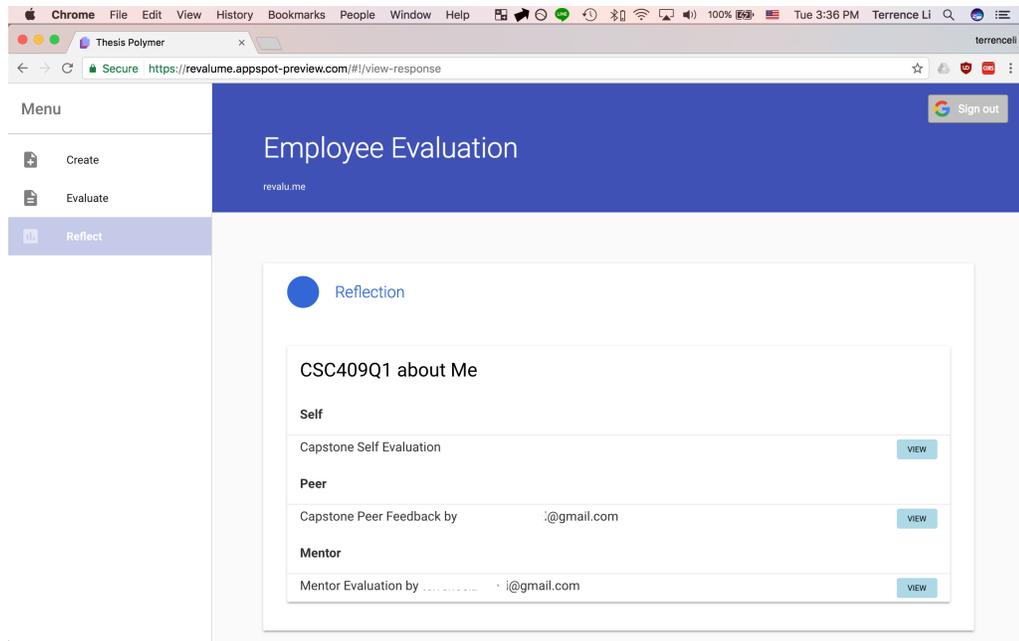
Figure 3.31: History of completed evaluations

Chapter 4

IMPLEMENTATION

Revalume is a cloud-based solution that tackles the challenges of time-consuming
and inaccurate reviews. This section describes the software architecture and techni-
cal implementation of Revalume. This complete web solution is built using Google
Polymer [1], Node.js [2], Firebase [3], Google App Engine [4], and various third-party li-
braries. Revalume looks to present an innovative approach of handling modern-day
evaluations by streamlining evaluations more smoothly with the help of third-party
applications and an intuitive user interface.

4.1   Revalume Architecture

Hosted in Google App Engine, this cloud-based solution's high-level architecture is
shown in Figure 4.1. The application follows the standard client-server architecture,
where the user interface component is the Polymer application page that the users
land on. Once the user lands on the page, the user logs in using Google OAuth
2.0 login and Firebase login. This will store the user's ID and email information
into Firebase and authenticate their credentials using Google login. After logging
in, Polymer will trigger a series of API calls and route the API endpoints using
Express, a popular Javascript middleware, to the backend. The backend, written in
Node.js, contains REST APIs that process the incoming API request. The backend
communicates with Firebase by reading and writing data. The backend aggregates
data from third-party applications such as UNBIASED [5]. After the REST API is
called, the backend handles the request and returns a response to the user.

---

[1]https://www.polymer-project.org
[2]https://nodejs.org/en/
[3]https://firebase.google.com/
[4]https://console.cloud.google.com/
[5]http://digitalcommons.calpoly.edu/theses/1614/
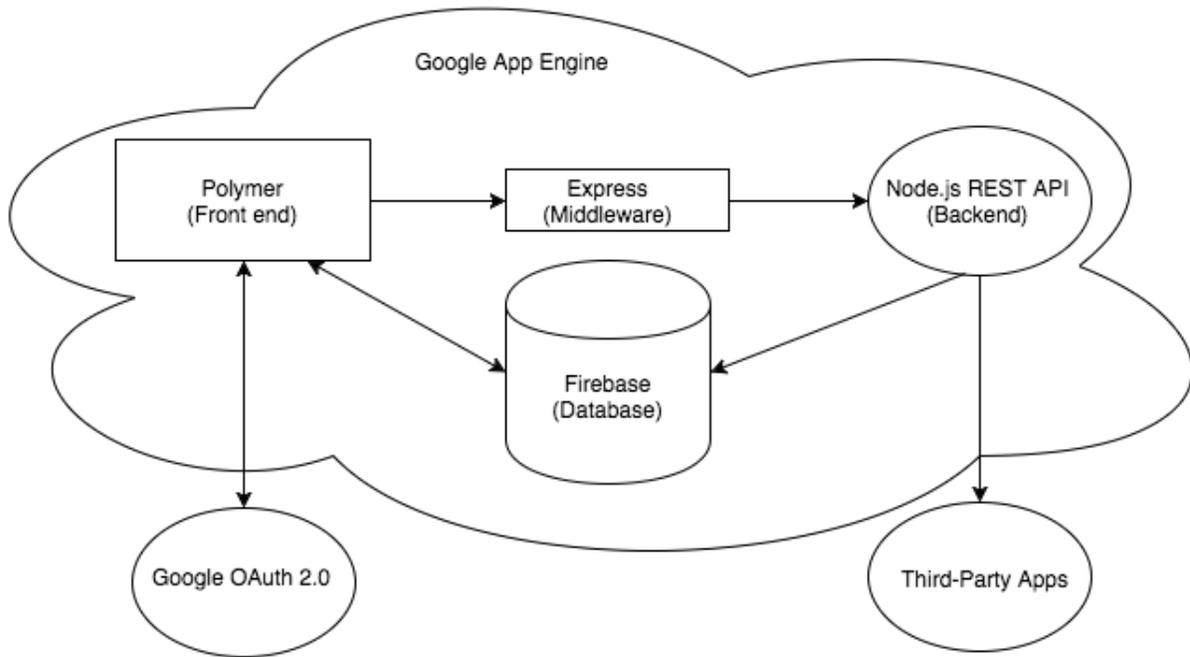
Figure 4.1: Overview of Revalume

4.2 Technologies Used

This section discusses the technologies used to build Revalume.

4.2.1 Google App Engine

Google App Engine is Google Cloud Platform's platform as a service (PaaS) [5]. With Google App Engine, web applications are built to be scalable. Additional features for Google App Engine include built-in services and APIs such as NoSQL databases, memcache, and user authentication [4]. The benefits of using a scalable service are that Google manages the resources and availability by scaling the application automatically. The cloud console, shown in Figure 4.2, for Google allows for load balancing, health checks, and application logging to assist with the application management. For our use case, Revalume uses both App Engine's standard environment and flexible environment. Google App Engine's standard environment supports the language Python which is used to host the UNBIASED application, created by

Jon Miranda. We have hosted Revalume and UNBIASED on separate Google App Engine servers. Revalume serves as the web server that presents users with content and APIs. UNBIASED serves strictly as web API.
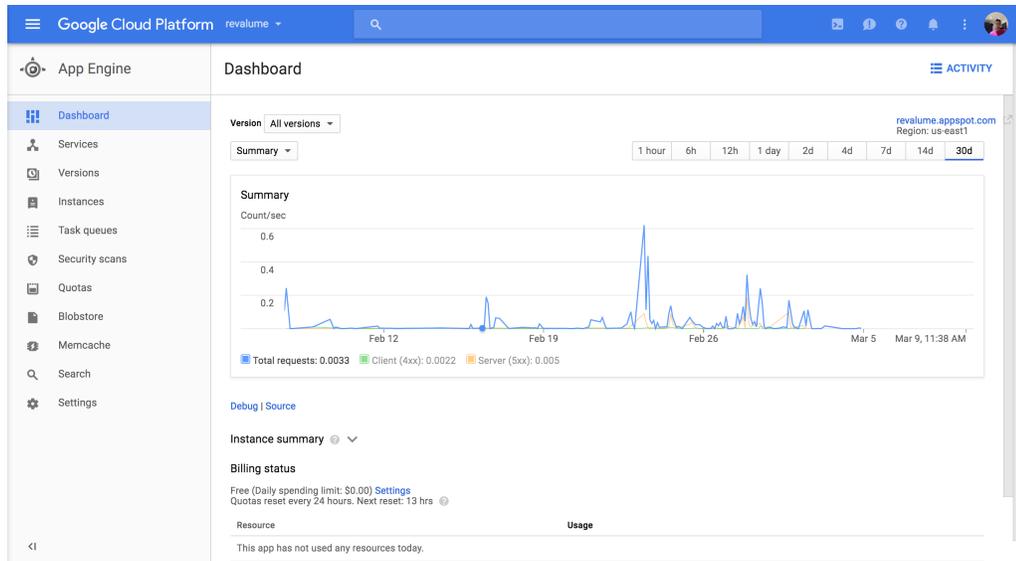
Figure 4.2: Google App Engine Console

We did a cost analysis on hosting our server on Google App Engine. Since Revalume runs on Node.js as opposed to Python, we must utilize Google App Engine's Flexible Environment. Using the Flexible environment, the runtime can be customized and the App Engine handles balancing the load and scaling the application. The cost of running Google App Engine in the Flexible Environment is shown on Figure 4.3. For our system, we were using the free trial version that eventually expired. After the expiration, we were charged around $10 per day. This was factored into our analysis of the system.

Flexible environment instances

Applications running in the App Engine flexible environment are deployed to virtual machine types that you specify. This table summarizes the hourly billing rates of the various computing resources:

US

Resource	Unit	Unit cost
vCPU	per core hour	$0.0526
Memory	per GB hour	$0.0071
Persistent disk	per GB per month	$0.0400

Figure 4.3: Google App Engine Flexible Environment

4.2.2 Polymer

Polymer is an open-source project led by the Chrome organization in Google [10]. Google Polymer provides a library containing custom elements, called Web Components, designed to make creating custom pages easier and faster while keeping the standard DOM. By using Polymer's custom elements, projects can reduce boilerplate code and still maintain the beautiful elements. Polymer allows for building and reusing Custom Elements, which are encapsulated Javascript, CSS, and HTML. In addition, these elements provide templating and bi-directional data binding [10].

This was an ideal choice for this project as it provided the necessary tools to create and deploy servers quickly and easily. In addition to the usability of the web components, Polymer also brings Material design to the web. "Material design is a unified system of visual, motion, and interaction design that adapts across different devices. Material design is inspired by tactile materials, such as paper and ink. Material surfaces interact in a shared space. Surfaces can have elevation (z-height) and cast shadows on other surfaces to convey relationships" [10].

4.2.3 OAuth 2.0

Google Sign-In is a method of authentication that allows users with Google accounts to authenticate themselves without creating a separate account on Revalume. This creates a seamless experience for users by requiring only permissions for the application to view their basic profile and email address. Firebase, Google APIs, and Google Authentication utilize an industry-standard protocol called OAuth 2.0. This method of authorization allows for specific permission access to specific APIs, such as Google Calendar and Jira accounts.

4.2.4 Firebase

Firebase is a mobile platform that provides a realtime database, authentication, cloud messaging, storage, hosting, and other features [1]. Firebase Realtime Database is a cloud-hosted NoSQL database that stores data in JSON format. This database is an expression-based rules language that allows users to define how data should be

structured and the security of read/writes [1]. Firebase is a popular DBaaS (Database as a Service) platform for Android, iOS, and Web developers with rich APIs that make it easy to integrate and use.

4.2.5   Express

Express is a Node.js web application framework that acts as a middleware and is responsible for routing and templating. It is mainly responsible for creating an MVC architecture by routing requests using the requesting handler to the appropriate API and then writing the results back in a response [2].

4.2.6   Jira

Jira is a popular development tool used by agile software teams [15]. Using Jira, users have the ability to plan, track, release, and report within software teams. Software development teams can create stories, issues, and distribute tasks. These tasks and stories can then be tracked along the pipeline up until the release. After the release, issues can be tracked and reported analytics can be visualized and analyzed for improved performance.

4.2.7   UNBIASED

UNBIASED is an application created by Jon Miranda. This system provided API templates for Google Calendar and Jira by gathering data, performing analysis on the data, and returning the data in a meaningful way for users to use in their evaluations. UNBIASED was designed to provide users assistance in the evaluation process with meaningful and accurate recorded data.

Using Miranda's codebase, we had to alter some of the original code to communicate to our backend. One of the main challenges was creating a secure communication channel between our backend, written in Node.js and UNBIASED, written in Python.

After making the necessary changes to the UNBIASED codebase to act purely as a Natural Language Processing API, we hosted our modified UNBIASED on another Google App Engine server in the Standard Environment. By hosting our own modified UNBIASED APIs, we can monitor the logs of the interactions between UNBIASED and Revalume.

4.2.8 Mailgun

Mailgun is an email automation service API by Rackspace. This cloud-based service is responsible for sending, receiving, and tracking emails, while providing analytics on your email traffic. Mailgun allows for emails sent through SMTP or with existing cloud applications. The Mailgun website provides a dashboard for managing your email automation and displaying analytics [8].

4.3 Database Schema

One of the challenges of the Revalume system is creating a schema that accurately portrays the relationship between the users. We present the database schema and reasons for the various design choices. Firebase is a NoSQL database where the database is represented as a JSON object.

4.3.1 Contacts

During login, Firebase will generate a unique id for that user. The API for creating contacts will be called automatically and bidirectionally map a user's ID to a user's email. The need to map a user's ID to an email and vice versa is for security purposes and for usability. When users make a request to POST forms or GET forms, the API call made will contain a user's ID as a parameter. This ID will be validated along with other meta-data to authenticate an API call in Firebase. In addition, this data schema is necessary for users to send forms to other users using only their email. On the server-side, the evaluation forms will be sent to specific user accounts by mapping their emails to their IDs.

4.3.2 Groups

During login, a user will be prompted to join a group, if they haven't. The *groups* data schema handles a list of all the groups. Inside each group is a list of user emails for that group. When a user has joined at least one group, during the adding reviewer process, the groups that the user is a part of will be displayed. The users can choose the groups they wish to send the evaluations to. Users will only be able to obtain information about other user emails if they all share the same group.

4.3.3 Progress

This attribute of the JSON keeps track of the different evaluation progresses currently happening. As users send out evaluations, a progress object is created. This progress object will contain:

- User IDs that are a part of the evaluation

- User roles in that evaluation

- Forms associated with the evaluation

This database schema maps the relationship between those three elements and also tracks the progress of the evaluation. Once the evaluation is complete, a flag inside the progress JSON object will inform the system that the evaluation is now complete.

4.3.4 Templates

This attribute of the database records the template forms that users use to help create their forms. This attribute stores the JSON of the different template forms and is public for all users to use.

4.3.5   Users

The bulk of the database stores user's information. In this part of the database schema, each attribute of the *users* JSON object represents the user's unique ID. Each unique ID key contained information about user's saved forms, incomplete forms, submitted evaluations, and groups. As mentioned previously, the group attribute in the user's JSON object was created once users joined a group.

When users create a form, the saved form will be saved as a JSON object under the *saved-forms* attribute. Each newly created form will have a uniquely generated Firebase key. A saved form will be stored under **<database-name>/users/<unique-id>/saved-forms/**. A form saved under the *saved-forms* attribute contains:

- **author**: The author of the saved form

- **elements**: The questions, question types, and question options of the form

- **evaluated person**: The person the evaluation is for

- **evaluation id**: This is the group evaluation ID that users set for forms with related groups

- **timestamp**: This is the timestamp when the forms are saved

- **period**: This is how often often the forms are conducted (weekly, quarterly, yearly)

- **title**: The title of the form

- **type**: The type of form (self, peer, mentor)

Once the user sends the forms, a JSON object will be stored under the *incomplete-evaluations* attribute. The key of the JSON object will be the same key as the forms that are sent out. Each incomplete evaluation object contains meta-data about the forms in progress. An incomplete evaluation will be saved under **<database-name>/users/<unique-id>/incomplete-evaluations/** object and contain the attributes:

- **author**: The author of the created form

- **completed**: Whether the form has been completed

- **evaluation id**: This is the group evaluation ID that users set for related forms appended with whom the evaluation is for

- **role**: The type of form (self, peer, mentor)

- **timestamp**: This is the timestamp for when the evaluation progress has been began

Note that the incomplete evaluation object is not the same as the saved forms object. This is to reduce redundancy in the database as the only data that incomplete evaluation objects need to include are who is responsible for the form, whether the form has been completed, who the form is for, and when the form has been sent out. This object will constantly interact with the progress objects as there are many checks throughout the system that verify the current status of an evaluation.

After users complete their forms, the attribute in the incomplete evaluation object labeled *completed* will be set to true. Once all forms in the evaluations are completed, the *completed* attribute in the progress object will be set to true. Additionally, each person related to the evaluation, such as the person who completed the evaluation and the person the evaluation is for will have that formed saved under **<database-name>/users/<unique-id>/submitted-forms/**. Each submitted form object contains:

- **author**: The author of the saved form

- **elements**: The questions, question types, question options, and answers of the form

- **completed by**: The individual who completed the evaluation

- **evaluation id**: This is the group evaluation ID that users set for related forms appended with whom the evaluation is for

- **timestamp**: This is the timestamp when the evaluations are completed

- **period**: This is how often the forms are conducted (weekly, quarterly, yearly)

- **title**: The title of the form

- **type**: The type of form (self, peer, mentor)

Chapter 5

VALIDATION

5.1 Survey on Employee Evaluations

We first performed a small study to understand the attitudes people in the industry felt about employee evaluations. Our study consisted of 6 responses. We discovered that all the organizations performed employee evaluations, mostly annual evaluations, and were usually limited to mentor and peer evaluations. As for user satisfaction, there was an wide distribution of satisfaction among all of the organizations.

The biggest concern with evaluations were that users wanted higher frequency of the evaluations, a better measurement for evaluations, and better feedback for the evaluations.

5.2 Survey Study

To validate this system's capabilities, testing and validation was performed in Dr. Janzen's Winter 2017 Capstone Course (CPE 405 Software Construction) to simulate this real-world application. We conducted a longitudinal study that determined if this system provided the necessary tools to reduce time while increasing contextual and accurate information. We compared Revalume's method of evaluation to Capstone's previous (Fall 2016) method of evaluation using CATME and Google Forms. In the Capstone class, CATME was used for midterm peer evaluations and Google Forms were used for quarterly self evaluations for the instructor. During the comparison, we created two surveys for each of the methods of evaluations.

- **Performance Pre-Evaluation Survey** gauges the class' impression of their current evaluation process using CATME and Google Forms.

- **Performance Post-Evaluation Survey** gauges the class' impression of the evaluation process after using Revalume.

These surveys address the following questions about the evaluation process:

- Are users satisfied with Revalume's evaluation process?

- What did users like or dislike about Revalume?

- How efficient was Revalume in assisting with user's evaluation process?

- How long did Revalume's evaluation process take?

- Do users believe that Revalume's evaluation process accurately reflected their contributions?

- Did users receive responses from their peers and did they find it helpful?

- Did users receive responses from their mentors and did they find it helpful?

- Which evaluation process would users prefer to use in the future?

- Users also provided additional comments.

Both sections of Dr. Janzen's Capstone class, a total of 48 students, were given both surveys to complete. The Performance Pre-Evaluation Survey was given before the Revalume software was introduced. Then, after both sections completed the evaluation process using Revalume, the students filled out the Performance Post-Evaluation Survey. The survey was introduced during the 6th week of the Winter 2017 quarter. Similarly to the Fall 2016 quarter, the 6th week was when midterm evaluations were introduced. This survey spanned about a week an half from the time the students filled out the pre-evaluation survey to the time the students filled out the post-evaluation survey. Both surveys asked nearly identical questions, with the exception of the post-evaluation survey, which asked which tool the users preferred. It is important to note that some students opted out of completing the post-evaluation survey, with a total of 43 students completing the survey. The survey and research were reviewed and approved beforehand by the Cal Poly Human Subjects Committee.

5.3 Time

The main issue that employees and managers complained about was the amount of time spent on performance related activities [16]. Therefore, the main objective for this system is to save the client's time and energy when performing evaluations. To test this system, we compared Capstone's previous evaluation process to Revalume. To limit any confounding variables attributing to the change in time, it was essential to make both evaluations identical in their questions and identical in their answers, meaning that the question type and the answer type had to remain the same. To measure time difference, the comparison between the traditional method and system will be measured under these scenarios:

- Time it takes to create the evaluations by employers

- Time it takes to complete the evaluations by employees

- Time it takes to release the evaluations to the employees

5.4 Context

In addition to cutting down on time, Revalume looks to provide a means of contextualizing past information for the users. As we presented potential bottlenecks for evaluation systems, one key finding was that it was difficult to provide context and accurate information. Some of the difficulties with completing evaluations are the difficulties with finding data that accurately reflects personal contributions. The surveys will measure if users found the third-party integrations with Google Calendar and Jira helpful in providing context to users for their evaluations.

5.5 Performance Pre-Evaluation Survey for Capstone 2017

Please refer to Appendix A for the Performance Pre-Evaluation Survey for Capstone 2017.

5.6 Performance Post-Evaluation Survey for Capstone 2017

Please refer to Appendix B for the Performance Post-Evaluation Survey for Capstone 2017.

5.7 Results

The following results are a comparison of the results between the Performance Pre-Evaluation Survey and the Performance Post-Evaluation Survey. We look to do an analysis on the responses to answer the questions we looked to address using the surveys. Please refer to Appendix C and D for the raw results from the survey.

5.7.1 Are users satisfied with Revalume's evaluation process?

This question was rated on a scale from 1 (*Not Satisfied*) to 5 (*Very Satisfied*).

During the pre-evaluation survey regarding the use of CATME and Google Forms, 8% of the respondents gave a rating of 1, 12% gave a rating of 2, 28% gave a rating of 3, 40% gave a rating of 4, and 12% gave a rating of 5. Pertaining the the satisfaction of the use of CATME and Google Forms, this would bring the average rating to 3.36.

During the post-evaluation survey regarding the use of Revalume, 2.3% of respondents gave a rating of 1, 9.3% gave a rating of 2, 34.9% gave a rating of 3, 41.9% gave a rating of 4, and 11.6% gave a rating of 5. This would bring the average satisfaction rating of Revalume to 3.512.

In Figure 5.1, we showed a slight increase in the satisfaction of using Revalume. However, this difference is negligent considering that we did not receive all the responses in the post-evaluation survey.

5.7.2 What did users like or dislike about Revalume?

This question was a free response question that asked respondents to list a positive aspect of the evaluation and a negative aspect of the evaluation.

How Satisfied Are You With This Performance Evaluation Process?
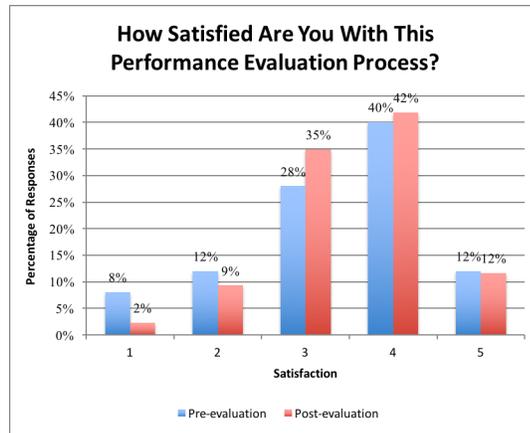
Figure 5.1: Survey about user satisfaction with their evaluation tool

In the pre-evaluation survey, we have grouped up similar feedback and presented the general response. Respondents liked that CATME and Google Forms:

- Provided feedback from their teammates

- Presented comprehensive and specific questions

- Easy to use and straight-forward

- Users had the opportunity to discuss their own contributions and interactions with their teammates

For CATME and Google Forms, respondents didn't like that:

- Some questions were unclear or repetitive

- The forms were too lengthy and time-consuming

- The answers or options for the questions were too rigid

- The user interface for CATME was unappealing

- The feedback was not meaningful

- It was difficult to keep track of who did what when filling out peer evaluations

In the post-evaluation survey, we also grouped up similar feedback and presented the general response. Respondents liked that Revalume:

- Allowed users the ability to customize questions to suit their specific needs (14)

- Provided feedback from mentors and peers (6)

- Encouraged quick evaluations (5)

- Provided a clean user interface (3)

In regards to the dislikes about Revalume, respondents didn't like:

- The bugs on the site (12)

- Peer reviews weren't anonymous (7)

- Difficulty with devising meaningful questions for reviews (5)

The likes and dislikes about Revalume were placed in order from most common feedback to least common feedback. It is clear that users appreciated being able to customize questions to contextualize their contributions in a more meaningful way. The main concern or inhibitors of Revalume was the bugs on the site that may have harmed the evaluation experience. The main bugs that were presented were that users occasionally could not view their forms or evaluations, certain types of questions had their answers lost, and had issues with their log in.

5.7.3 How efficient was Revalume in assisting with the user's evaluation process?

This question was a multiple choice question that asked respondents to express their attitudes towards the efficiency of the evaluation.

In the pre-evaluation survey about evaluation with CATME and Google Forms, 18% felt that the evaluation process was somewhat inefficient, 16% felt that the evaluation process was neutral, 52% felt the evaluation process was somewhat efficient,

and 14% thought the evaluation process was very efficient. These statistics demonstrate that users are somewhat satisfied with the efficiency of CATME and Google Forms, with an average of 3.62 (1 represents very inefficient, 2 represents somewhat inefficient, 3 represents neutral, 4 represents somewhat efficient, and 5 represents very efficient).

In the post-evaluation survey about the using Revalume, 7% felt that the evaluation process was somewhat inefficient, 23.3% felt that the evaluation process was neutral, 51.2% felt that the evaluation process was somewhat efficient, and 18.6% thought the evaluation process was very efficient. These statistics demonstrate that the majority of the users are somewhat satisfied with the efficiency of Revalume, with an average of 3.817 (1 represents very inefficient, 2 represents somewhat inefficient, 3 represents neutral, 4 represents somewhat efficient, and 5 represents very efficient).

Figure 5.2 compares the two results about the efficiency of both surveys. Both results demonstrated that a majority users found both evaluation processes somewhat efficient, with Revalume having a slight edge in average ratings.
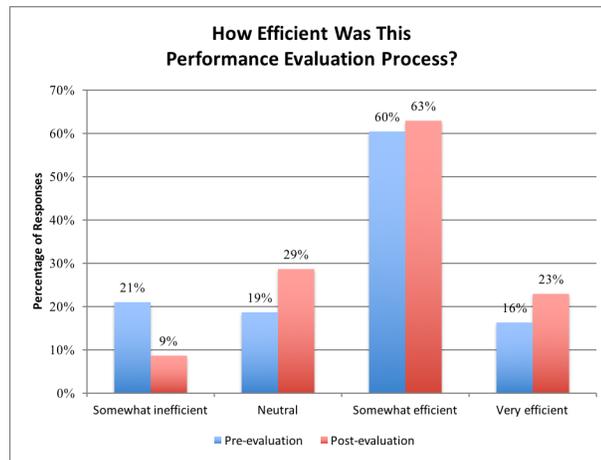
Figure 5.2: Survey about evaluation tool efficiency

5.7.4 How long did Revalume's evaluation process take?

This question was a multiple choice question that asked respondents to give a rough estimate of the amount of time it took for them to complete an entire evaluation.

In the pre-evaluation survey about the evaluation duration with CATME and Google Forms, 8% answered 10 minutes, 70% answered 30 minutes, and 22% answered 1 hour. After averaging the answers, the average amount of time for the evaluations took about 35 minutes.

In the post-evaluation survey about the evaluation duration using Revalume, 74.4% responded 10 minutes, 23.3% responded 30 minutes, and 2.3% responded 1 hour. After averaging the answer the average amount of time for the evaluations took 15.81 minutes.

This is the area where we see the greatest improvement with Revalume. As mentioned, Revalume really wanted to address the issue of time. Here in Figure 5.3, we see evidence of improvements in evaluation duration when comparing Revalume with CATME and Google Forms. This is statistically significant as the t-test for this one-tailed test survey yielded a p-value of 1.24422E-10.
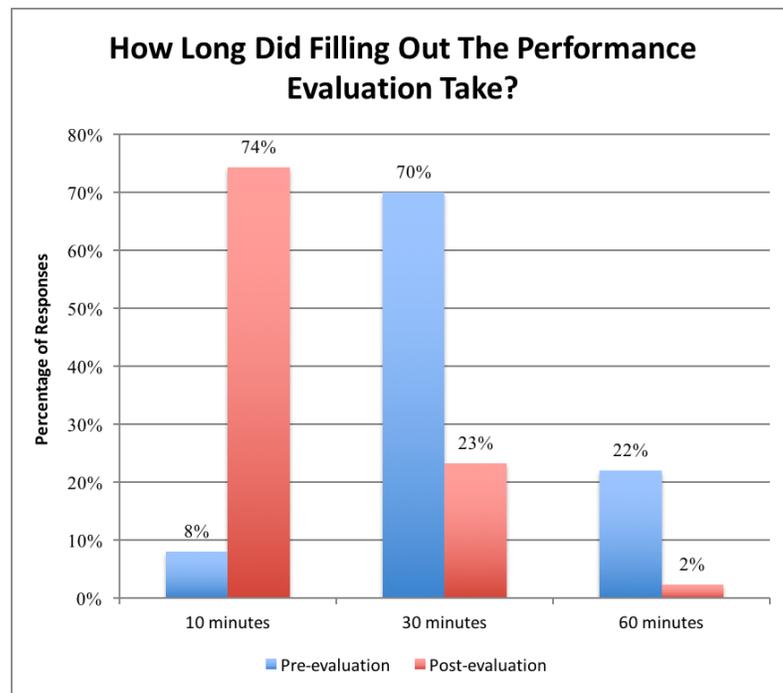
Figure 5.3: Comparison of evaluation process time (CATME + Google Forms vs Revalume)

5.7.5 Do users believe that Revalume's evaluation process accurately reflected their contributions?

This question was a yes/no question that asked respondents whether they felt that the evaluations accurately reflected their contributions.

In the pre-evaluation survey with CATME and Google Forms, 83.7% felt that the evaluations did reflect their own contributions, while 16.3% did not believe that the evaluations reflected their contributions. It is important to note that the pre-evaluation survey only obtained 49 responses as opposed to 50 for this question.

In the post-evaluation survey with Revalume, 88.1% felt that the evaluations did reflect their own contributions, while 11.9% did not believe that the evaluations reflected their contributions. It is important to note that the post-evaluation survey only obtained 42 responses as opposed to 43 for this question.

Revalume demonstrated an increase of about 5% in the amount of users who believed the evaluations accurately reflected their contributions. However, this increase is not statistically significant.

5.7.6 Did users receive responses from their peers and did they find it helpful?

Both of these questions were yes/no questions that asked respondents whether or not they receive peer evaluations and whether or not they would find peer evaluations helpful.

In the pre-evaluation survey with CATME and Google Forms, 64% of respondents did receive feedback from their peers, while 36% say they did not. Despite not every individual receiving peer evaluations, 91.8% of respondents felt that peer evaluations would be helpful.

In the post-evaluation survey with Revalume, 79.1% of respondents did receive feedback from their peers, while 20.9% said they did not. Of these 43 respondents, 69.8% found peer evaluations helpful and 30.2% did not find peer evaluations helpful.

The results for this question required additional examination, because not every individual received peer feedback. This could be attributed to Revalume's system

being unstable or participants not filling out peer evaluations. Either way, Revalume was designed to provide peer feedback to all users and the statistics have shown that the attitude toward receiving peer feedback was strongly positive.

5.7.7 Did users receive responses from their mentors and did they find it helpful?

A similar question was asked except about whether respondents received mentor evaluations and whether or not they would find it helpful.

In the pre-evaluation survey with CATME and Google Forms, 42% of respondents did receive feedback from their mentor, while 58% said they did not. As to whether respondents would find mentor feed back helpful, 84% said yes.

In the post-evaluation survey with Revalume, 59.5% of users did receive feedback from their mentor, while 40.5% said they did not. It is important to note that this question had 42 out of the 43 respondents answer. Regarding whether the users found the mentor evaluations helpful, 74.4% of users said yes while 25.6% of users said no.

The results for this question required additional examination, because not every individual received mentor revaluation. This could be attributed to Revalume's system being unstable or mentors not being able to fill out all mentor evaluations. Either way, Revalume was designed to provide mentor feedback to all users and the statistics have shown that the attitude toward receiving mentor feedback was strongly positive.

5.7.8 Additional Comments

This section was for users to add any inputs on their evaluations that was not included in the questions.

For pre-evaluation survey regarding CATME and Google Forms, users generally responded this way:

- There were feedback for some of the evaluation, but not all

- Only a portion of the feedback were helpful

- If they received peer feedback, they would like it to be anonymous

For post-evaluation survey regarding Revalume, users generally responded this way:

- Bugs were the greatest inhibitors of the user experience (receiving peer and mentor feedback)

- Recommended UI changes

- Mixed reviews about being responsible for creating your own questions

In the post-evaluation survey, we asked an additional question about which evaluation tool users preferred. Figure 5.4 shows how an overwhelmingly amount of students preferred to use Revalume. Students were overwhelmingly in favor of using Revalume because of the system's customizable forms, visibility with peer and mentor reviews, additional tools for contextualizing information, user interface, and the quick evaluations.

The post-evaluation survey also revealed that the main negative feedback were that the site was buggy and users had problems coming up with quality questions for peers and mentors. Users were unable to view peer and mentor reviews because the application would seldomly crash, greatly harming user experience. Additionally, users faced difficulties creating questions that they felt were of value.

Which performance evaluation tool would you prefer to use for future evaluations?

(43 responses)
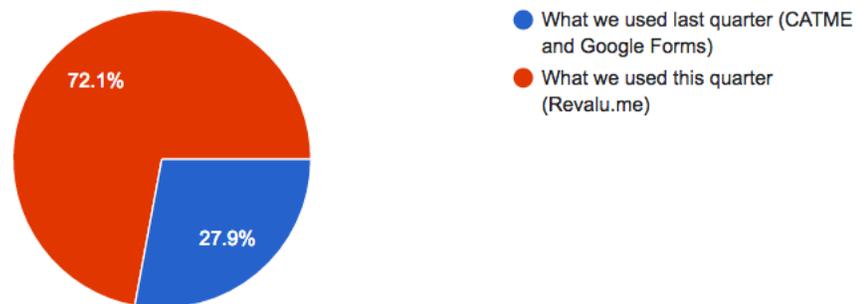
Figure 5.4: Survey results for which tools users preferred

Chapter 6

RELATED WORKS

This section lists some of the companies or products that are related to employee evaluations.

6.1   Workday

Workday, a company based in Pleasanton, provides enterprise cloud-based solutions for financial management, recruiting, talent, payroll, and professional services automation. Their business model focuses on providing business analytics and streamlined automation.

Figure 6.1: Workday Talent Management Tool

Workday Talent Management is a bundle of tools that handles on-boarding, goal management, performance management, succession planning, and career development planning. The main tool this paper is going to highlight is their Performance Management tool.

The Performance Management tool starts with the self evaluation and upon completion is handed to the manager for approval. The manager then evaluates the employee's accomplishments and provides an overall assessment. The evaluations will then undergo a calibration session to make sure the evaluations are consistent and accurate. After calibration, the evaluations are then vetted for accuracy by Second Level Managers, who are the manager's manager. After the approval of the Second Manager, there is a discussion that is held between the manager and employee for any final comments before the evaluation is complete [20].
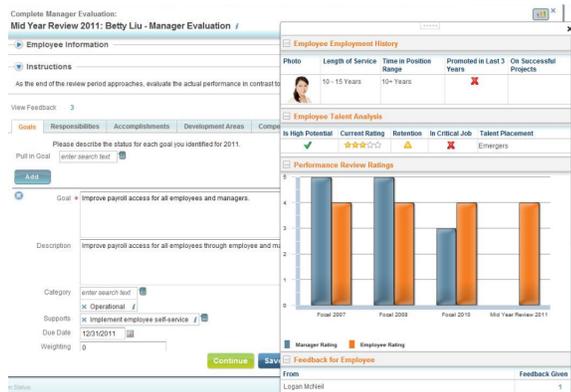
Figure 6.2: Workday Performance Management

6.2   15Five

15Five, is a light-weight performance management tool, looking to create a constant dialogue between employees and managers. Their cloud-based product looks to normalize weekly evaluations by making surveys quick and easy.

15Five uses tools that allow employees or managers to ask questions every week and address performance, engagement, and culture. This increased dialogue is emphasized to address issues early and to understand what tools are necessary to complete the task. Employees give weekly feedback to questions on discussion forum. Feedback is then viewed by managers and managers could view the feedback as analytics on graphs or respond to the feedback.
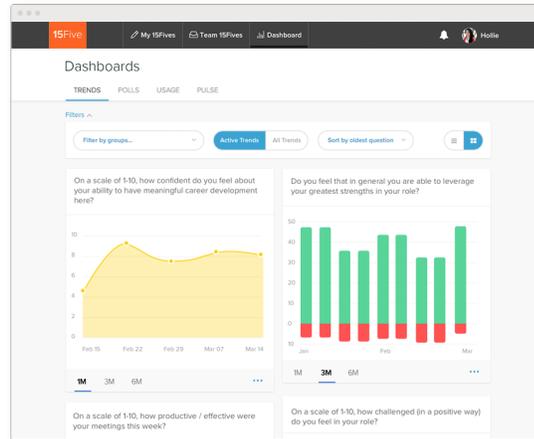
Figure 6.3: 15Five Dashboard

6.3   Trakstar

Trakstar is a cloud-based employee evaluation software based in Seattle, that provides real-time feedback and a 360 degree feedback. Trakstar allows users to customize forms for reviews as well as send email reminders.

In Trakstar, users create a profile which contains information about the user's role in the company. During the appraisal cycles, the users will be notified of evaluations that need to be completed after the request is sent by their managers. Each appraisal has a schedule associated with it where users can plan their evaluations. As users complete their evaluations, their appraisals are recorded and stored in their appraisal history. These appraisal progress can then be tracked with various measurements and analytics as employees progress toward their goal.

6.4   Halogen

Halogen is a cloud-based software solution based in Canada, that provides performance management, succession planning, learning, compensation, and more.

Halogen software is configured for agile performance management solution that pushes for ongoing feedback and coaching. The agile solutions that Halogen uses are ongoing check-ins, goal setting, development planning, and customized appraisals.

The appraisal process utilizes the 360 degree feedback to help managers assess the individual. In addition, Halogen allows for each user to create their own profile to help manage their goals set by themselves and their managers [6].

Chapter 7

CONCLUSION

In this paper, we presented an investigation on the various bottlenecks and criticisms of employee evaluations. We found the biggest deterrence for conducting employee evaluations are amount of time evaluations take and the difficulty with providing accurate and contextualized feedback. Managers don't view evaluations as an efficient use of time and employees don't feel that the performance evaluations are relevant to their job [12].

Revalume presented a novel employee evaluation cloud-based solution that aims to address time and context issues. The system utilized an asynchronous process by empowering each individual to create their own customized forms and begin their own evaluation process. By allowing user's control over the self, peer, and mentor evaluation, we saw an increase in satisfaction of the system. We also found that users felt that Revalume provided a more accurate reflection of their contributions when compared to their current evaluation method using CATME and Google Forms. The feedback for the system was so positive that 72% of the users preferred to use Revalume over their old system. We have also determined that users overwhelmingly found peer and mentor evaluation feedback helpful.

In closing, while Revalume may not be a fully functional product, we argue that Revalume contains the components necessary in creating user satisfaction with employee evaluation process. By allowing individuals to take control of their own evaluations and present them in a manner they feel is fair, we discovered that users were more satisfied and believed that the evaluations more accurately reflected their contributions. Additionally, Revalume allowed for evaluations to be completed quickly and while providing instant feedback from peers and mentors. These strategies used in Revalume proved to have a positive impact on employee evaluations.

Chapter 8

FUTURE WORK

As mentioned, one of the biggest deterrence of Revalume is the finicky nature of the site and the lack of anonymity of peer reviews. There could be additional patchwork to fix the inhibiting bugs that prevent a smoother user experience and create anonymous feedbacks. There is also room for future work in creating cross-platform capabilities as Revalume is limited to Chrome browsers.

During the analysis of Revalume, we saw that users sometimes had issues retrieving their peer or mentor evaluations. We have identified that the root cause responsible for this was that the application was unable to handle concurrent processes when interacting with the database. This limitation could be due to the free version of Firebase, called Spark, limited simultaneous connection to the database to 100. Once the connection surpasses 100, Firebase will stop accepting connection requests. This could be remedied if Revalume upgraded to a paid plan, which would add to the cost analysis. As mentioned, future work could include exploration into cloud-hosting alternatives that could be cheaper than Google App Engine.

There is also room for further third-party integration with other features in UN-BIASED, such as Github, Bitbucket, and Gmail. Using UNBIASED, there could be experimentation with autocompleting forms via NLP and the various third-party integrations. Although these tools are geared more towards software engineers, Revalume could be adapted to be a universal employee evaluation that includes additional APIs to better support a wider range of audience.

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APPENDICES

Appendix A

PERFORMANCE PRE-EVALUATION SURVEY

(see following pages)

Performance Pre-Evaluation Survey

Gauge opinions on the current performance evaluation tool and process.

1. **How satisfied are you with the performance evaluation process used last quarter (CATME and end-of-quarter Google Form)?**
   Mark only one oval.

	1	2	3	4	5	
Not satisfied	◯	◯	◯	◯	◯	Very satisfied

2. **What did you most like or dislike about last quarter's performance evaluation process?**

   _____

   _____

   _____

   _____

   _____

3. **How efficient was the performance evaluation process?**
   Mark only one oval.

   ◯ very efficient

   ◯ somewhat efficient

   ◯ neutral

   ◯ somewhat inefficient

   ◯ very inefficient

4. **How long does it currently take for you to fill out a performance evaluation?**
   Mark only one oval.

   ◯ 10 minutes

   ◯ 30 minutes

   ◯ 1 hour

   ◯ 2 hours

   ◯ > 2 hours

5. **Do you believe the evaluations you fill out accurately reflect your contributions?**
   Mark only one oval.

   ◯ Yes

   ◯ No

6. **Do you receive feedback from your peers?**
   Mark only one oval.

   ( ) Yes

   ( ) no

7. **Do you receive feedback from your mentor?**
   Mark only one oval.

   ( ) Yes

   ( ) no

8. **Would you find feedback from your peers helpful?**
   Mark only one oval.

   ( ) Yes

   ( ) No

9. **Would you find feedback from your mentors helpful?**
   Mark only one oval.

   ( ) Yes

   ( ) No

10. **Additional comments about your evaluation process.**

    _____

    _____

    _____

    _____

    _____

Appendix B

PERFORMANCE POST-EVALUATION SURVEY

(see following pages)

Performance Post-Evaluation Survey

Gauge the current performance evaluations.

1. **How satisfied are you with this performance evaluation process?**
   Mark only one oval.

	1	2	3	4	5	
Not satisfied	◯	◯	◯	◯	◯	Very satisfied

2. **What do you most like or dislike about this performance evaluation process?**

   _____

   _____

   _____

   _____

   _____

3. **How efficient was this performance evaluation process?**
   Mark only one oval.

   ◯ Very efficient

   ◯ Somewhat efficient

   ◯ Neutral

   ◯ Somewhat inefficient

   ◯ Very inefficient

4. **How long did it take you to fill out a performance evaluation?**
   Mark only one oval.

   ◯ 10 minutes

   ◯ 30 minutes

   ◯ 1 hour

   ◯ 2 hours

   ◯ > 2 hours

5. **Do you believe the evaluations you fill out accurately reflect your contributions?**
   Mark only one oval.

   ◯ Yes

   ◯ No

6. **Did you receive feedback from your peers?**
   Mark only one oval.

   ◯ Yes

   ◯ No

7. **Did you receive feedback from your mentor?**
   Mark only one oval.

   ( ) Yes

   ( ) No

8. **Did you find peer evaluations helpful?**
   Mark only one oval.

   ( ) Yes

   ( ) No

9. **Did you find mentor evaluations helpful?**
   Mark only one oval.

   ( ) Yes

   ( ) No

10. **Which performance evaluation tool would you prefer to use for future evaluations?**
    Mark only one oval.

    ( ) What we used last quarter (CATME and Google Forms)

    ( ) What we used this quarter (Revalu.me)

11. **Additional comments about your evaluation process.**

    _____

    _____

    _____

    _____
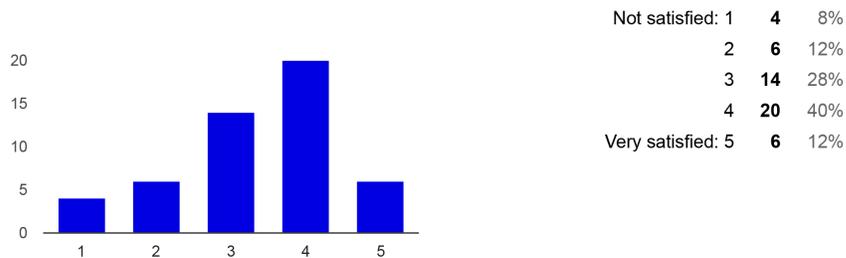
    _____

Appendix C

PERFORMANCE PRE-EVALUATION SURVEY RESULTS

(see following pages)

50 responses

Summary

How satisfied are you with the performance evaluation process used last quarter (CATME and end-of-quarter Google Form)?

Not satisfied: 1	**4**	8%
2	**6**	12%
3	**14**	28%
4	**20**	40%
Very satisfied: 5	**6**	12%

What did you most like or dislike about last quarter's performance evaluation process?

Overall, the CATME approach is nice because it is faster to fill out; however, there were many questions that felt repetitive. Especially on the page that had around 50 questions (I cannot remember the exact number). For the Google Form, I think it would be best to make certain sections optional or state some sections are optional because I felt I was being forced to make something up about my teammates that I believed was addressed in other portions of the survey.

Unclear

It was focused without being excessively long

I liked that we didn't have to type up a formal paper the way we did in 308 and 309.

It had a bit of a weird layout

I thought it was fine - it did everything a valuation is supposed to do. The UI is just not that great, it was kind of hard to use.

Swapping between rating categories and the personas was tedious. Hard to track who did what.

Too many questions

Some repeated questions were a hinderance

CATME is difficult to use with all options

It was pretty thorough

It was straightforward and gave me a lot of opportunities to talk about my work and my group members' work

Wierd questions that were sometimes hard to fit what I thought about other people into.

CATME sucked because I hated the practice evaluation we had to do.

I felt like some of the questions were kind of repetitive, I'd have liked to just have one big feedback space instead of 3 different questions to answer

I don't think the options were flexible enough, or that the descriptions were a little odd sometimes.

73

Was long and choices didn't feel mutually exclusive

The lay out of catme was not that great.

The questions were repeated multiple times

It was hard to understand and all the choices seemed similar.

The descriptions for each level of performance were vague and some of them were not distinct.

Long and repetitive.

Disliked how it might have had too much that needed to be done. Liked how easy it is to use.

I liked the end of the quarter eval better because it's easier to express my opinions about someone through text rather than a flat numeric score.

Google form was really nice. CATME was just very long and arduous and didnt allow a lot of open space to write from what I remember.

The ability to say more than what CATME offered.

It was time consuming.

Everything was on a scale from 1-5 which was hard to group people in and didn't really allow for text or handle special cases very well.

I liked that there were a lot of ways to gauge individual involvement on the team instead of just giving everyone a blanket score.

It gave opportunities to evaluate your specific interactions with individuals as well as discuss your own contributions to the project.

Length of survey, prerequisite of practice evaluation

I think we should have started to code sooner but it worked out well anyways.

The process was long but comprehensive.

No meaningfully feedback from the survey at all. Doesn't convey any concrete feedback and different people have different interpretations of scale. Generally not a great use of team time.

It was long and confusing

Neat to see how teammembers rated me but no way to indicate reasoning behind the rating

End of quarter eval was good, CATME was too long and the questions weren't very good

good to get opinions of my teammates anonymously (hopefully their feedback was honest)

The performance evaluation I did was really short and to the point but I feel like it was asking for too many granular details.

dislike: we were late on figuring out reactnavtive wasn't gonna work like: our group was able to pull it off

I did not like the CATME but did like the end-of-quarter Google Form. The questions on the Google Form felt like they were worded better. I felt like the CATME questions did not provide enough fields to explain and it felt like I was directly effecting their score.

way too long

It was detailed and specific.

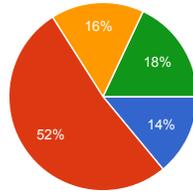I didn't like that there wasn't a scale to rate qualities or traits of each member

Catme is pretty vague about what the differences between the categories were

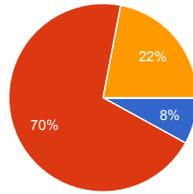I didn't think it was really clear and took a long time.

Too many questions.

## How efficient was the performance evaluation process?

very efficient   **7**   14%

somewhat efficient	**26**	52%
neutral	**8**	16%
somewhat inefficient	**9**	18%
very inefficient	**0**	0%

How long does it currently take for you to fill out a performance evaluation?

10 minutes	**4**	8%
30 minutes	**35**	70%
1 hour	**11**	22%
2 hours	**0**	0%
> 2 hours	**0**	0%

Do you believe the evaluations you fill out accurately reflect your contributions?
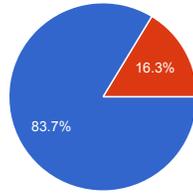
Yes	**41**	83.7%
No	**8**	16.3%

Do you receive feedback from your peers?
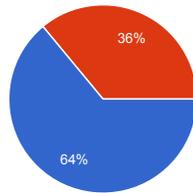
Yes	**32**	64%
no	**18**	36%

Do you receive feedback from your mentor?
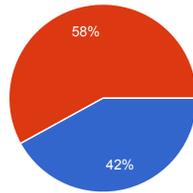
Yes	**21**	42%
no	**29**	58%

Would you find feedback from your peers helpful?
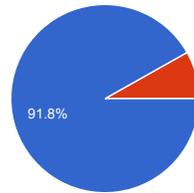
| Yes | **45** | 91.8% |
| No | **4** | 8.2% |

Would you find feedback from your mentors helpful?

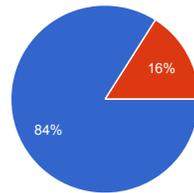| Yes | **42** | 84% |
| No | **8** | 16% |

Additional comments about your evaluation process.

The midterm evaluation gave feedback to our performances, but I have no idea how the last evaluation went.

I do kind of receive feedback from peers, but not very much.

Im not sure how effective it was because I don't know how accurate the feedback was. It felt kind of difficult to give accurate feedback so I assume it was probably hard for other people to.

N/A.

I'm not sure if I want feedback from my peers, it might seem a bit awkward if it was a bad review. On the other hand it would be helpful if I did get reviews from my peers so I know how to be better.

no

A lot of the questions in this survey are leading questions. I don't think anyone would say that they don't want feedback from people. Might be some more interesting questions to ask here that aren't leading.

Multiple choice style evals aren't super helpful. Short written responses are better, but there can't be an imposed length requirement or the quality of the evaluation goes down.

i think anonymity of feedback from peers is best. It allows people to be most honest about how they truly feel, but I do think that it can leave the person receiving the feedback wondering about who has the different opinion.

My evaluation process was in Sweden where we completed surveys about ourselves and also each other. The evaluation was organized into two parts. Part one was a table where we graded our teammates and ourselves. The second part was a written report about our contributions to specific parts of the project and also what we learned from the class as a whole.

I didn't really see the individual peer evals and saw the overall evalutation

The midterm evaluation was confusing in its format.

I believe we should be able to see the feed back given by our other team members but it should be anonymous

Number of daily responses

Appendix D
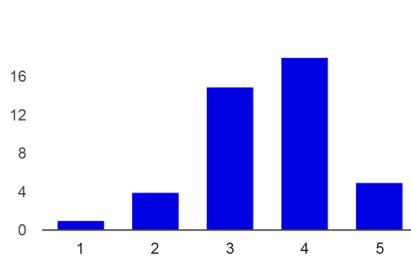
PERFORMANCE POST-EVALUATION SURVEY RESULTS

(see following pages)

43 responses

Summary

How satisfied are you with this performance evaluation process?

Not satisfied: 1	**1**	2.3%
2	**4**	9.3%
3	**15**	34.9%
4	**18**	41.9%
Very satisfied: 5	**5**	11.6%

What do you most like or dislike about this performance evaluation process?

Ability to edit the questions to our specific needs

I dislike its buggy software and ugly UI. I dislike how I have to spend much effort to create templates.

More individualized, seems like the feedback should be better. The website/interface is very finicky though.

Just overall bugginess of the site

The UI is clean and easy enough to understand.

I like the fact we can see the feedback ourselves. I dislike the execution of the website however.

Team feedback

It has some bugs but thats the main issue with it. Having dialogue that tells me feedback whenever something successful happens too would be great.

I didn't really like the effort of making our own evaluation questions, while it was nice to have the option of customization but it made it difficult and take longer

Process was buggy.

Feels like you have to come up with your own questions.

I liked how quick and easy it was to invite people to the evaluations.

Just wasn't working well so its hard to tell how effective it was.

I liked the customizability, but I'd prefer team sharing to be more automatic

I liked the customization but it was hard to think of additional questions

There were some bugs. In the end the rating questions ended up not being useful at all because the ratings were all set to 1.

I like being able to add in personal questions, however I think there should always be a template for others to use as a base, since people are lazy and not extremely creative. I dislike that the peer evaluations are not anonymous. I really feel this is necessary for complete honesty, and I feel it helps others be more critical and helpful, rather than nice and optimistic.

I think some people would prefer to stay anonymous

Good user interface

I don't like that people can see your name. It would be better if people could see what you wrote without actually seeing your name.

Dislike the requirement for chrome and the inconsistency for what shows up. Like the ability to add your own questions.

I like being able to see what feedback my peers gave me, so I can try to improve. I didn't like 2 things, first of all the text didn't wrap in the text box, so it felt hard to write long responses. I also one time filled out my self evaluation on the create page by accident, and it let me submit and everything but it didn't actually save anything. So maybe make it clearer on the create page that you can't fill out those surveys when you view/edit them.

I like that we can add our own questions and that we can see peer feedback. I don't like that the website was buggy.

I do not like that no one is anonymous in their review. I do not think people are as honest in their review if they know you will see it

Actual feedback that is not a multiple choice answer. Lack of anonymity

Its customizable. So it can be quick and easy or if you want it can go into more detail.

It was too buggy and I could barely do any of the surveys

It requires to much on the user being evaluated. Evaluations are not fun, or something enjoyable, and should be made as easy as possible for the participant.

Seems to encourage short, quick responses. Not as in-depth input.

I wish there was a way to see only my todo evaluations rather than scrolling through each evaluation and looking for the "TODO" label.

Was much shorter than compared to catMe, more customizable

It is simple to fill out.

I liked the ability to edit the questions, but it might be beneficial to have anonymous responses and not include questions that give away who wrote it.

customizeable

I liked that we actually had better rating metric, as opposed to CATME and students were able to choose their questions.

I thought the process was confusing. Having each person create their own form and send it to everyone seemed more complicated than it needed to be.

I feel like some of the GUI could differ a little more to differentiate the different types of surveys. The professor evaluation could be improved to be a pre filled template.

The ability to add my own questions.

It was nice for it to be decentralized and for people to be able to complete it asynchronously. This also had some downsides of it being decentralized and asynchronously. This doesn't really mirror how performance reviews are done in industry which I think would be more valuable to a capstone related class.

Like the freedom to ask my own questions. Dislike the frustration when I don't know what are the good questions to ask or what I should ask.

My team was a group of 4 so leaving detailed feedback with a small group is challenging. It is obvious who said what with such a small group. I think if the teams were bigger it would be a lot better.

I would have liked a default survey for the mentor

I was not informed that my teammates could see what I had written, which was kind of annoying. It's much easier to honestly rate someone if your name wouldn't be associated with your review. Otherwise you might as well have talked to them face to face.

**How efficient was this performance evaluation process?**
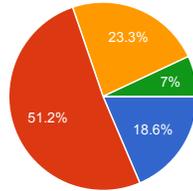
Very efficient	**8**	18.6%
Somewhat efficient	**22**	51.2%
Neutral	**10**	23.3%
Somewhat inefficient	**3**	7%
Very inefficient	**0**	0%

How long did it take you to fill out a performance evaluation?
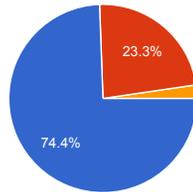
10 minutes	**32**	74.4%
30 minutes	**10**	23.3%
1 hour	**1**	2.3%
2 hours	**0**	0%
> 2 hours	**0**	0%

Do you believe the evaluations you fill out accurately reflect your contributions?
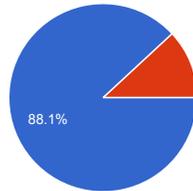
Yes	**37**	88.1%
No	**5**	11.9%

Did you receive feedback from your peers?
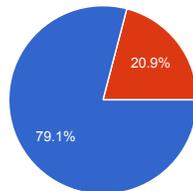
Yes	**34**	79.1%
No	**9**	20.9%

Did you receive feedback from your mentor?

Yes	**25**	59.5%
No	**17**	40.5%
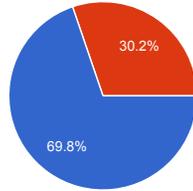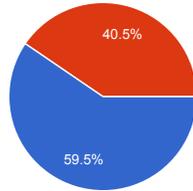
Yes	30	69.8%
No	13	30.2%

Did you find mentor evaluations helpful?
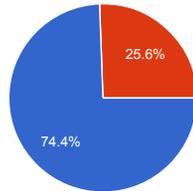
Yes	32	74.4%
No	11	25.6%

Which performance evaluation tool would you prefer to use for future evaluations?
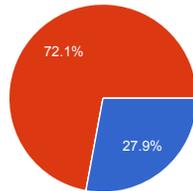
What we used last quarter (CATME and Google Forms)	12	27.9%
What we used this quarter (Revalu.me)	31	72.1%

Additional comments about your evaluation process.

I think both performance evaluation tools are poor. CATME is opinionated and adamant about objective ratings which is a failed experiment. Revalu.me is better but doesn't provide a nice UI & robust software which is important in the current year. Additionally, the process of creating the template and the notion of championing templates for evaluation surveys is subpar. For example in this evaluation form I would prefer to explain my opinions in a human process rather than a binary robotic form which most likely does not capture all the gradients of human emotion and perspective.

Short answer questions with an emphasis on areas that can be improved are best

I felt CATME was much more informative overall and I liked that. However, Revalue.me was a a little easier / quicker.

Wish it was executed better, but the overall idea was good. It was hard getting accurate evaluations about me by the backend team since I don't work closely with them.

Didnt not like this process because it did not work for me. I could not post a survey and it did not save my responses for other peoples evaluations. I think the old way accomplishes the same thing with more efficiency.

The least efficient part is writing your own questions, not answering others.

Work out some of the bugs in the system.

This solution is better but needs to be fleshed out

Everything looked good except for the backend bugs!

I didn't see a lot of my feedback from people just because of the system. But if I could have seen them I think it would have been helpful.

I didn't really use the ability to add additional questions, but it seems like a better way to do it than only having set questions. But having set questions in addition to being able to add them was good

It would be awesome if the text boxes could expand instead of putting all of the text on the same line.

I don't think the peer evals helped much since there weren't lots of open ended questions. I should've added more questions so that I could get more feedback.

Last quarter's did have quite a bit of detailed information and feedback, which is nice. Also, I wasn't really able to complete the evaluations due to a few bugs.

I think a set of required questions with open responses or at least scales larger than 5 would have been helpful.

Overall I preferred this method over CATME, I just wish it wasn't so buggy because some evaluations wouldn't submit.

I had to fill out the forms multiple times, which made m frustrated with this process. I also still have not received feedback from my team.

i like the idea for peer evaluation. i did not receive any feedback due to system bugs

I'd like an option to make a question required. Otherwise, speaking for myself, if a free-response question isn't required, I'm not going to write very much.

To be honest, the only thing that sets revalu.me aside from the google process ignoring all of the technical differences is the customization that a user can have for the feedback. Catme is annoying and more work than the benefit that it provides. Google forms is more stable but you can only really have one set of questions per group or you have to create multiple surveys on surveys. Revalume seems to be a nice balance where it's still not perfect and trying to solve a problem that really should be solved by constant feedback from peers (quarterly feedback just doesn't work that great in industry), but it does a good job at what it's trying to do.

I wasn't able to receive/view my mentor and peer evaluations so I put no for them being helpful. I will try to email you.

Number of daily responses