Software Measurement

Tools & Techniques for Planning and Estimation

Group 1

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ABSTRACT

Estimating the effort, time, and resources needed to complete project activities is one of the most challenging tasks that project managers must face. This is because of the inherent uncertainty associated with many activities. Almost all the projects are unique. Uncertainty because the activity is unique to the project or the activity is being accomplished by a resource that is not a practiced expert or the interaction of this activity with other project activities is unique in this project. All of these can create problems when estimating effort, time or resources. If the effort needed to complete the scope is uncertain - for instance the number of hours of work needed to complete an analysis - the time and resources needed will be uncertain. There are various tools which are mainly used for estimating project activities. This document briefly describes about the tools and techniques for estimation along with the examples. Before the project work begins, you must make sure that the work is properly understood and agreed to by the project sponsor and key stakeholders. You need to work with the sponsor and stakeholders to ensure that there is a common perception of what the project will deliver, when it will be complete, what it will cost, who will do the work, how the work will be done, and what the benefits will be. The larger the project, the more important it is that this information be mapped out formally and explicitly. All projects should start with this type of upfront planning to prevent problems caused by differing viewpoints on the basic terms of the project. You should create an overall project work plan before the project starts. This helps you estimate the total project effort and duration. Without proper project planning, there will be poor estimates, poor scope control and lack of business support. Project managers must use some effective project planning tools in order to make sure the project flow is maintained. This document explains about the tools for planning along with some instances. Along with the tools and techniques of Planning and Estimation, this document shows the importance of BA Tool which is a software created for effective planning and estimation.

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1. Estimation

1.1 What is Software Development Estimation?

Software Development Estimation is the process of predicting the most realistic amount of effort required to develop or maintain software based on incomplete and uncertain data.

1.2 Why is Software Development Estimation required?

Software Development Estimation determines how much money, effort, resources and time it will take to build a specific system or product.

1.3 What is Software Development Estimation based on?

• Past data or Past Experience: Some of the products that are being created might have been created in the past. This data/experience would be used in creating products of similar types. Example: Creating a website, Basic features such as User Registration and User Login are already known and can be created with past knowledge/experience.

• Available Documents/ Knowledge: Some of the products/ projects can be created based on available documents. Example: Naïve Bayes Algorithm which is available to everyone can be used in data mining projects.

• Assumption: Some of the factors such as time, cost can be assumed for some projects which helps in the software development phase. Example: Time required to create a particular feature.

• Identified Risks: Risks that are already been identified in the previous projects can be ignored which saves a lot of time. Example: Security holes such as login screen timeout.

2. Types of Estimation Techniques

2.1 Analogous Estimation

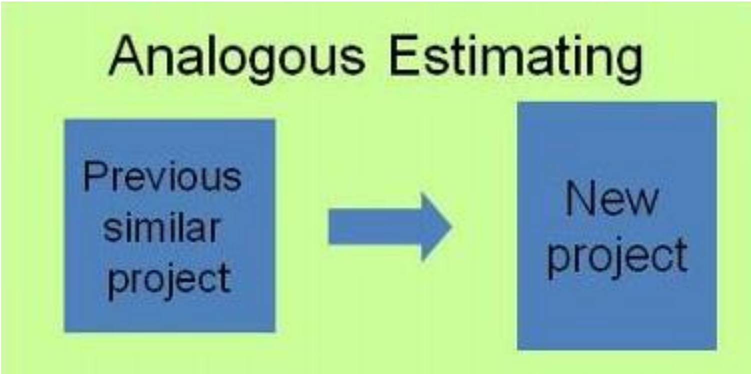

Figure 2.1: Analogous Estimation

This is a type of estimation that uses historical data to give estimate of the project. It has been used by developers who've worked on similar projects. This is the fastest technique to estimate cost and can be used with limited information available about the project but least accurate.

It is used when there is limited information regarding your current project, an analogous estimate is considered "top-down" and is generally not as accurate as other estimating techniques.

Because the project manager's, and possibly the team's experience and judgment are applied to the estimating process, it is considered a combination of historical information and expert judgment.

Obviously, the new projects are not identical to the completed projects. Nevertheless, some of the tasks and some of the deliverables in the new projects are going to be similar to tasks and deliverables in the old ones. Project managers may have to look through a number of previously completed projects to find tasks and/or deliverables that are roughly similar to those in their new projects.

The longer the organization builds these archives of its project work and cost data, the more valuable it will be. After a year or two, it becomes relatively easy for project managers to find similar deliverables and tasks in the archives. These are the analogous deliverables they will use in their estimating process. Then the project manager and sponsor make adjustments to the historic, analogous data to reflect the differences between the old project and the new one.

As an example, let's say a new project requires a training session for the employees who will work on the new procedures and processes the project produces. The project manager could review the number of work hours used to create the training class curriculum in a previous project. They might also look at the actual classroom time used on the previous project. Then the project manager would consider the differences in complexity, scale, scope and focus between the old and new projects. The project manager would ask the Human Resources trainers to compare the two training efforts and they are told the new one is 20% more difficult and will take 20% more time than the old one.

Then the project manager would adjust the historic data for their project. Getting input from the people who will do the work is very valuable. It lets the project manager present data on the work and cost of deliverables that has a solid basis in reality. It's certainly possible to debate the size of the adjustment factor. But you are still discussing the actual amount of work for a training class based on a previous project. That is much better than using data plucked from the sky.

You can use the analogous estimating technique at any level of the project. You can use it to develop initial estimates when a project is first discussed or initiated. You can also use it when you're making estimates of the work and duration of the individual team members' tasks and of the project as a whole.

2.2 Parametric Estimation

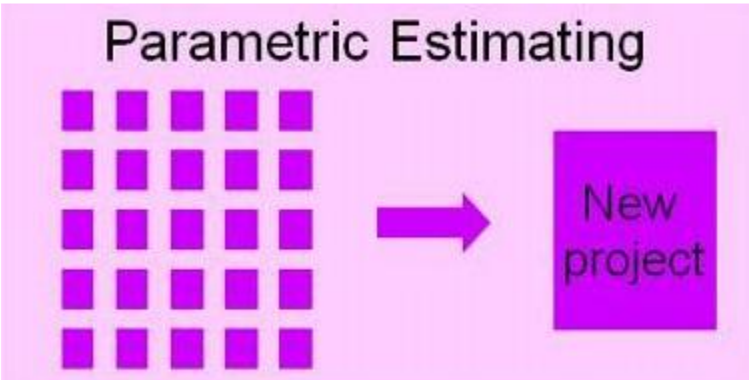

Figure 2.2: Parametric Estimation

It is also known as the top-down approach, parametric estimation also uses historical data to give estimates of the project but it adds an additional layer of accuracy by dividing the work into measurable units. This technique uses statistical relationship between historical data and variables and it is comparatively more accurate than analogous estimation.

Essentially, a parametric estimate is determined by identifying the unit cost or duration and the number of units required for the project or activity.

Parametric estimating is the task of looking at past projects to get a good estimate of how long a current project will take and how much it will cost. It also allows you to measure individual tasks within the project to get a more accurate cost and time frame.

Parametric estimating requires you to know some of the basics about your current project so that you can match it up with historical data. First, you need to know how many units you will be producing. This is because you will need to figure out how many hours you will need to produce each of those units from previous projects. Keep in mind that units can be anything from manpower, supplies, equipment, and any individual task that can be measured. Second, you will also need access to past projects. Parametric estimating needs historical data to make an accurate estimate about your current project.

For example, if it took me two hours to mow my one acre yard last week and this week I'm mowing four acres, I could estimate that it will take eight hours to mow.

However, if the first one hour was spent transporting my tractor and preparing it to mow, the estimate would need to be scaled appropriately: 1 hour for transporting and then four hours to mow, for a total of five hours.

Let's say you are in charge of administering a test to 5 students at the local college. The test will consist of 50 multiple choice questions and each student will take it individually. In order to properly schedule a babysitter, you need to know how long it will take for all of the students to finish the test. You decide to look at past test data to see how long this type of test typically takes. You find that the average rate to take a test with 50 multiple choice questions is about 45 minutes. So, to determine how long you will need your babysitter to stay, you would calculate the time as follows:

45 minutes X 5 students= 225 minutes or 3 hours and 45 minutes

2.3 Three Point Estimation

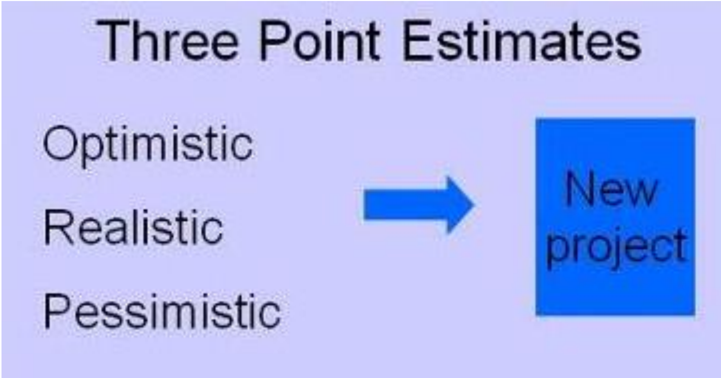

Figure 2.3: Three Point Estimation

It uses three estimates to calculate the average estimate. a- best case estimate, m – most likely estimate, b- worst case estimate.

3-Point Estimating is a 3-Step Process

1. First, you work with the team member assigned to each task and identify both the positive and negative risks involved in their task. Negative risks are the things that could make it take more time and positive risks are the things that could make it take less time.

2. Next you ask the team member to make three estimates. The first is a best guess (BG) which is the average amount of work the task might take if the team member performed it 100 times. The second estimate is the pessimistic (P) estimate which is the amount of work the task might take if the negative factors they identified do occur. The third estimate is the optimistic (O) estimate which is the amount of work the task might take if the positive risks they identified do occur.

3. Then you do some simple mathematics with the three estimates. You calculate the mean and standard deviation using the 3-point estimation formulas: (O + 4BG + P) ÷ 6= the weighted mean and P-O/6 = the standard deviation (used for calculating probabilities). The weighted mean estimate from the three estimates the team member gave you is the one you use for their task. It reflects the amount of risk in the task and the severity of the impact of the optimistic and pessimistic risks.

The 3-point estimating technique gives you better data because you're explicitly considering risks. You learn about the risks of a task early in the process from the person who will be doing the work. That knowledge gives you the opportunity to take corrective actions before you start work on the project. That increases the likelihood of the good risks and decreases the likelihood of the bad risks.

As an example, if a team member says that on previous assignments involving a certain department in the company, the amount of work in the task increased substantially. That was because supervisors and managers from that department repeatedly failed to come to project planning meetings. Knowing that, you would take steps to encourage that department to attend the planning meetings. You might even involve the project sponsor to gain the department supervisors' and managers' commitment to attend the meetings. If you can reduce the likelihood of negative risks, you take a big step toward accurately estimating the work and improving our project's duration.

2.4 Bottom-Up Estimation

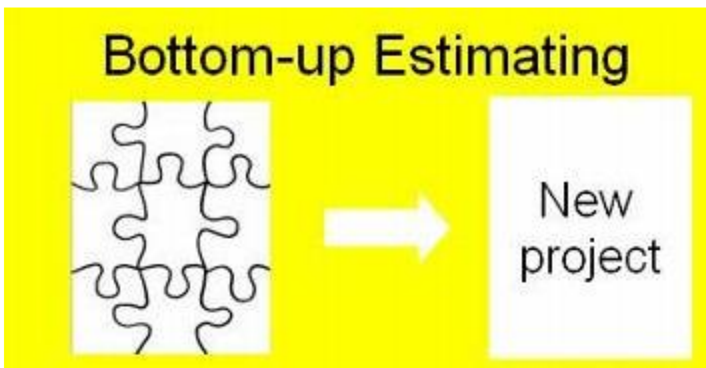

Figure 2.4: Bottom-Up Estimation

This is used when every detail of the project is available, where large parts of the projects are decomposed into smaller chunks and estimated. This technique is used when every detail of the project is available. This is time consuming and costly technique but gives most reliable and accurate results.

In bottom-up estimating, you follow a three-step process, working from the lowest level of detail in the work breakdown structure (WBS). You begin bottom-up estimating by developing a detailed work package to go with the WBS. In the work package, you detail the scope and major deliverable that each team member will produce. You describe the risks that affect the task and its cost and duration.

Many projects group related tasks into phases. The phases represent groups of tasks, and the overall project is a group of phases. This is another level of bottom up estimate because each task, phase, and the overall project each have an estimate. They are each "rolled up" into the higher level and represent the sum of the lower level. This is a bottom up estimate.

Let's say you are building a fence. The project has two tasks:

Set posts

Build fence

You head to google before starting the project and discover that the local hardware store suggests a fencepost cost of roughly $75/post. Since there are 10 posts, that equates to $750. This is called a parametric estimate.

Next, your colleague, who built a fence last month tells you that their fence cost about $5,000 (excluding the fence posts) for a fence that was 100 feet long. Thus, since your fence is half as long, it would cost roughly $2,500. This is an analogous estimate.

For the entire project, we add the two together. This is called bottom up estimating and results in the overall project cost.

3. Example of Analogous Estimation & Parametric Estimation

You are the project manager for the annual Earth Day 5k road race, with three primary components -

- marketing
- registration
- race-day coordination

Marketing - there will be 500 flyers printed up at a cost $0.20 each. It took two weeks for the flyers to be printed for last year event, so you estimate two weeks for the printing of the brochures for this event.

Registration - Last year it took one week to design the on-line registration form and the cost to host the registration website was $850.00.You estimate the same this year.

Race-day coordination - There will be four people used to coordinate the race. Each resource will be paid $25 per hour and they will be working an estimated seven hours, based on the race last year.

- Marketing
  - Cost: $100 for brochures (parametric estimating 500 x $0.20)
  - Duration: two weeks (analogous estimating)
- Registration
  - Cost: $850 (analogous estimating)
  - Duration: one week (analogous estimating)
- Coordination
  - Cost: $700 (parametric estimating 4 x $25 x 7)
  - Duration: 7 hours (analogous estimating)

4. Time Estimation using Three Point Estimation and Bottom-Up Estimation

4.1 Three Point Estimation of Time

In this example, we are going to use the three point estimation technique to estimate the time needed to create the features of iteration 1 that is ‘User Account’. The features in this iteration are User Sign-up, User-Login, Webpage design, Email Confirmation and Testing.

Number	Feature	Best Case	Most likely	Worst Case	E = (a+4m+b)/6	SD = (b-a)/6	Est = E +(2*SD)
1	User Sign-up	4	6	8	6	0.666666667	7.333333333
2	User Login	4	6	8	6	0.666666667	7.333333333
3	Web-Page Design	20	25	30	25	1.666666667	28.33333333
4	Email Confirmation	8	10	12	10	0.666666667	11.33333333
5	Testing	8	10	12	10	0.666666667	11.33333333
TOTAL (EST) - 65.66							

Figure 4.1: Three Point Estimation of Time Example

Figure 4.1 shows the example of Three Point Estimation of Time. The Best Case (a), Worst Case (m) and Worst Case (b) are inputted for each features and then standard formulas are applied to calculate the total estimated time for ‘User Account’.

Time estimated to implement the user account feature is 65.66 Hours.

4.2 Bottom-Up Estimation of Time

In this example, we are going to use the bottom up estimation technique to estimate the time needed to create the features of iteration 1 that is ‘User Account’. The features in this iteration are User Sign-up, User-Login, Webpage design, Email Confirmation and Testing.

- Web-page design :
  - The user should view an attractive front page, effort needed is 3, time needed is 4 hours
  - The front page should have GUI features, effort needed is 8, time needed is 12 hours

    - The front page should have various pictures and video options, time needed is 8 hours
    - Total estimated time for this feature is 24 hours

- User-Signup
    - The user should be able to sign up with the website, effort needed is 3, time estimated to implemented this feature 8 hours
- User-Login
    - The user should be able to login to the website, effort needed is 3, time estimated to implement this feature is 8 hours
- Email-Confirmation
    - The user's account should be linked with their email to receive notifications, updates and email confirmation, effort needed is 5, and time estimated is 10 hours.
- Testing
    - Test cases are built and designed, effort needed is 2, time needed to build test cases is 6 hours
    - Test cases are implemented and tested, effort needed is 3, estimated time would be 8 hours
    - Total estimated time is 14 hours.

Time estimated to implement the user account feature is 24+14+8+8+10 = 64 Hours.

4.3 Time Estimation Ranges

By using the 3 point estimate, Time estimated to implement the user account feature is 65.66 Hours.

By using the Bottom up Approach, Time estimated to implement the user account feature is 24+14+8+8+10 = 64 Hours.

By this we can assume that the time required to build user account would be in the range (64 – 65.66) Hours.

5. Cost Estimation using Three Point Estimation and Bottom-Up Estimation

5.1 Three Point Estimation of Cost

To design the 'User Account Feature', we need 2 Programmers and 1 Software Engineer. Salary of a Programmer is $25 per hour and salary of a Software Engineer is $40 per hour. So the salaries for these two programmers is 2*$25 and 1 Software Engineer with salary 1*$40.

Total salary will be (2*25) + (1*40) = $90 per hour.

Based on figure 4.1, we will calculate the estimated cost for each feature.

Number	Feature	Best Case	Most likely	Worst Case	E = (a+4m+b)/6	SD = (b-a)/6	Est = E +(2*SD)
1	User Sign-up	360	540	720	540	60	660
2	User Login	360	540	720	540	60	660
3	Web-Page Design	1800	2250	2700	2250	150	2550
4	Email Confirmation	720	900	1080	900	60	1020
5	Testing	720	900	1080	900	60	1020
TOTAL (EST) – 5910							

Figure 5.1: Three Point Estimation of Cost Example

Figure 5.1 shows the example of Three Point Estimation of Cost. The Best Case (a), Worst Case (m) and Worst Case (b) are inputted for each features and then standard formulas are applied to calculate the total estimated cost for 'User Account'.

Cost estimated to implement the user account feature is $5910.

5.2 Bottom-Up Estimation of Cost

To design the 'User Account Feature', we need 2 Programmers and 1 Software Engineer. Salary of a Programmer is $25 per hour and salary of a Software Engineer is $40 per hour. So the salaries for these two programmers is 2*$25 and 1 Software Engineer with salary 1*$40.

Total salary will be (2*25) + (1*40) = $90 per hour.

As per Section 4.2, the total estimated time to implement a 'User Account' feature is 64 Hours.

So, cost estimated to implement the user account feature is 90*64 = $5760.

5.3 Cost Estimation Ranges

By using the 3 point estimate, Cost estimated to implement the user account feature is $5910.

By using the Bottom up Approach, Cost estimated to implement the user account feature is $5760.

By this we can assume that the cost required to build user account would be in the range ($5760 – $5910).

6. Comparison between Estimation Techniques

- Purpose
  - Analogous - Used with limited information available about the project
  - Parametric - Uses statistical relationship between historical data & variables
  - Three Point - Uses three estimates to calculate the average estimate
  - Bottom Up - Used when every detail about the project is available
- Accuracy
  - Analogous - Least accurate
  - Parametric - Accurate than Analogous
  - Three Point - Accurate than Analogous & Parametric
  - Bottom Up - Most accurate
- Speed
  - Analogous - Fastest
  - Parametric - Faster
  - Three Point - Average
  - Bottom Up - Time consuming

7. Planning

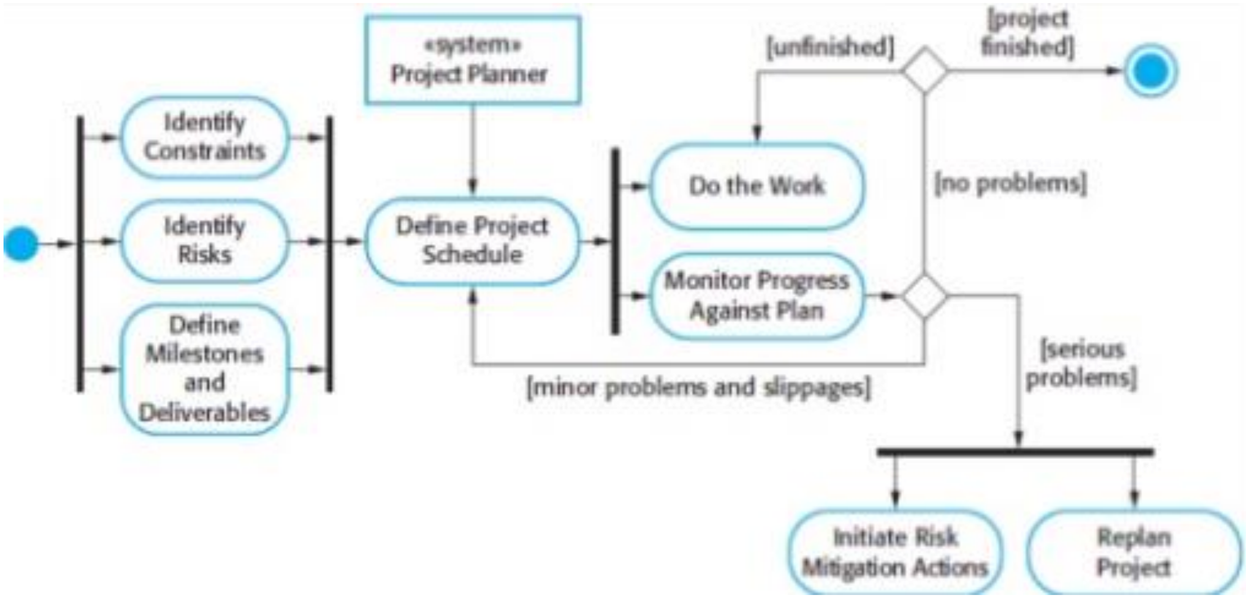

Figure 7: Planning

Planning begins before technical work starts, continues as the software evolves from concept to reality and culminates only when a software is retired. Objective of planning is to provide a framework for manager to make reasonable estimates of resources, costs and schedules.

Figure 7 shows the flow of planning of a project. When the project is initiated, three tasks are mainly done – identify constraints, identify risks and define milestones and deliverables. Then, when the project is in a bit progress, schedule of a project needs to be done by using project planner. Furthermore, the work is started and also we need to monitor progress against plan. Moving forward to it, we need to know whether there is any serious problem, minor problem or no problem. If there is any serious problem, then we need to initiate the risk mitigation actions and again plan the project. If there is any minor problem, then we need to again define the schedule of the project and then resume the work. If there is no problem, then we conclude that the project is finished.

Before starting a software project, it is essential to determine the tasks to be performed and properly manage allocation of tasks among individuals involved in the software development. Hence, planning is important as it results in effective software development.

Project planning is an organized and integrated management process, which focuses on activities required for successful completion of the project. It prevents obstacles that arise in the project such as changes in projects or organization's objectives, non-availability of resources, and so on. Project planning also helps in better utilization of resources and optimal usage of the allotted time for a project.

Planning activities are listed below:

- It defines the roles and responsibilities of the project management team members.
- It ensures that the project management team works according to the business objectives.
- It checks feasibility of the schedule and user requirements.
- It determines project constraints.

For effective project planning, some principles are followed. These principles are listed below:

- **Planning is necessary:** Planning should be done before a project begins. For effective planning, objectives and schedules should be clear and understandable.
- **Risk analysis:** Before starting the project, senior management and the project management team should consider the risks that may affect the project. For example, the user may desire changes in requirements while the project is in progress. In such a case, the estimation of time and cost should be done according to those requirements (new requirements).
- **Tracking of project plan:** Once the project plan is prepared, it should be tracked and modified accordingly.
- **Meet quality standards and produce quality deliverables:** The project plan should identify processes by which the project management team can ensure quality in software. Based on the process selected for ensuring quality, the time and cost for the project is estimated.
- **Description of flexibility to accommodate changes:** The result of project planning is recorded in the form of a project plan, which should allow new changes to be accommodated when the project is in progress.

8. Types of Planning Techniques

8.1 GANTT Chart

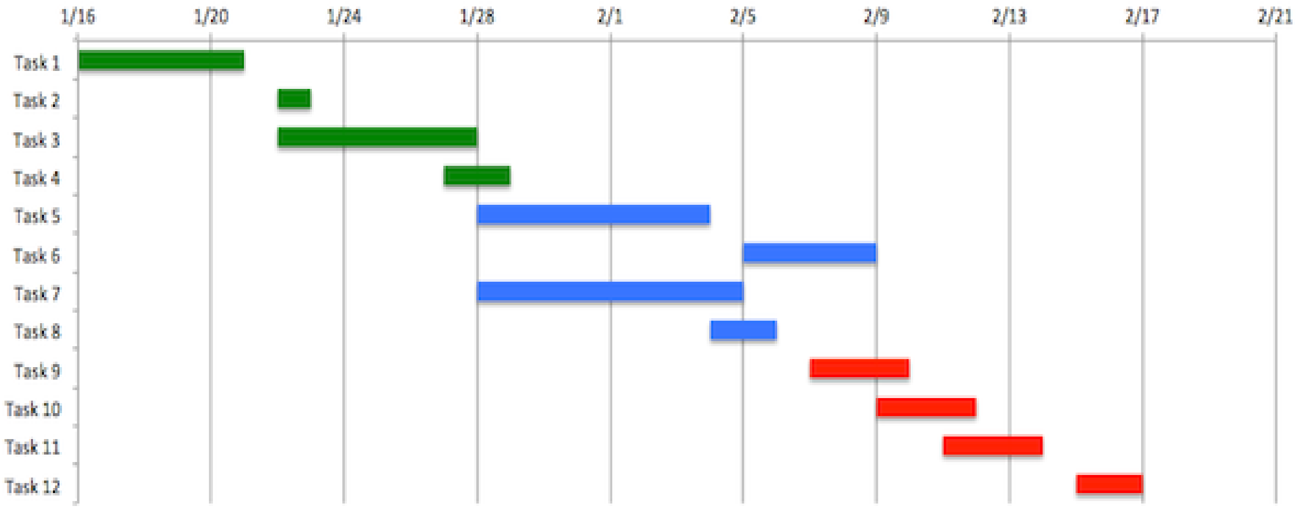

Figure 8.1 (a): Gantt chart

A Gantt chart, commonly used in project management, is one of the most popular and useful ways of showing activities (tasks or events) displayed against time. On the left of the chart is a list of the activities and along the top is a suitable time scale. Each activity is represented by a bar; the position and length of the bar reflects the start date, duration and end date of the activity.

Example –

In the following figure there are seven tasks, labeled A through G. Some tasks can be done concurrently (A and B) while others cannot be done until their predecessor task is complete (C and D cannot begin until A is complete). Additionally, each task has three time estimates: the optimistic time estimate (O), the most likely or normal time estimate (M), and the pessimistic time estimate (P). The expected time (TE) is estimated using the beta probability distribution for the time estimates, using the formula (O + 4M + P) ÷ 6.

Activity	Predecessor	Time estimates			Expected time
		Opt. (*O*)	Normal (*M*)	Pess. (*P*)	
A	—	2	4	6	4.00
B	—	3	5	9	5.33
C	*A*	4	5	7	5.17
D	*A*	4	6	10	6.33
E	*B*, *C*	4	5	7	5.17
F	*D*	3	4	8	4.50
G	*E*	3	5	8	5.17

Figure 8.1 (b): Activities and Expected Time – Gantt chart

Once this step is complete, one can draw a Gantt chart.

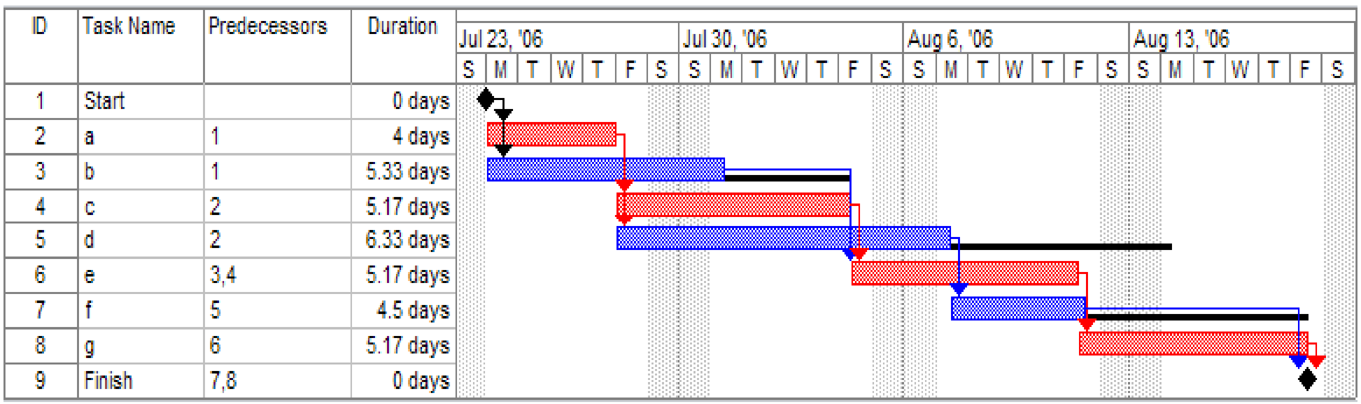

Figure 8.1 (c): Resultant Gantt chart

8.2 PERT Chart

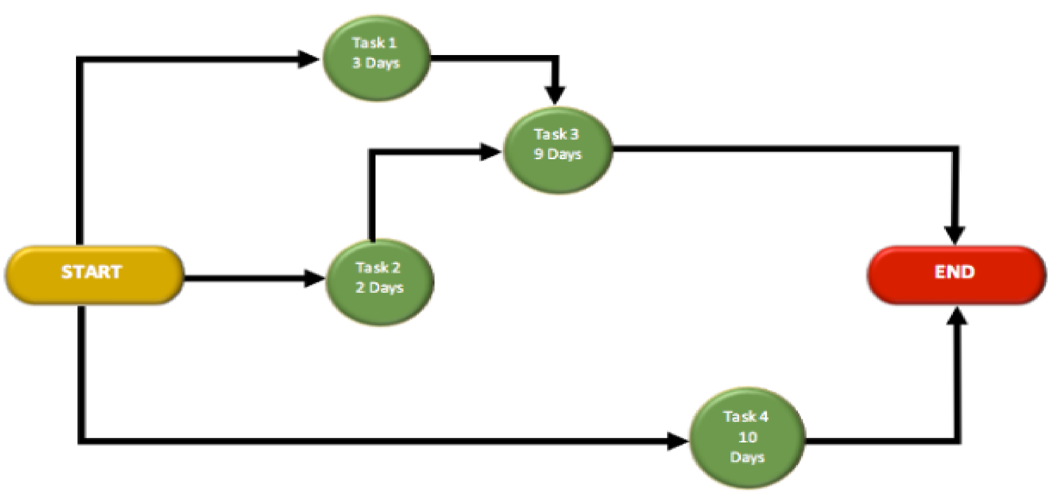

Figure 8.2(a): PERT chart

PERT which stands for Program Evaluation Review Technique is a business or organizational tool that is used for managing the projects and steps included in order to complete the project. It includes scheduling, coordinating and organizing the different steps of a project. PERT chart is a diagram that explains the beginning, duration, and steps included and finishing of a project. Figure 8.2 shows how PERT chart works. At the beginning of the project, the tasks are assigned and performed within the required days and then the project comes to an end.

Example –

Activity	Predecessor	Time estimates			Expected time
		Opt. (*O*)	Normal (*M*)	Pess. (*P*)	
A	—	2	4	6	4.00
B	—	3	5	9	5.33
C	*A*	4	5	7	5.17
D	*A*	4	6	10	6.33
E	*B*, *C*	4	5	7	5.17
F	*D*	3	4	8	4.50
G	*E*	3	5	8	5.17

Figure 8.2 (b): Activities and Expected Time – PERT chart

We need to determine the following things in order to create the PERT chart for figure 8.2 (b).

Early Start (ES) – maximum EF of all predecessor activities, unless the activity is the first activity, for which the ES is zero (0)

Early Finish (EF) – ES + duration

Late Start (LS) – LF − duration

Late Finish (LF) – minimum LS of all successor activities, unless the activity is the last activity, for which the LF equals the EF

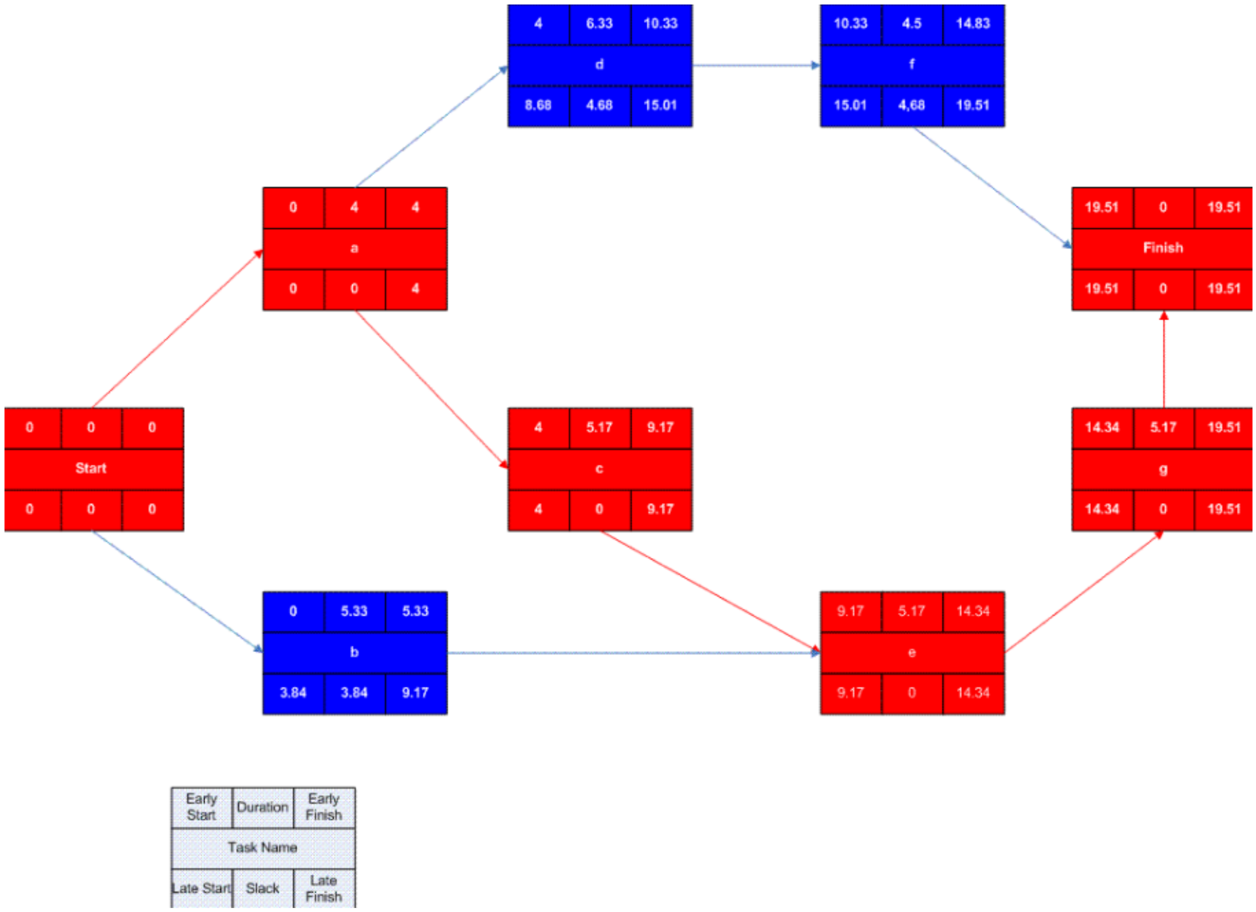

Figure 8.2 (c): Resultant PERT chart

9. BA Tool for Planning and Estimation

9.1 BA Tool Introduction

A tool called as 'BA Tool' is created to implement the concept of Project Planning and Estimation. This tool is basically used by large organizations where they have multiple projects to complete within a stipulated amount of time. This tool enables the organization to add as many projects as they have in order to have proper planning and estimation for each and every project.

For the project estimation, there are 2 things – Project Duration Estimation and Project Cost Estimation. Project Duration Estimation simply adds the details of the duration of the phases of the projects by inputting the phase name, maximum days to complete that phase and minimum days to complete that phase. For Example – 'Deployment' Phase will be completed in 8 days (maximum) or in 4 days (minimum). The average of maximum days and minimum days is then calculated to be on a safer side to complete the phase. All the phases of SDLC can be added along with the maximum and minimum days to complete. Project Cost Estimation simply adds the details of the costs that will incur when the project progress is going on. It inputs cost name and estimated cost. For Example – 'Fixed Costs' i.e. the costs required for office rental or setup of the business is estimated to have $8000. All types of costs can be added for a particular project.

For the project planning, there are 3 things – Add Modules, Add Roles and Assign Module to Role. In Add Modules, a module is added which belongs to a particular phase. For Example – 'HTML Integration' module is added which belongs to 'Coding' phase. In Add Roles, a role is added along with the role name, employee name and employee email. For Example – 'Database Administrator' role is added in which the employee is 'Shahrukh Khan' and his email id is 'akshayshahhabit@gmail.com'. In Assign Module to Role, task is being assigned to a role along with the task description and days to complete. For Example – 'HTML Integration' module is assigned to 'Shahrukh Khan' with 20 days to complete that module. Once the module is assigned to a role, the email will be sent to the employee's email id saying that he/she needs to complete that task in given amount of days. For Example – 'HTML Integration' task will be sent to 'akshayshahhabit@gmail.com'.

9.2 BA Tool Screenshots

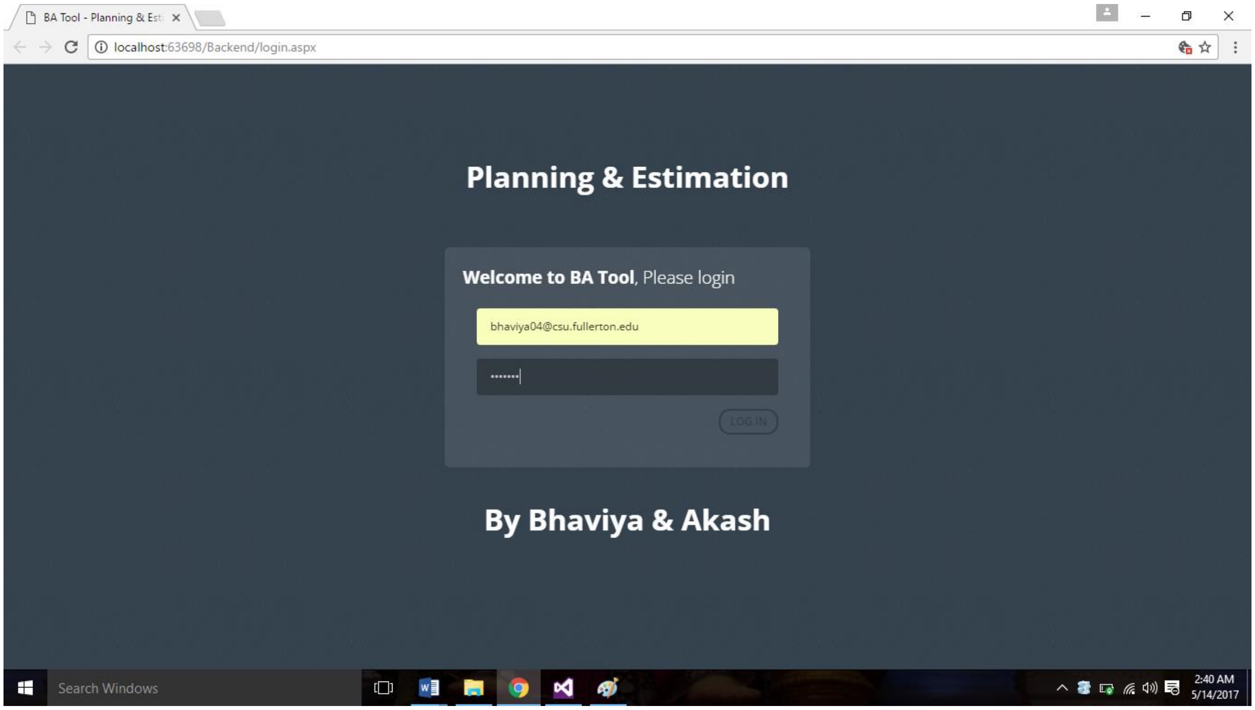

Figure 9.2 (a): Login Page

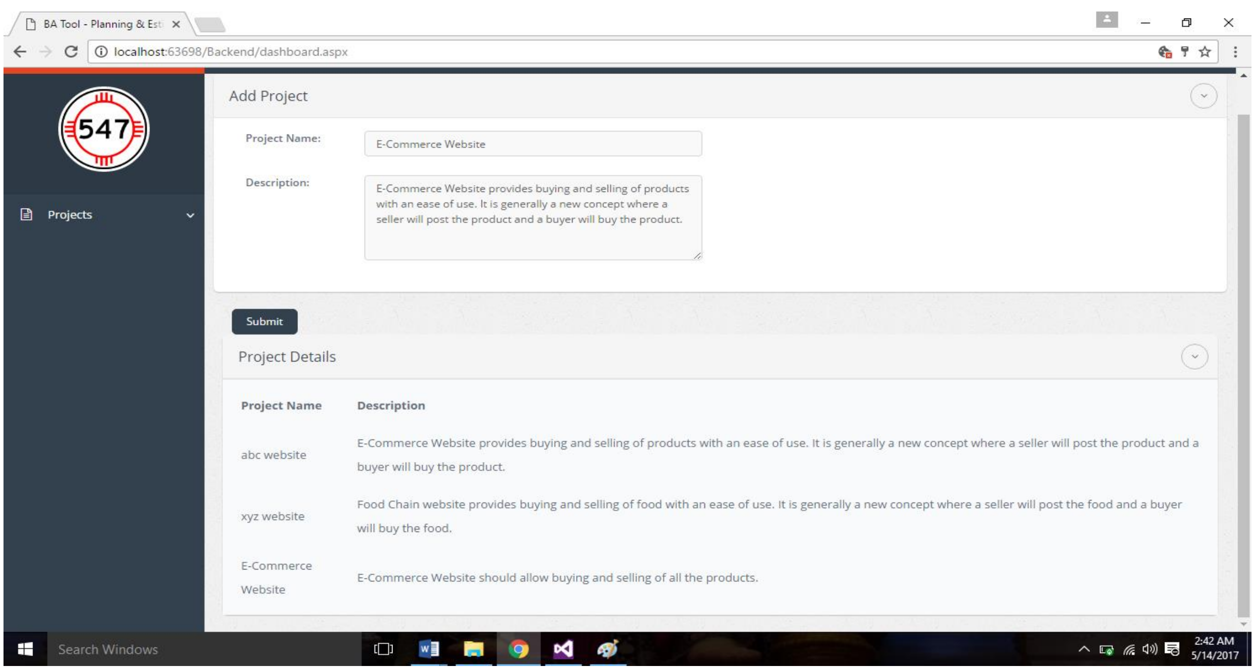

Figure 9.2 (b): Add Project Page

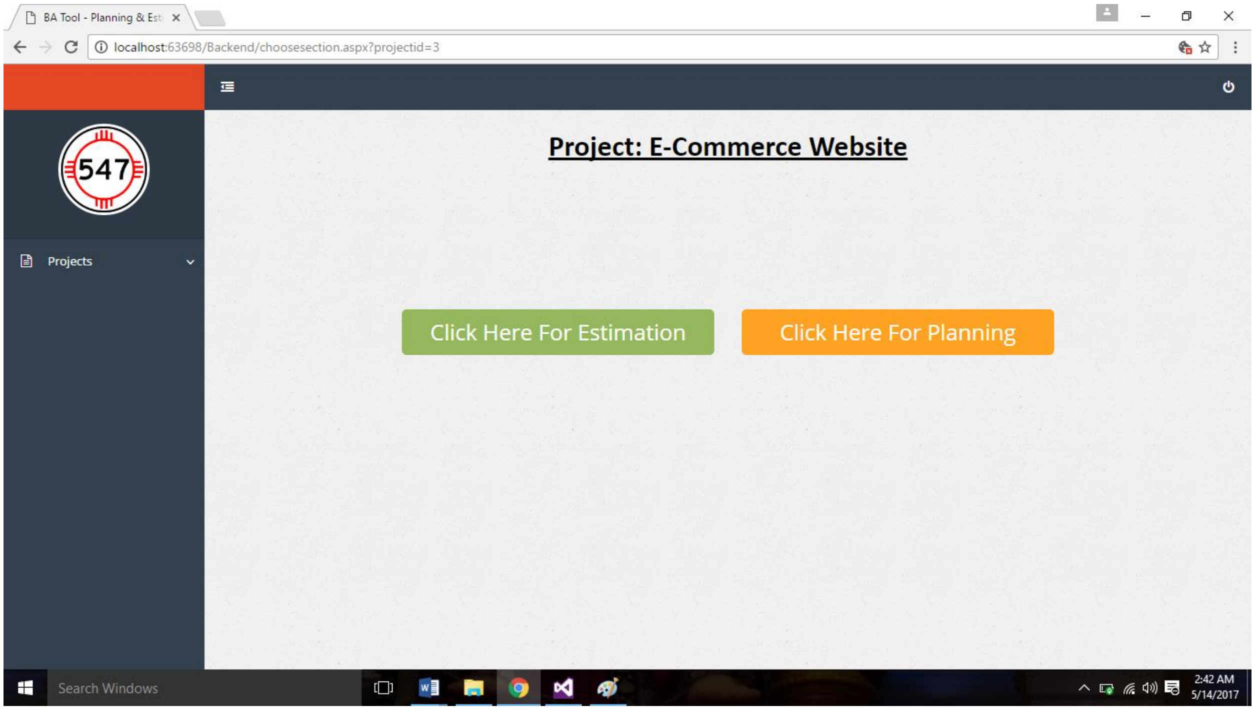

Figure 9.2 (c): Estimation/Planning Redirect Page

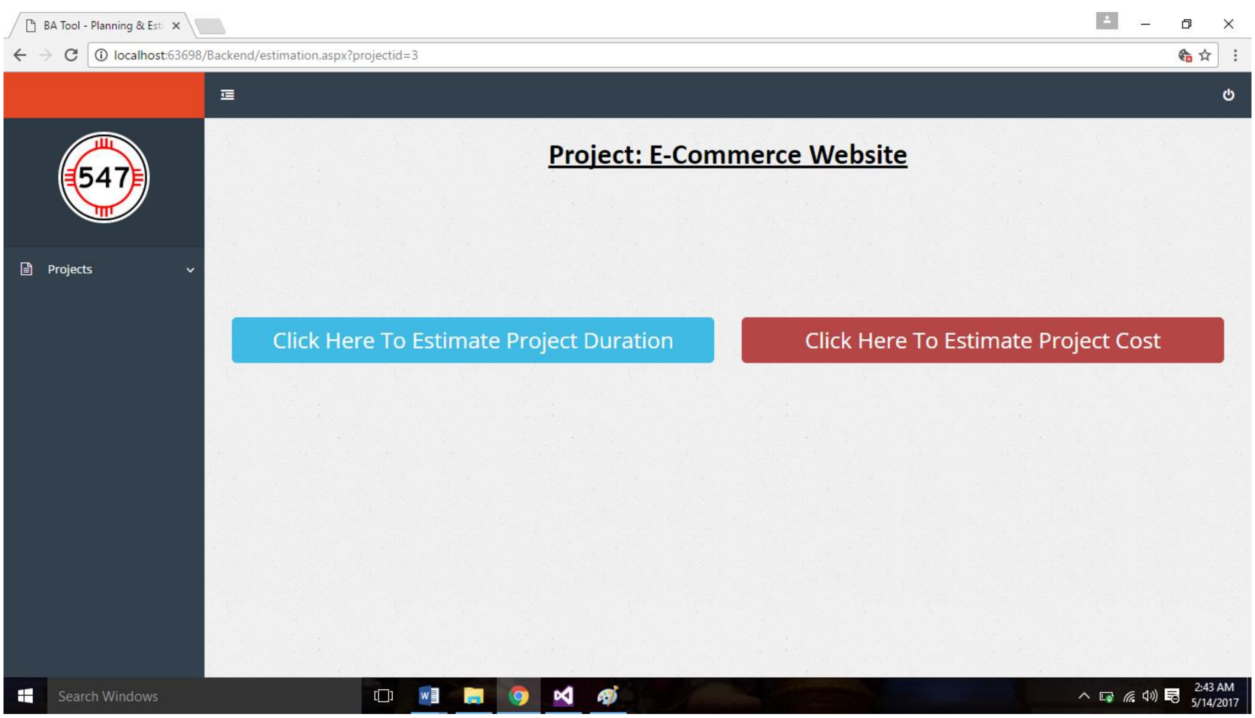

Figure 9.2 (d): Duration/Cost Estimate Redirect Page

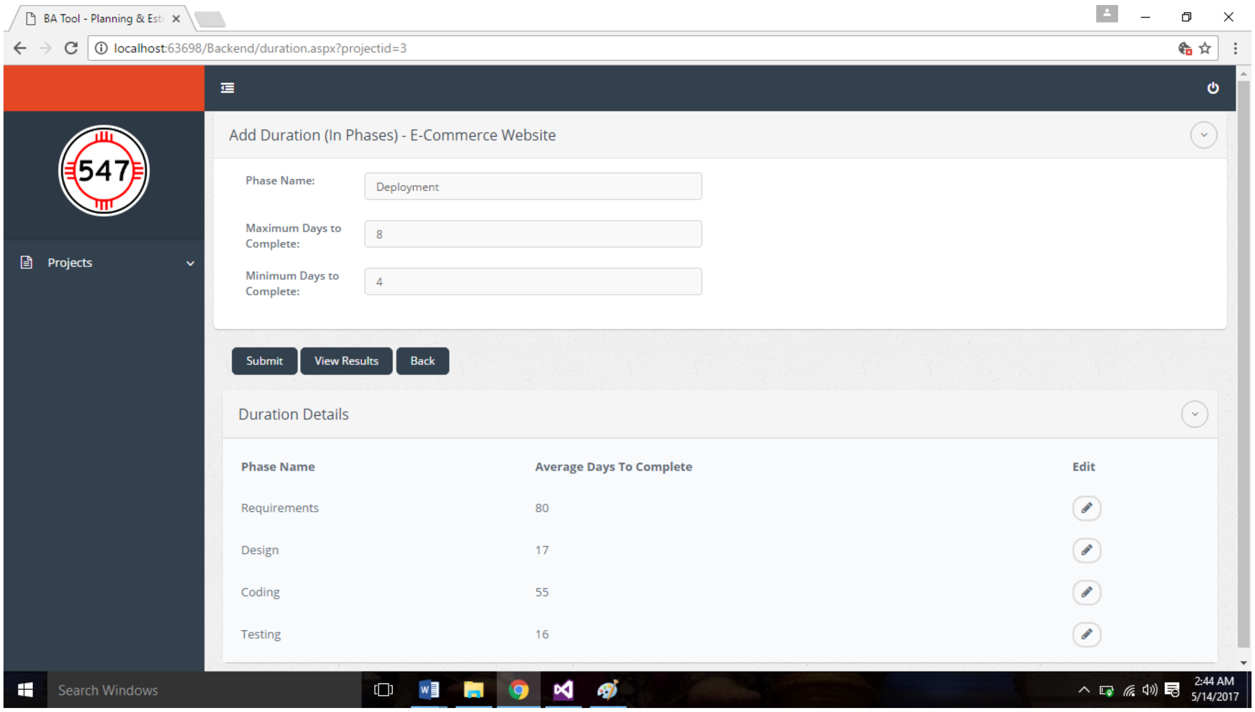

Figure 9.2 (e): Input Duration Details Page

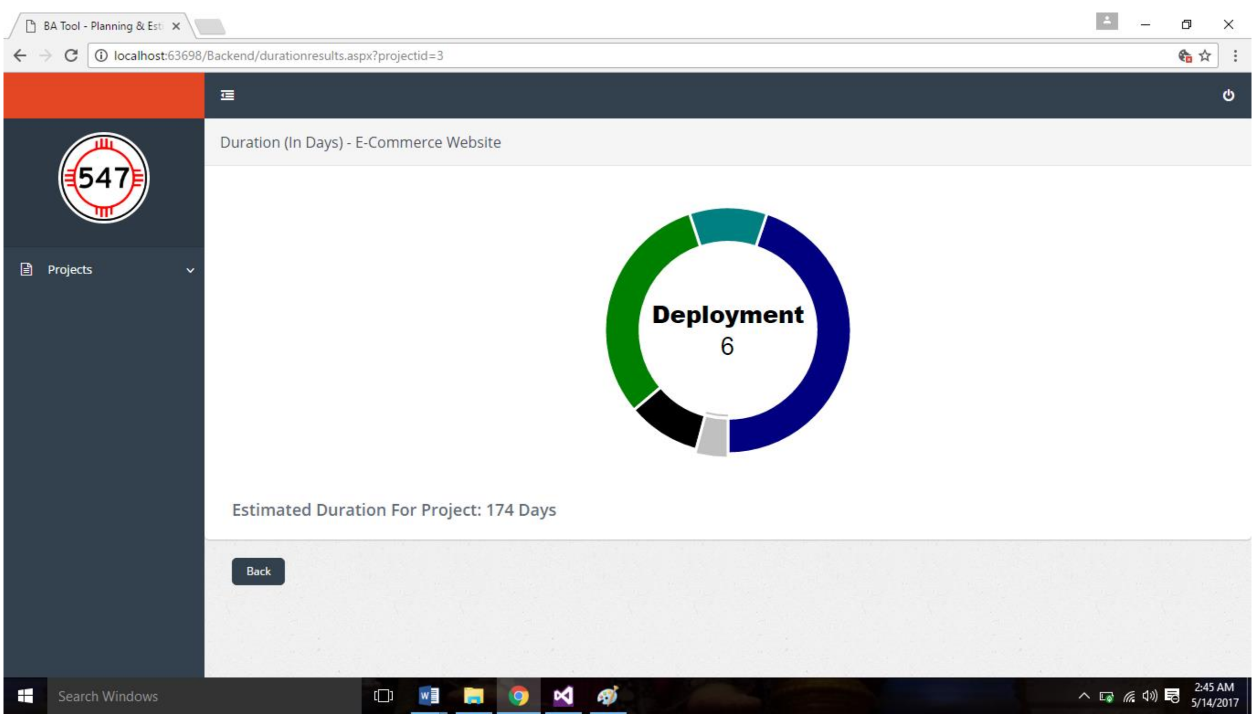

Figure 9.2 (f): Duration Results Page

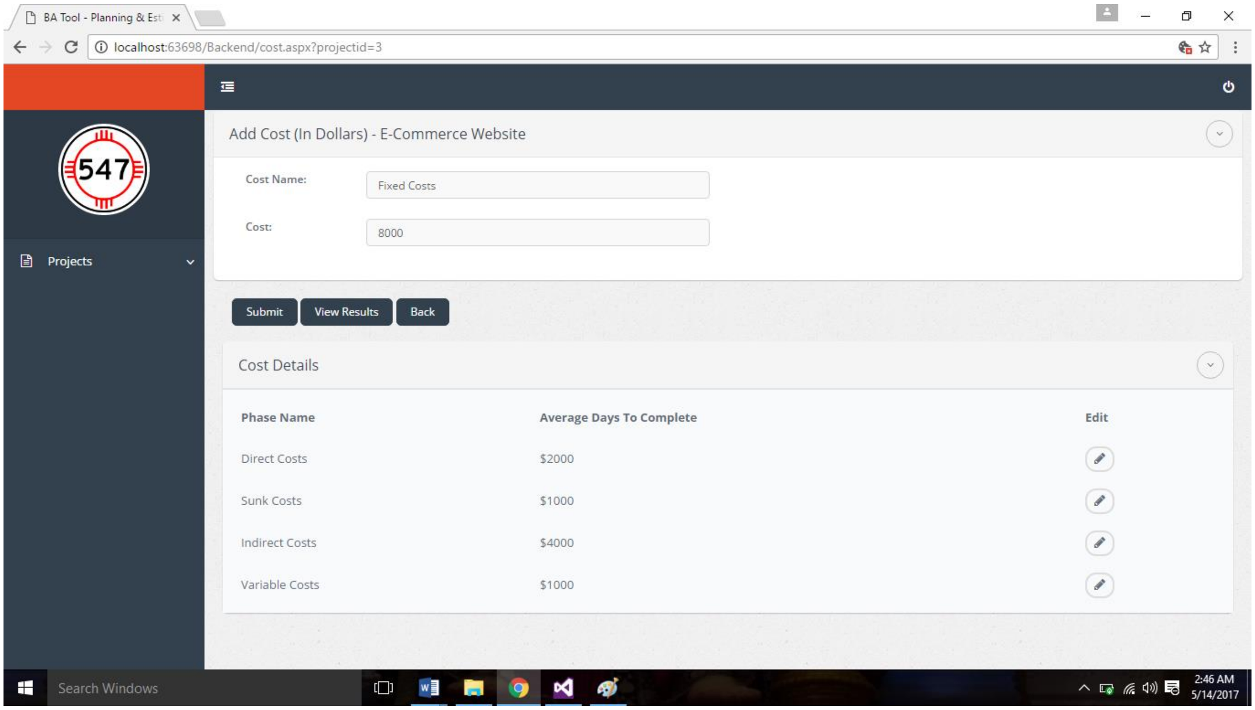

Figure 9.2 (g): Input Cost Details Page

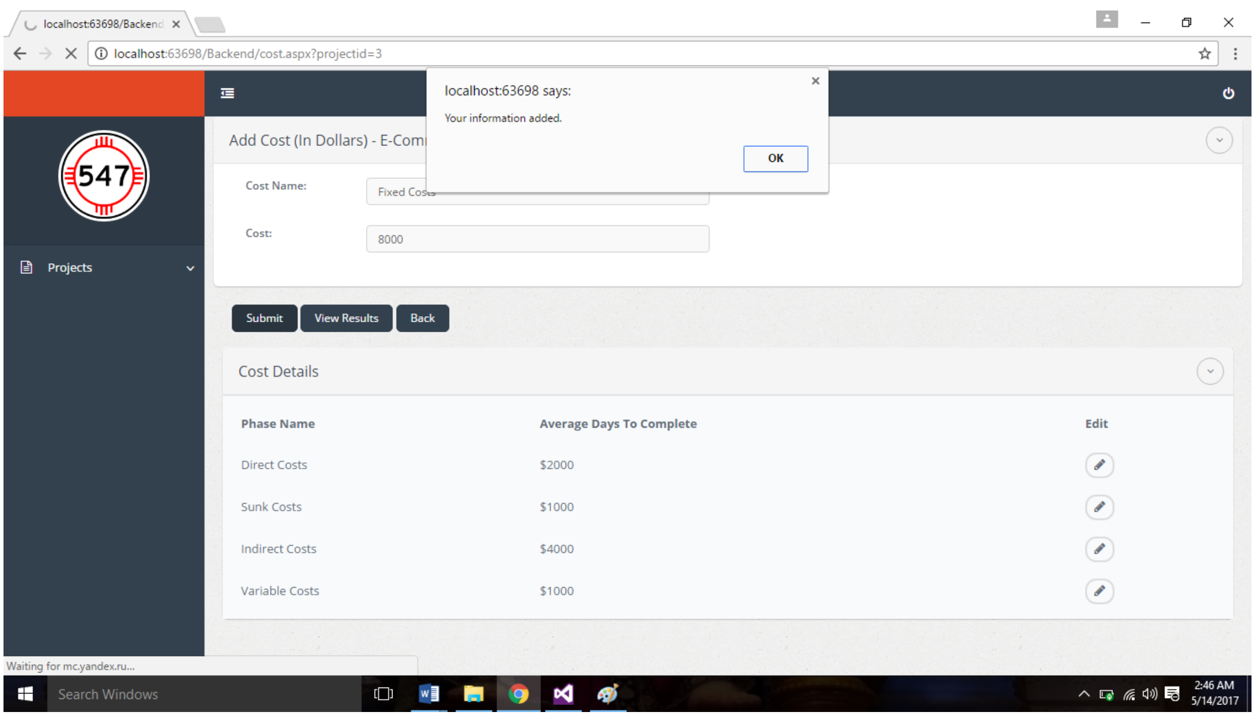

Figure 9.2 (h): Cost Details Added Page

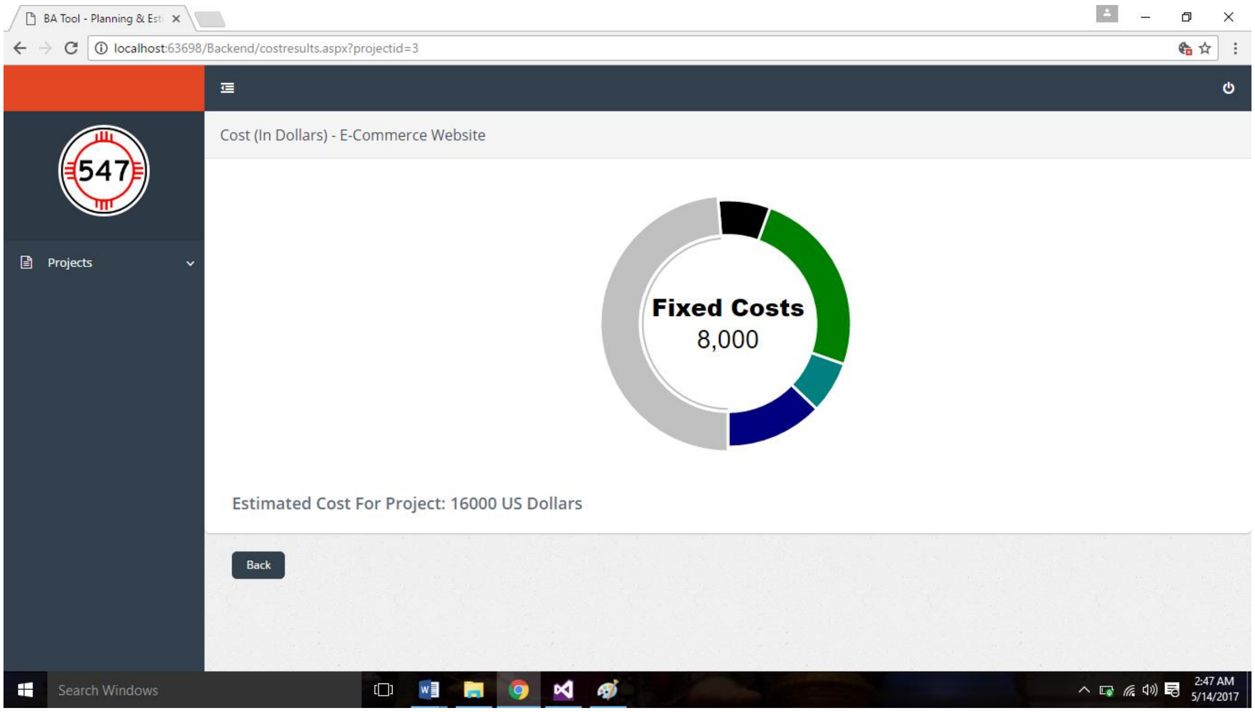

Figure 9.2 (i): Cost Results Page

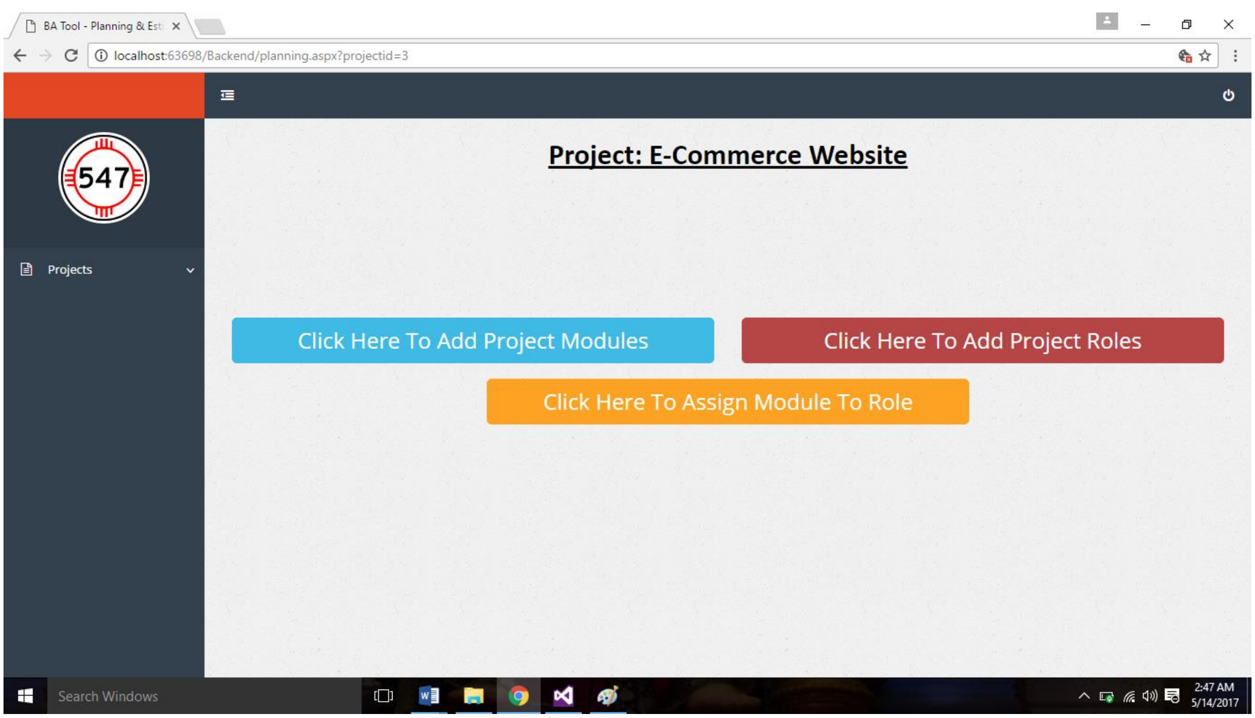

Figure 9.2 (j): Modules/Roles Redirect Page

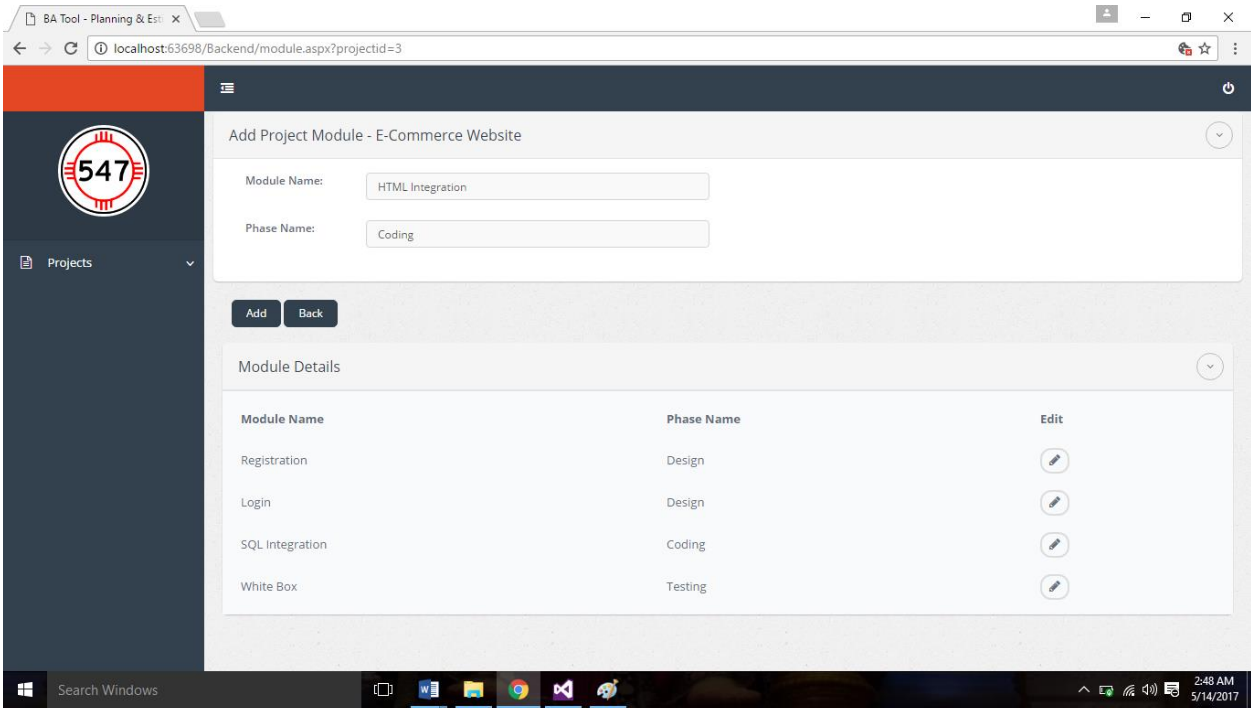

Figure 9.2 (k): Input Modules Page

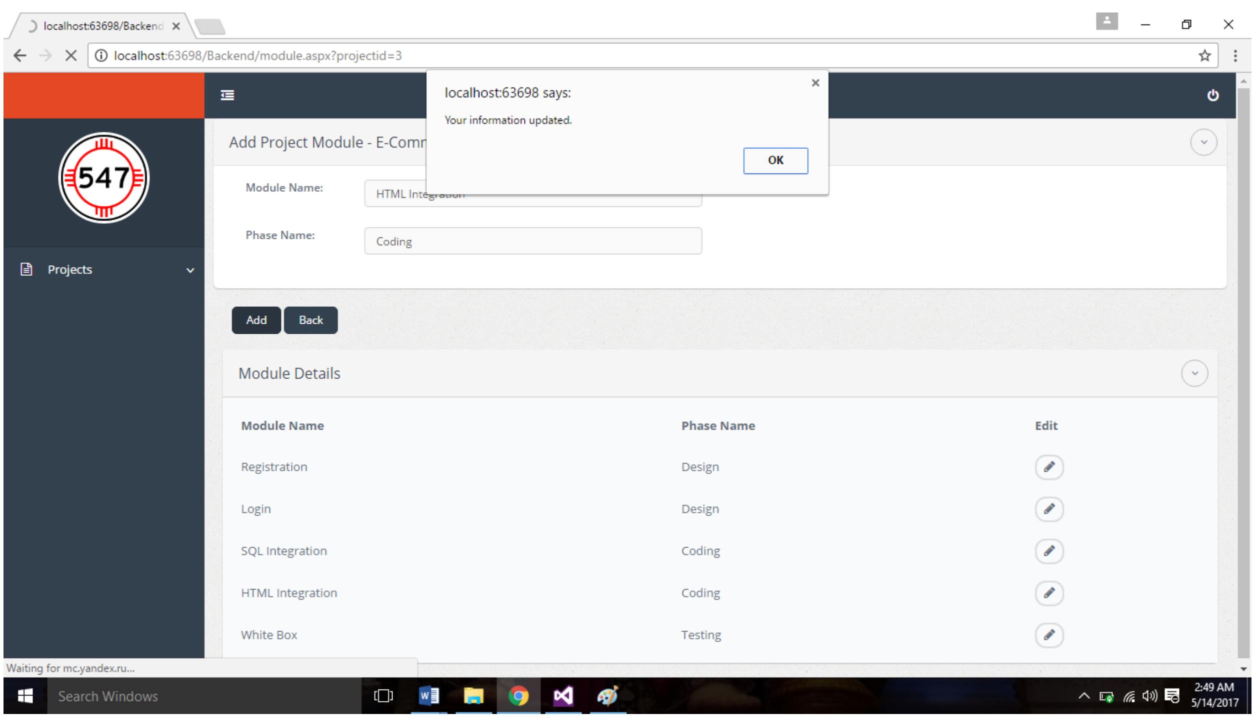

Figure 9.2 (l): Modules Updated Page

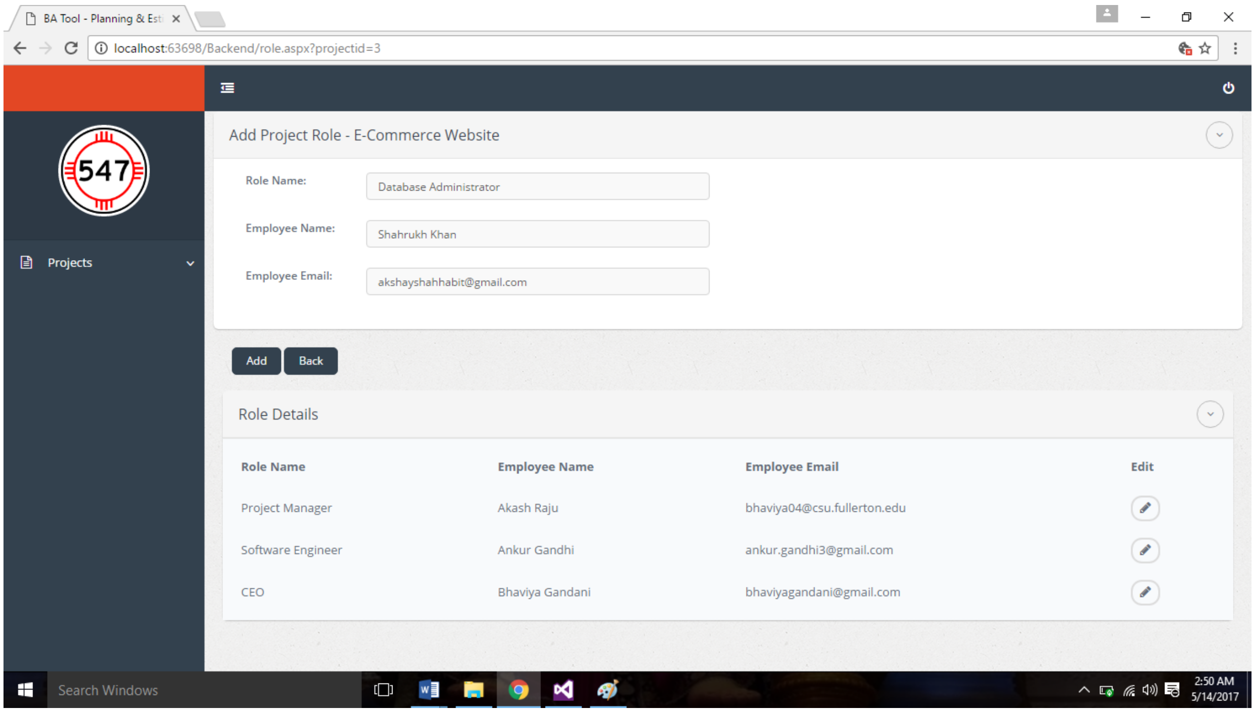

Figure 9.2 (m): Input Roles Page

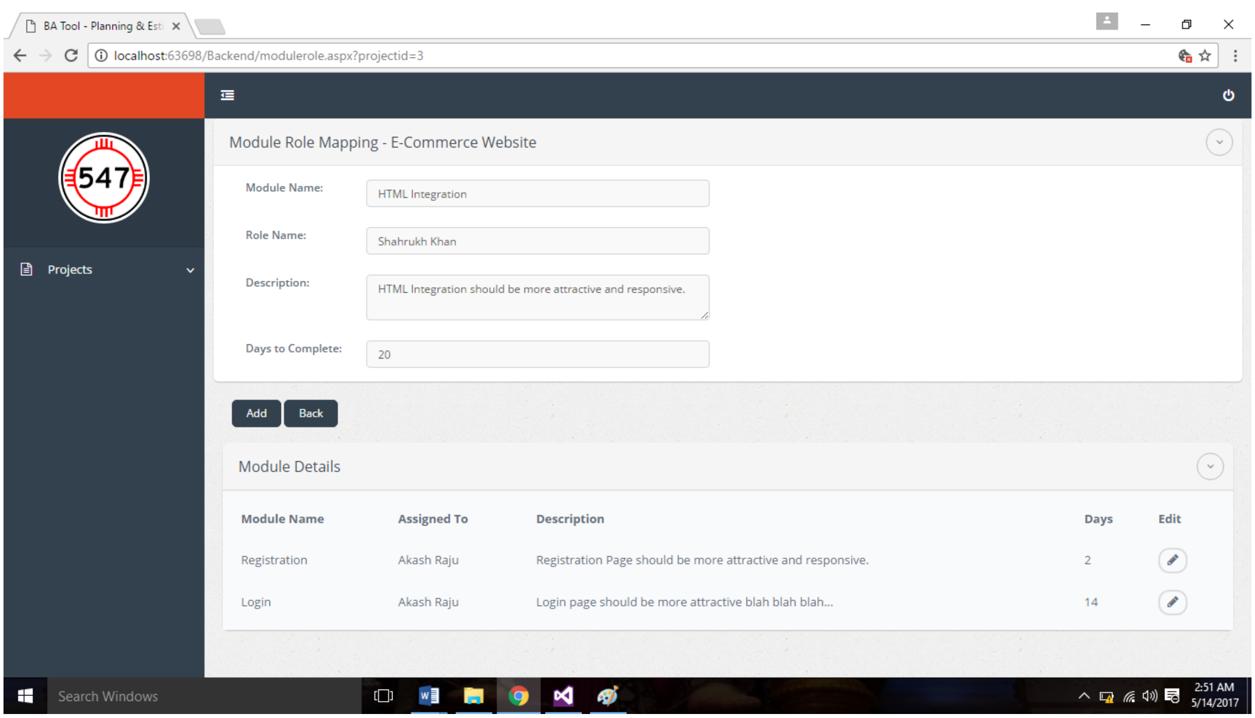

Figure 9.2 (n): Module-Role Mapping Page

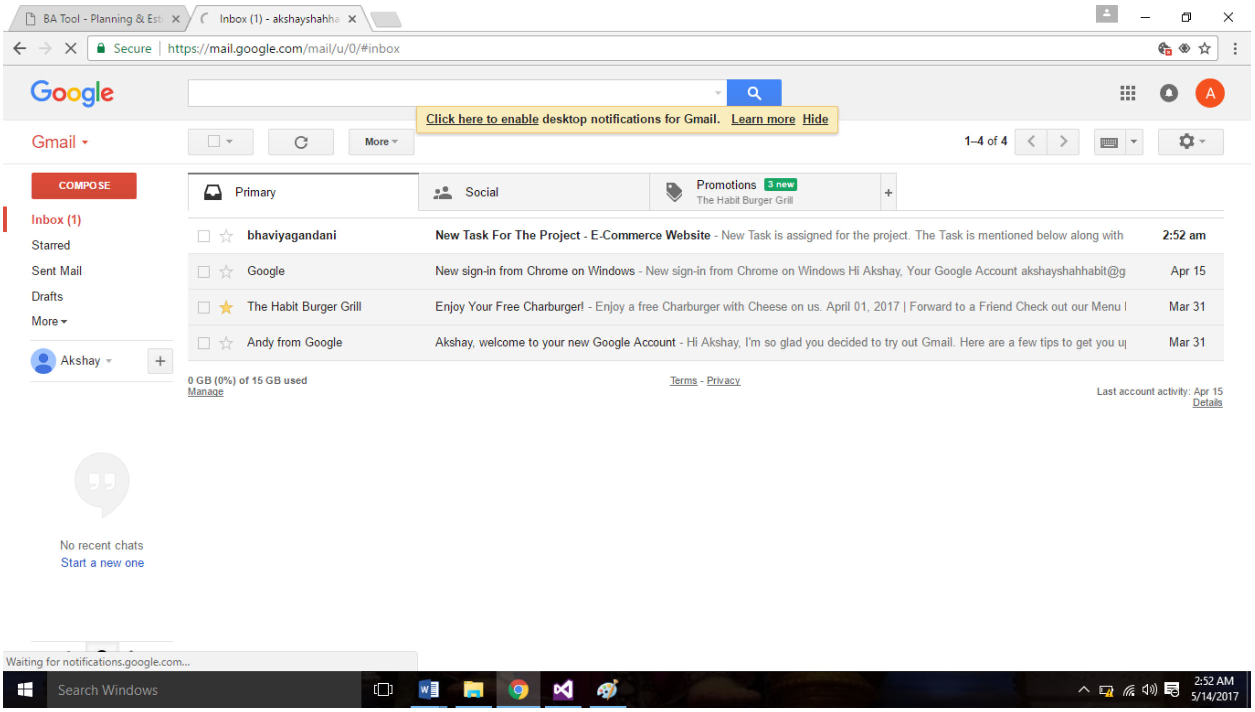

Figure 9.2 (o): Module Assigned to Role Email Page

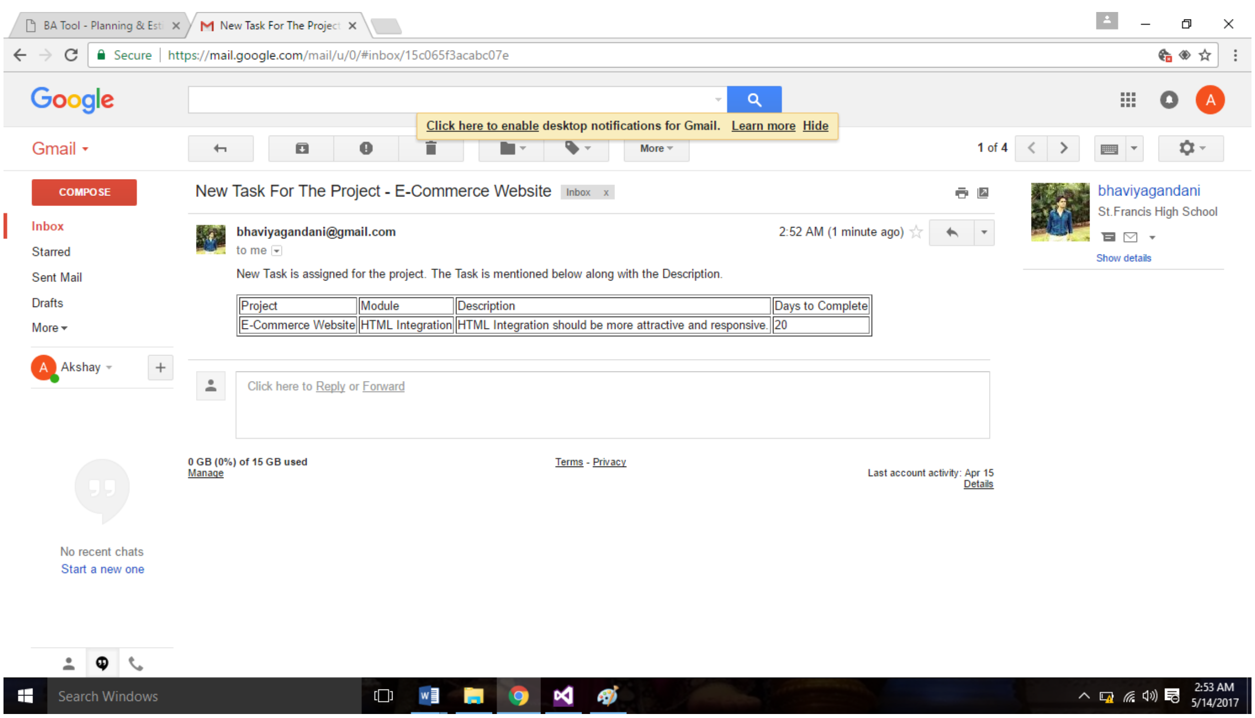

Figure 9.2 (p): Module Assigned to Role Email Details Page

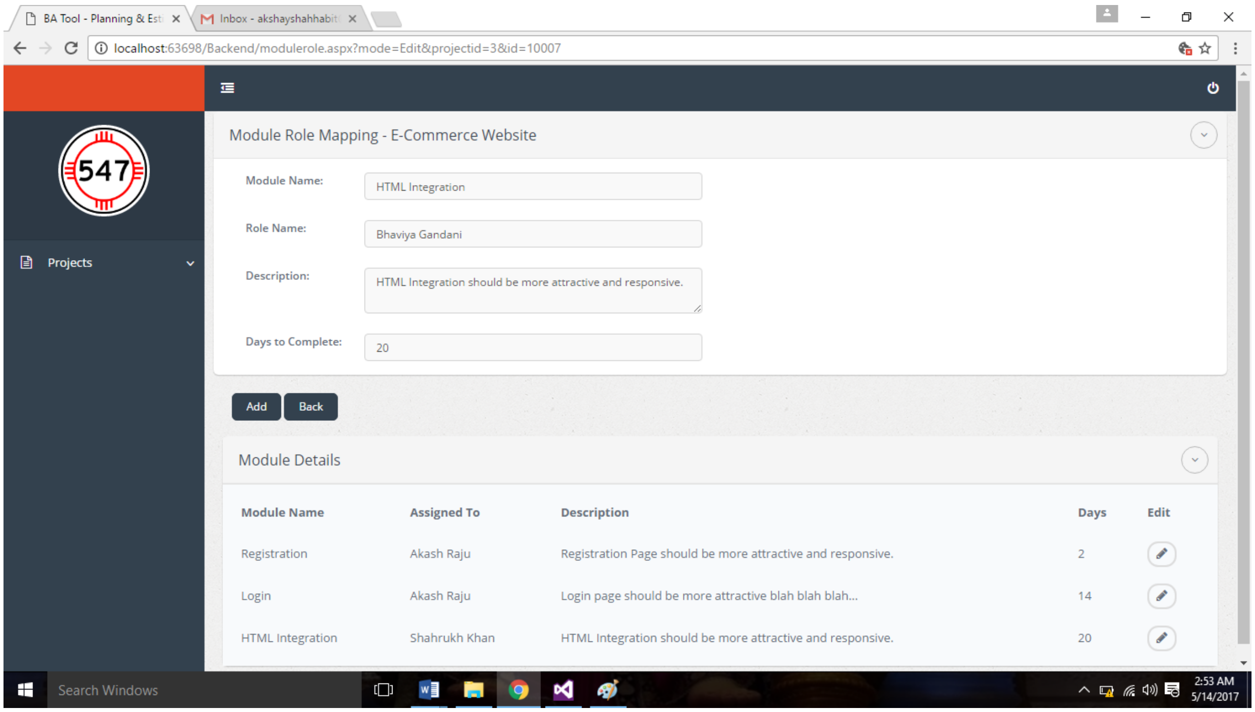

Figure 9.2 (q): Module Updated to different Role Page

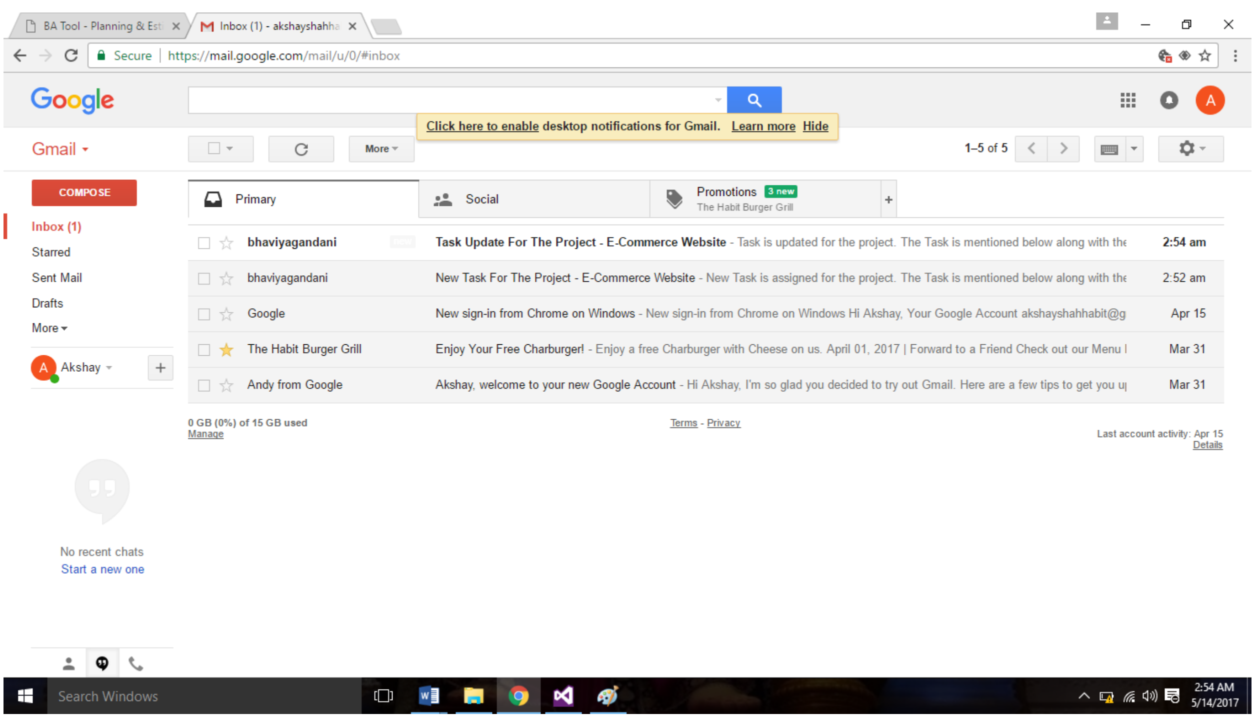

Figure 9.2 (r): Module Updated to different Role Email Page

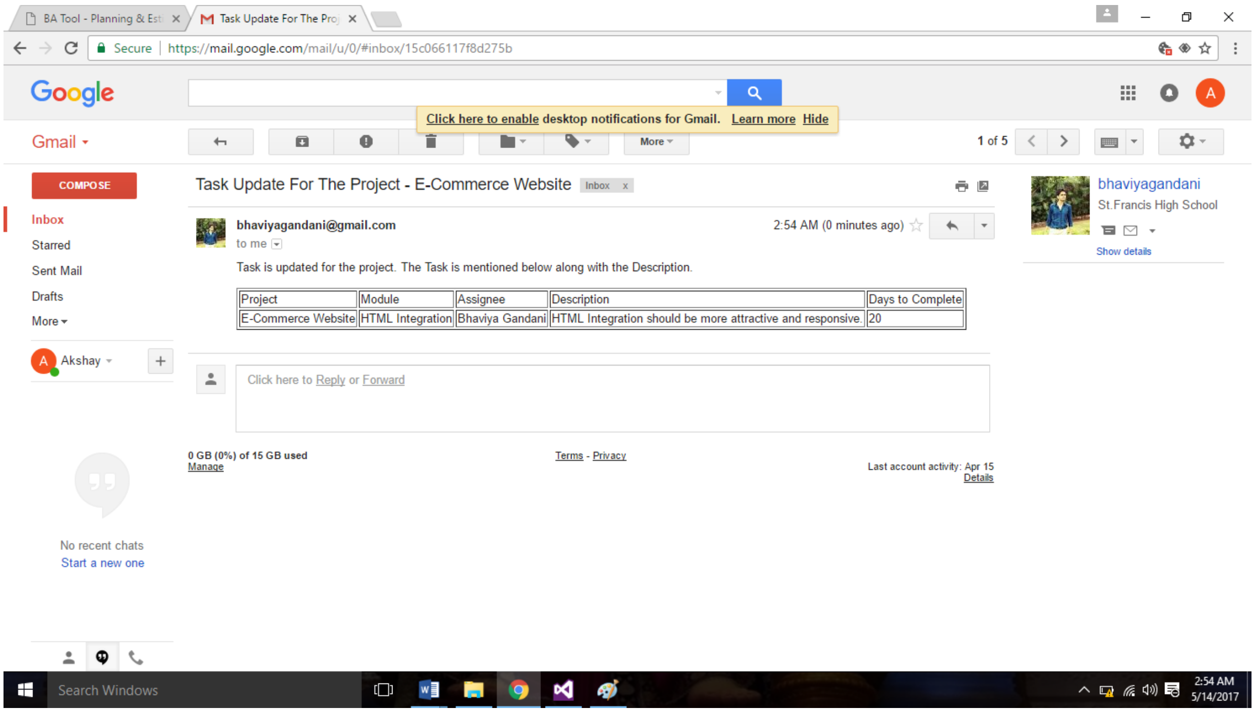

Figure 9.2 (s): Module Updated to different Role Email Details Page

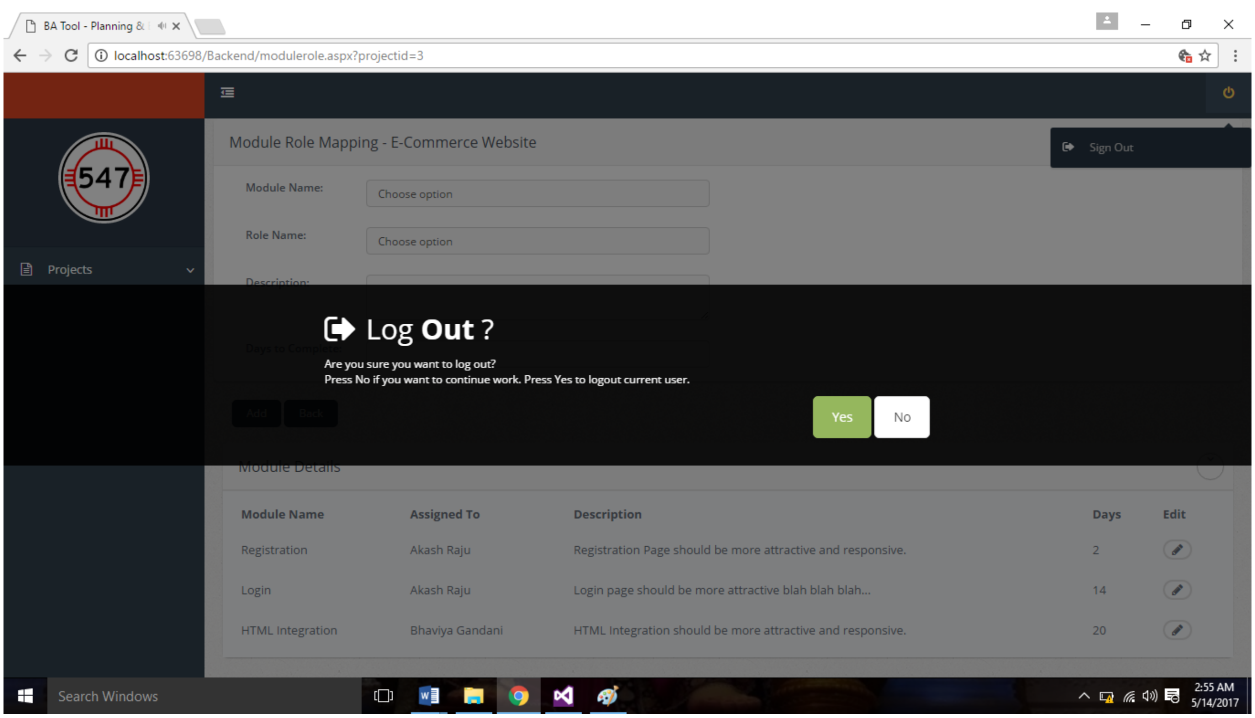

Figure 9.2 (t): Logout Page

9.3 BA Tool Programming Languages

- C#
- ASP.NET
- ADO.NET
- Microsoft sql server 2016
- Visual studio 2015 community
- Javascript
- Jquery
- Ajax
- Html

9.4 BA Tool Features

- Project planning & scheduling
- Team collaboration
- Project budgeting
- Time tracking
- Advanced analytics

9.5 BA Tool Advantages

- Flexibility
- Accurate
- Responsive
- Email inclusion
- Attractive user interface
- Striking pie chart

9.6 BA Tool Features to be added in future versions

- Task categories – bug, add-on feature, modify feature, etc
- Git integration
- More diagrams to be added to show the data diagrammatically
- Email alerts
- App to be created
- Messages

10.References

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