Digitized Engineering Notebook

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Abstract

In today’s world technology is advancing and changing rapidly and it is having a huge impact on our lives. Engineering notebook is a log book which is used by an engineer to record details about their projects, plans and laboratory work. The Digitize Engineering Notebook is an online web application that can be used instead of a paper notebook. The Digitize Engineering Notebook web application will allow users to store and retrieve records of data and images about previous and ongoing projects for easy access. The Digitize Engineering Notebook also allow users to create new projects edit existing projects online while working with their colleagues.

This website consists front page with a welcome message, a menu for navigation and administrator privilege for website administration. Also, it contains secure user login function to ensure the user has correct access privileges on the website. Display a list of existing projects and allow users to create new projects. Ability to add team members to the project. There will be web forms to enter detail logs and list the log entries in chronological order. Project logs can be download into a Microsoft Word document and into a PDF document. The user will be able to print project logs. There will be a file uploader to upload files such as text documents, sketches, and drawings. The calendar will show the events related to each day. The search function will help to find log entries within few seconds. Discussion board will help to team members to express their ideas and communicate, discuss, argue about certain logs. This website will allow multimedia elements such as pictures and videos embedded in web pages.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project Description</td>
<td>1</td>
</tr>
<tr>
<td>1.1. Competitive Information</td>
<td>1</td>
</tr>
<tr>
<td>1.2. Relationship to other projects</td>
<td>1</td>
</tr>
<tr>
<td>1.3. Assumptions and Dependencies</td>
<td>1</td>
</tr>
<tr>
<td>1.4. Future Enhancements</td>
<td>1</td>
</tr>
<tr>
<td>2. Technical Description</td>
<td>1</td>
</tr>
<tr>
<td>2.1. Project Architecture</td>
<td>2</td>
</tr>
<tr>
<td>2.2. Project Information Flow</td>
<td>2</td>
</tr>
<tr>
<td>2.2.1. User</td>
<td>2</td>
</tr>
<tr>
<td>2.2.2. Administrator</td>
<td>3</td>
</tr>
<tr>
<td>2.3. Interaction with other Applications</td>
<td>4</td>
</tr>
<tr>
<td>2.4. Application Capabilities</td>
<td>4</td>
</tr>
<tr>
<td>2.5. Risk Assessment and Management</td>
<td>4</td>
</tr>
<tr>
<td>3. Project Requirements</td>
<td>5</td>
</tr>
<tr>
<td>3.1. Identification of Requirements</td>
<td>5</td>
</tr>
<tr>
<td>3.2. Operations and Administrations</td>
<td>20</td>
</tr>
<tr>
<td>3.3. Security and Fraud Prevention</td>
<td>20</td>
</tr>
<tr>
<td>3.4. Release and Transition Plan</td>
<td>20</td>
</tr>
<tr>
<td>4. Project Design Description</td>
<td>20</td>
</tr>
<tr>
<td>4.1 Data Flow</td>
<td>20</td>
</tr>
<tr>
<td>4.1.1. Add Projects</td>
<td>20</td>
</tr>
<tr>
<td>4.1.2. Add Team Members to Projects</td>
<td>20</td>
</tr>
<tr>
<td>4.1.3. Add Logs</td>
<td>20</td>
</tr>
<tr>
<td>4.1.4. Add Comments</td>
<td>21</td>
</tr>
<tr>
<td>4.1.5. Add Events</td>
<td>21</td>
</tr>
<tr>
<td>4.2. Database Design</td>
<td>21</td>
</tr>
<tr>
<td>5. Project Internal and External Interfaces</td>
<td>22</td>
</tr>
<tr>
<td>6. Project Design Units</td>
<td>26</td>
</tr>
<tr>
<td>6.1. User</td>
<td>26</td>
</tr>
<tr>
<td>6.1.1. Project</td>
<td>26</td>
</tr>
<tr>
<td>6.1.2. Logs</td>
<td>26</td>
</tr>
<tr>
<td>6.1.3. Comment</td>
<td>26</td>
</tr>
<tr>
<td>6.1.4. Event</td>
<td>26</td>
</tr>
<tr>
<td>6.2. Administrator</td>
<td>26</td>
</tr>
<tr>
<td>6.2.1. Add/Update/Delete User</td>
<td>26</td>
</tr>
<tr>
<td>6.2.2. Add/Update/Delete Projects</td>
<td>26</td>
</tr>
<tr>
<td>6.2.3. Add/Update/Delete Logs</td>
<td>26</td>
</tr>
<tr>
<td>6.2.4. Add/Update/Delete Events</td>
<td>26</td>
</tr>
<tr>
<td>6.2.5. Add/Update/Delete Title</td>
<td>27</td>
</tr>
<tr>
<td>7. References</td>
<td>28</td>
</tr>
</tbody>
</table>
1. Project Description

The Digitized Engineering Notebook is a web application which will allow users to document their ideas, inventions, and progress of their ongoing projects. This web application also allows users to retrieve records of data, log files and images about previous and ongoing projects for easy access. Digitize Engineering Notebook web application allow users to create new projects edit existing projects online while working with their colleagues.

1.1. Competitive Information

There are few websites available to use as an engineering notebook. The EDN.com website can be used as an engineering notebook. By developing the Digitized Engineering Notebook web application, we are trying to build more competitive and more user-friendly web application with more functionalities compared to the web applications currently available in the market. Adding more functionalities to the Digitized Engineering Notebook web application will make it the much better and user-friendly. So, it can give a tough competition to the other competitors.

1.2. Relationships to other projects

As specified earlier the Digitized Engineering Notebook web application being developed likely to other online engineering notebooks available in the market. We carefully studied all the functionalities provided by existing engineering notebook web applications and tried to implement all the functionalities to the Digitized Engineering Notebook. Moreover, we have added few additional functions to improve user-friendliness and better accessibility for the users.

1.3. Assumptions and Dependencies

The following assumptions are being made during the development of the web application.

- The Digitized Engineering Notebook web application is expected to complete in time with four team members.
- Four team members should work together to complete the project including project planning, designing, implementation and testing within the given time framework.

The only dependency which we identified during the development of the web application is that it will depend on four human resources and failure to work as a team will lead to a project failure.

1.4. Future Enhancements

At present users can upload external images, sketches and other data files into their projects. In future, we are planning to develop an online diagram editor to draw diagrams such as data flow diagrams and activity diagrams. In future, we also going to build a text editor to write different programming languages.

2. Technical Description

The Digitized Engineering Notebook web application is developed using the ASP.Net 4.5 as the application language and Microsoft SQL Server 2016 as the database. The Visual Studio 2015 and
MS SQL Server 2016 Management Studio are used during the process of developing this web application. HTML, CSS, Bootstrap and JavaScript are used for designing the web application.

2.1. Project Architecture

The project is being developed by using the three-tier architecture where the code is divided into three layers and each tier has its own functionality. The three-tier architecture is a client-server software architecture. The presentation tier gives a user access to the application. The Logical tier also called as middle tier consists with business and data rules, process commands, make logical decisions. The data tier interacts with the data stored in the database. The below diagram shows how the three-tier architecture works.

![Project Architecture Diagram](image)

Figure 1 – Project Architecture

2.2. Project Information Flow

The following diagrams describe the flow of control from one page to another page between different users having different levels of authorization. As described earlier the Digitized Engineering Notebook web application has two different levels of users. They are mentioned bellow.

- User
- Administrator

2.2.1. User

Any user can sign in to the Digitized Engineering Notebook web application using their username and password. If a user does not have an account he/she can sign up and create a new account. After login into the web application Users can create projects, add team members to their projects, create logs, add logs to the assigned projects, comments on the logs, create events and invite team members to the upcoming events.
2.2.2. Administrator

The administrator is a super user in this web application. The administrator can view all the user details, projects, logs, and events. The administrator can update or delete existing user details, projects, logs, and events.
2.3. Interaction with other Applications

The Digitized Engineering Notebook web application using personal Gmail account to send and receive emails to communicate with users. In future, we are going to buy an email server. That way we do not have to depend on the third-party email servers. So, we can ensure the security of the sensitive information communicates through emails.

2.4. Application Capabilities

The Digitize Engineering Notebook is an online web application that can be used instead of a paper notebook. The Digitize Engineering Notebook web application will allow users to store and retrieve records of data and images about previous and ongoing projects for easy access. The Digitize Engineering Notebook also allow users to create new projects edit existing projects online while working with colleagues. The below is the list of features or the actions being implemented in the application.

- User Sign In/ Sign Up for better security of the website.
- Forgot password function to recover the password if a user forgets his/her password.
- Display a list of existing projects and allow users to create new projects.
- Ability to add team members to the project.
- There will be web forms to enter detail logs and list the log entries in chronological order.
- Project logs can be download into a Microsoft Word document and into a PDF document.
- The user will be able to print project logs.
- There will be a file uploader to upload files such as text documents, sketches, and drawings.
- Create events required to each project.
- Add and invite project members to the future events.
- The calendar will show the events related to each day.
- The search function will help to find projects, events within few seconds.
- Discussion board will help to team members to express their ideas and comments.
- Admin privileges to website administration.

2.5. Risk Assessment and Management

Delivering the project on time is the biggest risk and challenge our team had to face. Due to the complexity of the project, time limitation and limited resources are the main factors our team faced during the development life cycle of this project.

Resource limitation is one of the main risks our team had to face. Somehow our team managed to complete the all the requirements of the project on time. If any project member does not participate and does not put their effort on the project, it will not only decrease the speed of the project but also create additional workload to the other members.

If the product does not meet the minimum quality requirements it has a probability to fail. Our team members control the quality of the product from the beginning. We use standard methods and good practices to maintain the quality of the product.

The security of the user credentials and data are most valuable assets in this web application. So, our development team had to put so much effort to enforce all the security measurements as possible.
3. Project Requirements

The requirements for the project are based on the guidelines given. All the mandatory requirements and validations are completed. Project requirements are listed below.

3.1. Identification of Requirements

<DigitizedEngineeringNotebook-1-UserLogin-1>

Existing users can sign using their username and password on the sign-in page. New users will use the sign-up section in the sign-in page. In the sign-up section, users would require to fill all the required fields of user first name, last name, email, password and confirm the password. All these fields are required fields which will be validated to check if they are filled and not left empty as well as if they are filled correctly.

Sign-In/ Sign-Up page

- All the required fields should be filled by the user.
- Existing users should enter the email address and password to sign-in to their account.
- User Email address is unique and if any user registered he/she cannot reuse the same email address to create a new account.
- Password and confirm password should be same in the sign-up section. Otherwise, it will give an error message.
- User password should be minimum five characters, at least one alphabet character, at least one number and one special character.
- In the sign-up section, it is checking whether it is a valid email format.
- When user filled all the required fields in the sign-up section then it will create a new account.
- When new users registered successfully confirmation email is going to send to their email address.
Figure 4 – User Sign In / Sign Up Page

Figure 5 – User Registration Email Confirmation
Password Recovery

- If users forgot their password they can recover the password by entering the email address.
- After submitting the email address in the following text box user will receive an email to recover the password.
- The user needs to login to the email account and clicks on link send by the Digitized Engineering Notebook.
- After clicking on the link user will be redirected to the password reset page. The user needs to provide a new password.
- The user must provide the same password in both password and confirm password text boxes.
- After user insert the same password in both new password and confirm new password text boxes new password will be updated in the database. After that user will automatically redirect to the user login page.
- For better security passwords are encrypted and stored in the database.

Figure 6 – Password Reset Link
Figure 7 – Password Reset Page

Figure 8 – All Passwords Are Encrypted
When a user signs into the Digitized Engineering Notebook web application he/she will be redirected to the home page. There is a dashboard, user profile, event calendar, ongoing projects and upcoming events. The user also can search projects and events from the home page.

![Figure 9 – Home Page](image)

This feature enables the user to create a new project. Users also can view or delete existing projects. Users need to fill all the required fields. By adding a project name, description, start date, and end date user can create a new project.

![Figure 10 – Add Project Page](image)
After creating a new project, users can assign members to that project. To do that, the user needs to select the project from the drop-down list and enter the email address of the team members one by one. As soon as user assign a team member to a project that team member will receive an email notification about the project assigned.

![Add Members to the Project](image)

**Figure 11– Add Members to the Project**

Users can view the team members of the project by clicking on the project id. This project id is a link button. When the user clicks on the project id team members will be shown in the team members panel grid view.

The project owner can delete the projects. When a user clicks on the delete link button project will be inactive. It will be remaining in the database as an inactive project. If the user needs to recover the deleted project he/she can request the administrator to recover the deleted project. The administrator can change the project status and recover the project.
In this webpage, the users can add logs to the projects they have created. First, users need to select the project from the drop-down list which they need to add a new log. After that user needs to input values to all the required fields. If required users also can upload any kind of files such as Word documents, PDF documents, images, zip files. Users can view existing logs, download log files into a Word document or PDF document and print the log files without downloading them.
Users can update log name and log description. In the update logs section, there will be a drop-down list to select the log name. After selecting the log name, users can change the log name or log description or both.

![Figure 14 – Update Logs](image)

Users can add comments to each log. This discussion board will help to team members to express their ideas and comments. When a user adds a comment, user’s name, date, time, and the comment will be shown to all the members assigned to that project.

![Figure 15 – Add Comments to Logs](image)
Print log function allows users to print their logs easily. Users can easily choose the log that they need to print and click on the print button to print it.

Figure 16 – Print Logs

Users can download the logs into a Microsoft Word document. They can save the download logs.

Figure 17 – Download logs into MS Word
Users can download the logs into a PDF document. They can save the download log files.

![Figure 18 – Download logs into PDF](image)

This feature allows users to create events related to the projects. First, the user must select the project from a drop-down list. Then users can create a new event by filling all the required fields.

![Figure 19 – Add Events](image)
After creating an event, user can add members to the event. To invite members for an upcoming event, the user needs to select the event name from the down-down list on the add members to the event panel. After that user can insert the email address of the member needs to be invited to the event and clicks on add member button.

![Add Members to Events](image)

**Figure 20 – Add Members to Events**

Users can use the calendar event function to view the upcoming events. Upcoming events are highlighted so the user can easily identify that there is going to be an event on that day. When user clicks on the highlighted date users can see the details about the event.

![Event Calendar](image)

**Figure 21 – Event Calendar**
Users can search through the projects they created to find the project easily from their home page of the web application. They can use project id, project name or part of a project name to search projects. The administrator can search through all the projects, events, users, title.

![Figure 22 – Search Projects](image)

There could be so many events and it could be hard to find the event which user wants. Users can search through events to find the events easily from their home web page. They can use event name or part of an event name to search events.

![Figure 23 – Search Events](image)
The administrator is a super user with all the privileges. The administrator has a separate user login. This page cannot be accessible by a regular user. Only administrator can be login to the administrator page. The administrator can view, update, and delete users, projects, logs, and events. And, the administrator can search through users, projects, logs, events and titles.

Figure 24 – View/Update Delete Users

Figure 25 – View/Update Delete Projects
Figure 26 – View/Update Delete Events

Figure 27 – View/Update Delete Logs
Figure 28 – View/Update Delete Title

Figure 29 – Search Users
3.2. Operations and Administrations

The primary task of the Digitized Engineering Notebook is to allow users to document their ideas, inventions, and progress of their ongoing projects. This web application also allows users to retrieve records of data, log files and images about previous and ongoing projects for easy access. This is a very user-friendly web application and any user can create an account start using the web application without any training. The administrator can view, edit and delete all the users, projects, logs, and events.

3.3. Security and Fraud Prevention

To enforce the security of the web application every user need to have a username name and password to log into the Digitized Engineering notebook web application. Every user should create a strong password for their accounts. User password should be minimum five characters, at least one alphabet character, at least one number and one special character. Since this is a password protected website, every user password is encrypted and securely stored in the database. Moreover, we used encryption method to encrypt the data when data transferring through a query string from a web page to another web page. These security measurements have been taken to prevent unauthorized access to the web application.

3.4. Release and Transition plan

The Digitized Engineering Notebook web application is expected to be hosted on the Microsoft Azure cloud by buying some server space and the domain name for the access at the server. This web application was built using Microsoft Visual Studio and Microsoft SQL Server database. So, Microsoft Azure will be ideal to host this web application. This web application is expected to be hosted on June 1st, 2017.

4. Project Design Description

Every user must sign into the web application to perform every task. Unless users sign in into the web application they won’t be able to perform any kind of task.

4.1. Data Flow

4.1.1. Add Projects

In this web page, a user can create a new project. Users also can view or delete existing projects.

4.1.2. Add Team Members to Projects

After creating a new project users can assign the members to that project. As soon as user assign a team member to a project that team member will receive an email notification about the project assigned.

4.1.3. Add Logs

In this web page, the users can add logs to the projects they have created. If required users also can upload any kind of files such as Word documents, PDF documents, images, zip files. Users
can view existing logs, download log files into a Word document or PDF document and print the log files without downloading them.

4.1.4. Add Comments

Users can add comments to each log. This discussion board will help to team members to express their ideas and comments. When a user adds a comment, user’s name, date, time and the comment will be shown to all the members assigned to that particular project.

4.1.5. Add Events

This feature allows users to create events related to the projects. After creating a new event, users can invite team members to participate that event.

4.2. Database Design

The below database design diagram depicts the relations between each table created in the database. Following tables have primary key constraints, foreign key constraints, not null constraints and check constraints.

![Database Diagram](image)

Figure 30 – Database Diagram
5. Project Internal and External Interfaces

The main web page designs are listed below.

![Sign In/Sign Up Page](image)

Figure 31 – Sign In/Sign Up Page
Figure 32 – Home Page

Figure 33 – Projects Page
Figure 34 – Log Page

Figure 35 – Comments Page (Discussion Board)
Figure 36 – Events Page

Figure 37 – Admin Page
6. Project Design Units

The project can be divided into two modules based on the roles the application can detect. At present in the application, there are two roles which are defined as follows.

- User
- Administrator

6.1. User

The below are a list of activities that can be performed by the user.

6.1.1. Project

In here the user will be able to add projects.

6.1.2. Logs

The user will be able to add logs into the projects. Users also can upload files into the web application.

6.1.3. Comment

Users can comment on the logs. Every member assigned to a certain project can see those comments.

6.1.4. Event

In here user will be able to create events. So, users can invite their team members to participate their events.

6.2. Administrator

Apart from regular user designs administrator has an admin page to website administration. This page cannot be accessible to a regular user. Only administrator can be login to the administrator page. The administrator can view, update, and delete users, projects, logs, and events.

6.2.1. Add/Update/Delete Users

In here the administrator can view existing user, update and delete existing users.

6.2.2. Add/Update/Delete Projects

In here the administrator can view existing projects. Update and delete projects. If a project has been deleted its status changes to 0 which mean no longer an active project.

6.2.3. Add/Update/Delete Logs

In here the administrator can view existing logs, update, and delete existing logs.

6.2.4. Add/Update/Delete Events

In here the administrator can view existing events, update, and delete existing events.
6.2.5. Add/Update/Delete Title

In here the administrator can view all the job titles. Users need to select their job title when they sign up. The administrator can update exiting titles, add a new job title, and delete an existing job title.
7. References


