Corporate Employee Attrition Analytics

A PROJECT REPORT

Submitted By

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of

BACHELOR OF ENGINEERING

IN

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NANDHA COLLEGE OF TECHNOLOGY, ERODE

ANNA UNIVERSITY::CHENNAI 600025

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1. INTRODUCTION

1.1 Project overview

Employee attrition has become a vital problem across the world. It is one of the crucial issues faced by business leaders within companies where they lose the most talented employees. A good employee is always an asset to the organization and their resignation can lead to various problems like financial losses, overall performance, and loss of acquired knowledge. Furthermore, hiring new employees is far exorbitant, taxing, and time-consuming in comparison to recruiting the existing one. It is very time-consuming to recruit a new employee as it takes him months for training, adjusting to the culture, rules, and environment. Therefore, upcoming trends and technology using Machine Learning Algorithms must be exploited for the benefit of business organizations. Knowing the reason beforehand for the employee attrition, companies can mitigate this loss. This analysis provides a conclusive review of employee attrition from the dataset 'IBM HR Analytics Employee Attrition Performance

1.2 Purpose

Hardik P. K. (2016) , researched on "a study on employee attrition: with special reference to Kerala IT Industry". His research examined the relationship between organizational factors and attrition of IT professionals. The result can conclude that the organizational factors played significant role in predicting the variance in turnover intention (attrition) of Kerala IT professionals. Therefore, the HR managers in IT organizations may take into consideration the problems with organizational factors of their workers to reduce the turnover intention of the skilled employees.

2.LITERATURE SURVEY

2.1 Existing Problem

The Existing system includes only few attributes for analysis and deals with qualitative observations and simple statistical analysis. The qualitative observations deal with data and can be observed through human senses. They do not involve measurements or number. Due to the increase in IOT and connected device, we now have access to so much of data and along with it an increase needs to manage and understand data

2.2 References

From Big Data to Deep Data to support people analytics for employee attrition prediction, Nesrine Ben Yahia, Hlel Jihen, Ricardo Colomo-Palacio(2021)

Machine Learning Approach for Employee Attrition Analysis.Dr. R.

S. Kamath | Dr. S. S. Jamsandekar | Dr. P. G. Naik ,Published in International Journal of Trend in Scientific Research and Development (ijtsrd), (March 2019)

Investigation of early career teacher attrition(ECT) and the impact of induction programs in Western Australia, Janine E.Wyatt, MichaelO'Neill (2021)

EMPLOYEE ATTRITION PREDICTION USING DEEP NEURAL

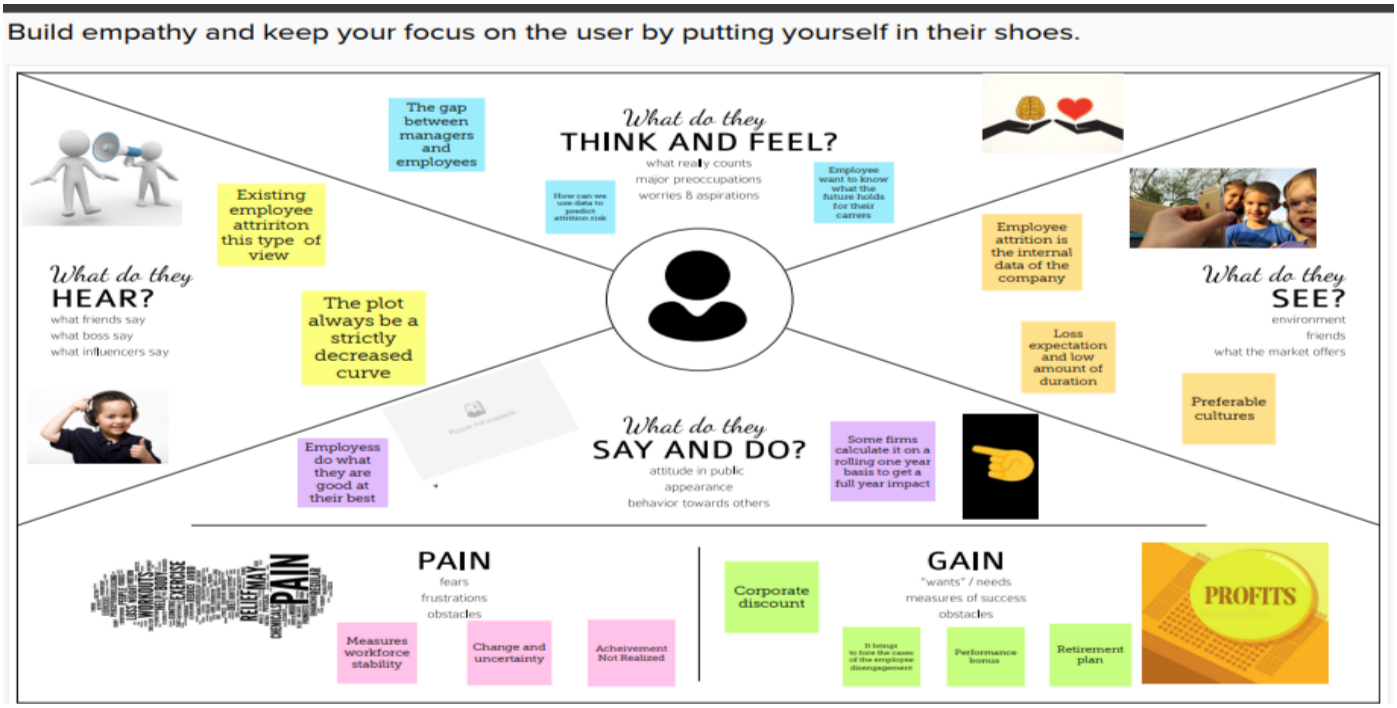
NETWORK, Salah Al-Darraji, Dhafer G. Honi, Francesca Fallucchi, Ayad I. Abdulsada, Romeo Giuliano and Husam A. Abdulmalik,(3 November 2021)

2.3 Problem Statement Definition

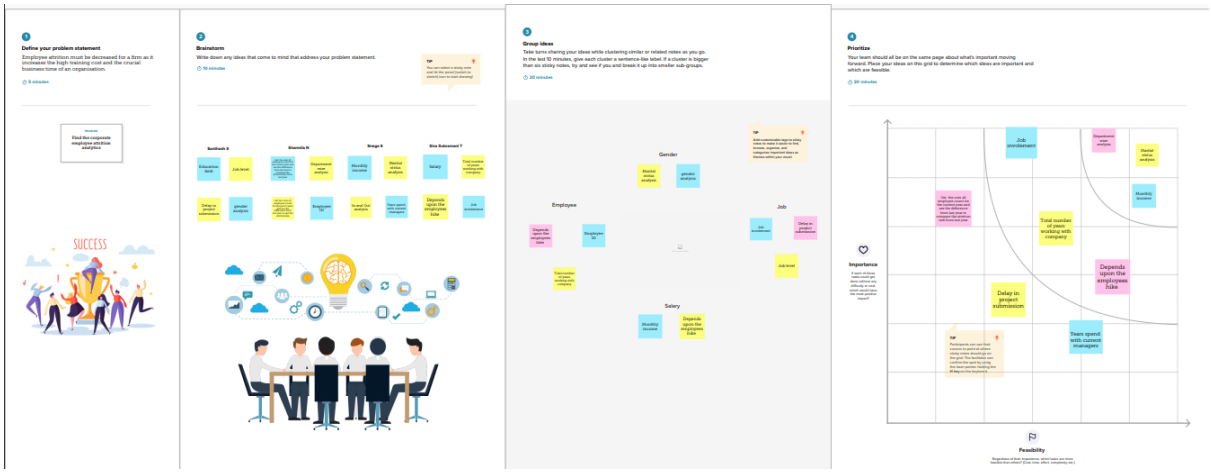
To create a dashboard and perform analysis of employee attrition in corporates using IBM Cognos analytics platform. To reduce the employee attrition rate through data analytics, data visualization by analyzing the major factors that causes attrition.

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas



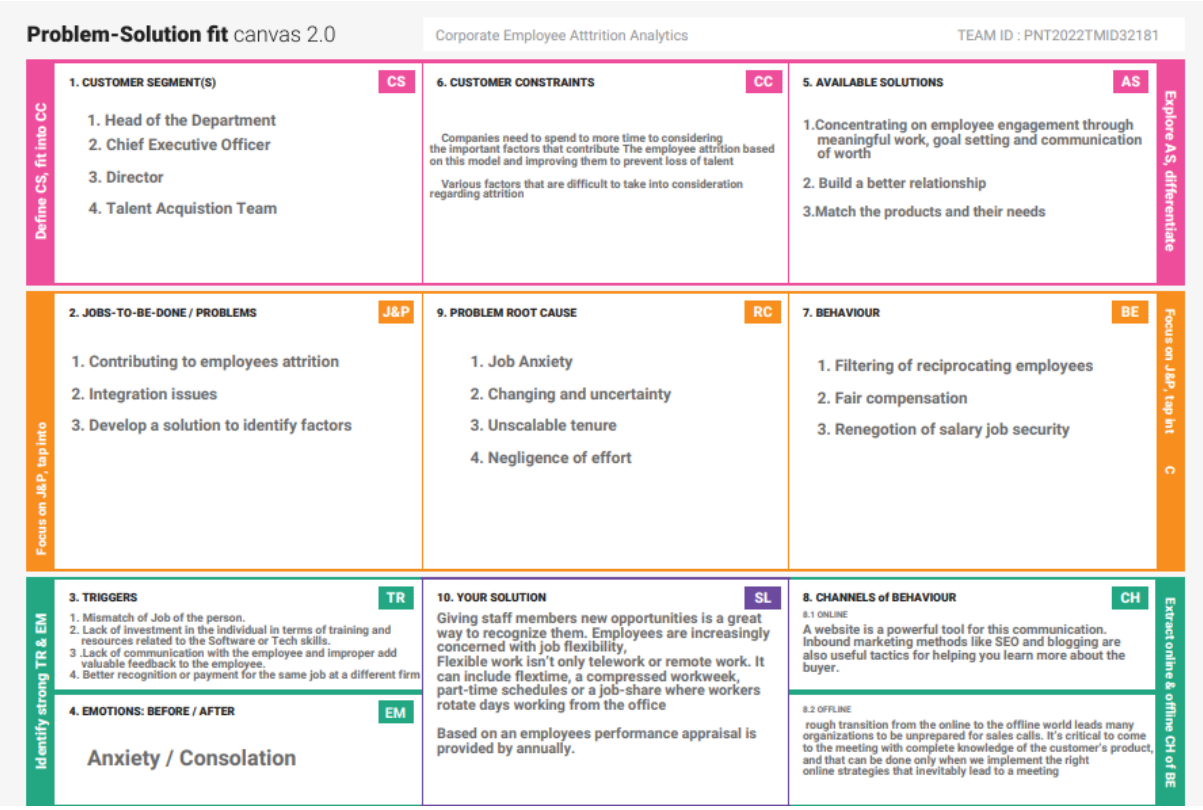
3.2 Ideation & Brainstorming



3.3 Proposed Solution

1.	Problem Statement (Problem to be solved)	➢ It is difficult to identify all the potential employees through visual monitoring by HR.Potential employees leaving company may tend to decrease the company's profit. Layoffs, which occur due to a change or decrease of the business reduce employee morale and make it difficult to hire for other positions. When employees leave by choice, the company can decrease costs while moving forward with other hiring decisions. ➢ For an organisation to be successful it is important to attract and retain top talents. In order to do that, an organisation must determine the factors and the cause of an employee to leave or stay.
2.	Idea / Solution description	➢ By collecting the data set of the corporate employee and using the methods of data analysis like visualizing, we can get some useful insights about the performance of the employees. ➢ Using algorithms to find the factors to analyze and understand the underlying pattern to improve on the factors leading to retention of employees.
3.	Novelty / Uniqueness	➢ It is useful for the HR to identify their employees potential in order to retain them. This also helps the company to gain high profit by retaining good talents. ➢ Right before the employee joins, the analytical system would use the factors like gender,age,work duration in previous companies and etc to categorize whether the employee would stay for long term or short term hence controlling the attrition.
4.	Social Impact / Customer Satisfaction	➢ Employees are of different types..Some employees after joining in the organization tend to be inactive and receive same salary as the one to work sincerely. ➢ This data analysis will be a warning sign to the employees too to work in the respective manner in order to achieve the organization goal.
5.	Business Model (Revenue Model)	➢ The analysis can be performed with minimum cost and at the same time it can provide high performance.
6.	Scalability of the Solution	➢ Predicting the exact result through data analysis helps us to increase the scalability of the solution.

3.4 Problem Solution fit



4.REQUIREMENT ANALYSIS

4.1 Functional requirement

Functional Requirements (Epic)	**Sub Requirements (Story & Sub Task)**
collect Dataset	Data from different sources are collected in order to get optimized result
Data cleaning	When combining data from multiple sources there are duplicated data and hence we clean the data 1st
Data modelling	Identify the relationship between Various parameters.
Prediction and analysis	The length of stay is predicted with the Machine learning algorithm

4.2 Non-Functional requirements

Non-Functional Requirement	Description
Usability	User can view and visualize the data through the interactive dashboard and predict the length of stay of patients with machine learning algorithm
Security	IBM Cognos provides better security. The dataset uploaded to the dashboard cannot be downloaded or accessed by external sources
Reliability	The dashboard and the prediction is very reliable and provide prediction with more accuracy
Performance	The length of stay of patients is predicted with more accuracy
Availability	The predicted length of stay and the visualization will be available in Cognos analysis
Scalability	The software is scalable and extendable. Because it allow multiple user to handle the data at the same time

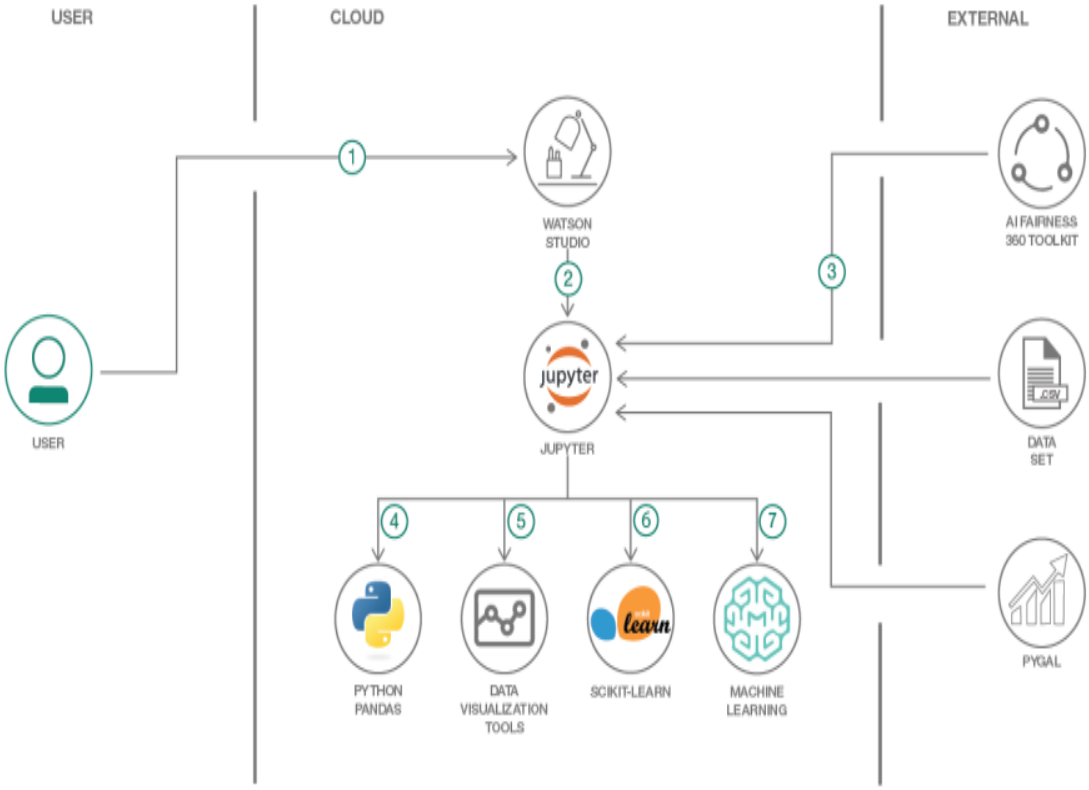
5. PROJECT DESIGN

5.1 Data Flow Diagrams

A two-dimensional diagram explains how data is processed and transferred in a system. The graphical depiction identifies each source of data and how it interacts with other data sources to reach a common output. Individuals seeking to draft a data flow diagram must identify external inputs and outputs, determine how the inputs and outputs relate to each other, and explain with graphics how these connections relate and what they result in. This type of diagram helps business development and design teams visualize how data is processed and identify or improve certain aspects.

Data Flow Diagrams:

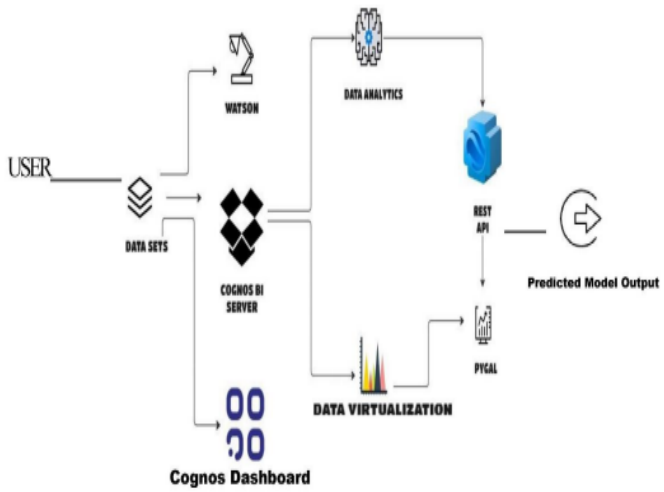
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 Solution & Technical Architecture

A system architecture or systems architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system. System architecture can comprise system components, the externally visible properties of those components, the relationships (e.g. the behavior) between them. It can provide a plan from which products can be procured, and systems developed, that will work together to implement the overall system. There have been efforts to formalize languages to describe system architecture, collectively these are called architecture description languages (ADLs).

Technical Architecture:



- As shortly after beginning their jobs, staffers register in the institution's database.
- After a specified period of time, the employees leaving from the organization in which uses machine learning model like Decision Tree, Random Forest model, K-Nearest Neighbour training accuracy, etc. to the training the dataset to get the accuracy by predicting the value.
- User interacts with the application using website UI HTML, CSS, JavaScript, React Js etc.
- This logic depends on the extracting the needed contents into the dataset using Python.

5.3 User Stories

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail Login	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password	I can access my account / dashboard	High	Sprint-1
	Dashboard	USN-5	Uploading the Dataset	I can be able to upload my dataset	High	Sprint 2
		USN-6	Working With Dataset	I can be able to access my dashboard	High	Sprint 2
		USN-7	Visualization	I can be able to view the visual attrition rate of my dataset	High	Sprint 3
		USN-8	Working with Dashboard	I can be able to view the various views of the attrition rate	High	Sprint 3
Customer Care Executive		USN-9	Asking Help / Feedback	I can be able to ask help if I can face any issues or problems while using the webpage	Medium	Sprint 4
Administrator		USN-10	Managing the Database	I can assure that my data is in secure state	High	Sprint 4
		USN-11	Managing the over all process	I can assure that my data and process is going good	High	Sprint 4

6 PROJECT PLANNING

6.1 Sprint Planning & Estimation

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Datasets	USN-1	As a user, I can enter the details of the employees working in our organization for the attrition detail.	5	High	Sharmila N, Snega S, Santhosh S
Sprint-1		USN-2	As an Analyst, I Prepare the data & Provide meaningful insights through EDA in Cognos Analytics	3	High	Snega S, Sivasubramani T, Santhosh S
Sprint-2	Exploring data and creating model	USN-3	As a user, I want to find connections between various visualization that leads to attrition	2	Low	Sivasubramani T, Santhosh S
Sprint-2		USN-4	As an Analyst, I will create a prediction model for predicting the attrition.	3	Medium	Santhosh S
Sprint-3	Prediction	USN-5	As an Analyst, I will create different type of model to identify which give the correct prediction.	3	Medium	Sharmila N, Santhosh S, Sivasubramani T
Sprint-3		USN-6	As an Analyst, I will use Cognos Analytics to generate a report	3	Medium	Snega S, Sharmila N, Santhosh S
Sprint-4	Dashboard	USN-7	As a user, I can only understand the Analysis in animated presentation of dataset	5	Medium	Sivasubramani T, Santhosh S
Sprint-4		USN-8	As an Analyst, I use Cognos Analytics to create an animated presentation (Story) of the dataset	3	High	Santhosh S

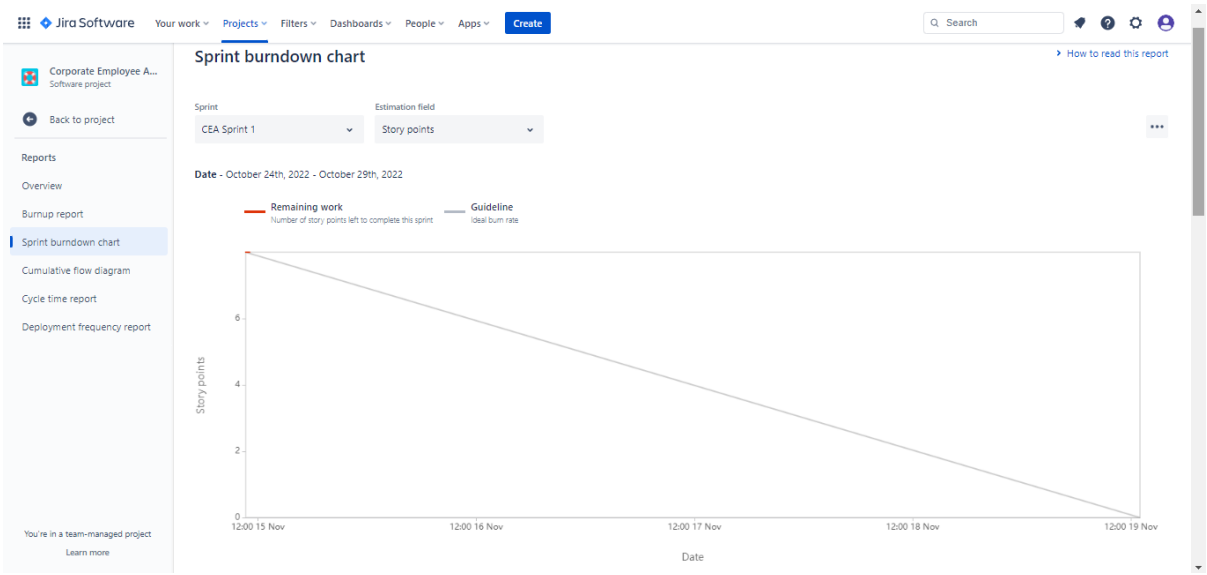
6.2 Sprint Delivery Schedule

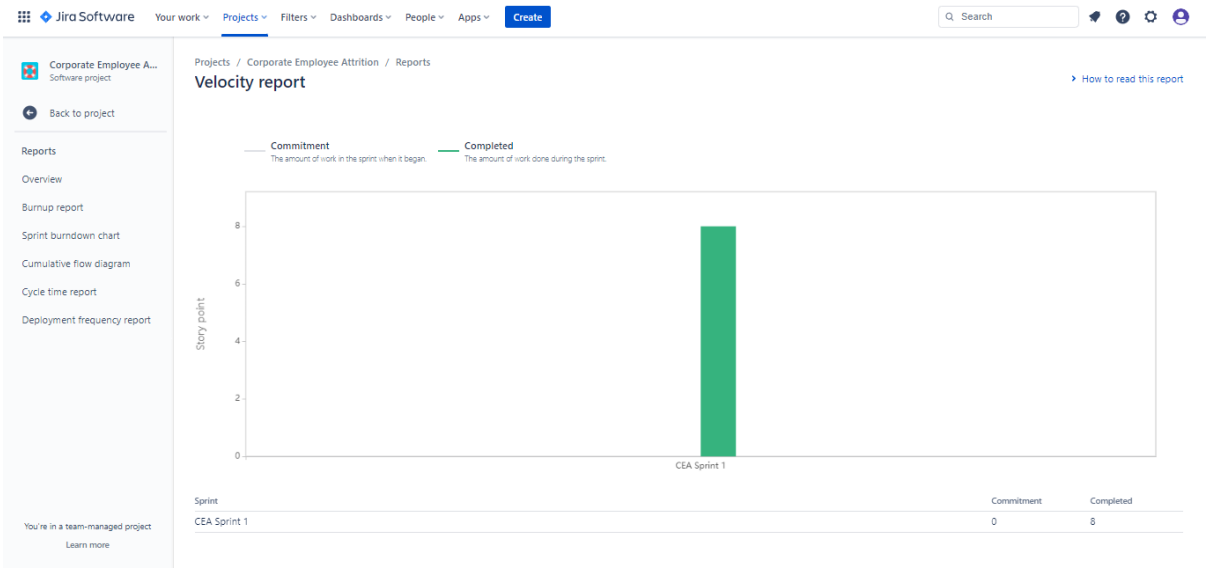
Project Tracker, Velocity & Burndown Chart: (4 Marks)

`Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	5	6 Days	24 Oct 2022	29 Oct 2022	5	29 Oct 2022
Sprint-2	5	6 Days	31 Oct 2022	05 Nov 2022	5	05 Nov 2022
Sprint-3	5	6 Days	07 Nov 2022	12 Nov 2022	5	12 Nov 2022
Sprint-4	5	6 Days	14 Nov 2022	19 Nov 2022	5	15 Nov 2022

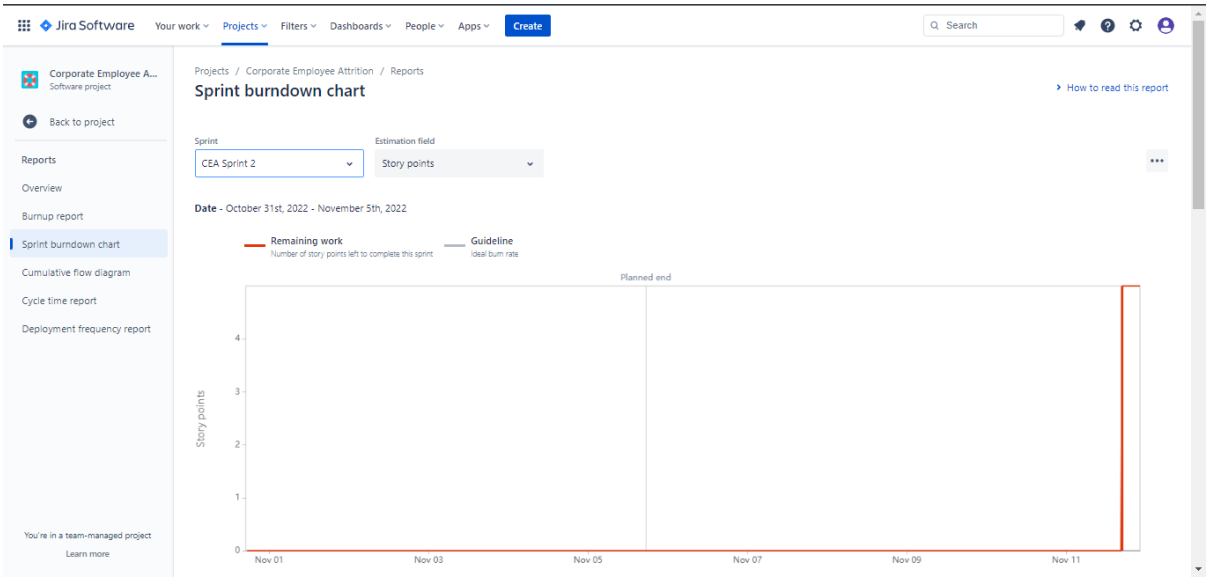
6.3 Reports from JIRA

Sprint 1:





Sprint 2: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Software project
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Reports
Overview
Burnup report
Sprint burndown chart
Cumulative flow diagram
Cycle time report
Deployment frequency report
You're in a team-managed project
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Sprint burndown chart
How to read this report
Sprint
CEA Sprint 2
Estimation field
Story points
Date - October 31st, 2022 - November 5th, 2022
Remaining work
Number of story points left to complete this sprint
Guideline
Ideal burn rate
Planned end
Story points
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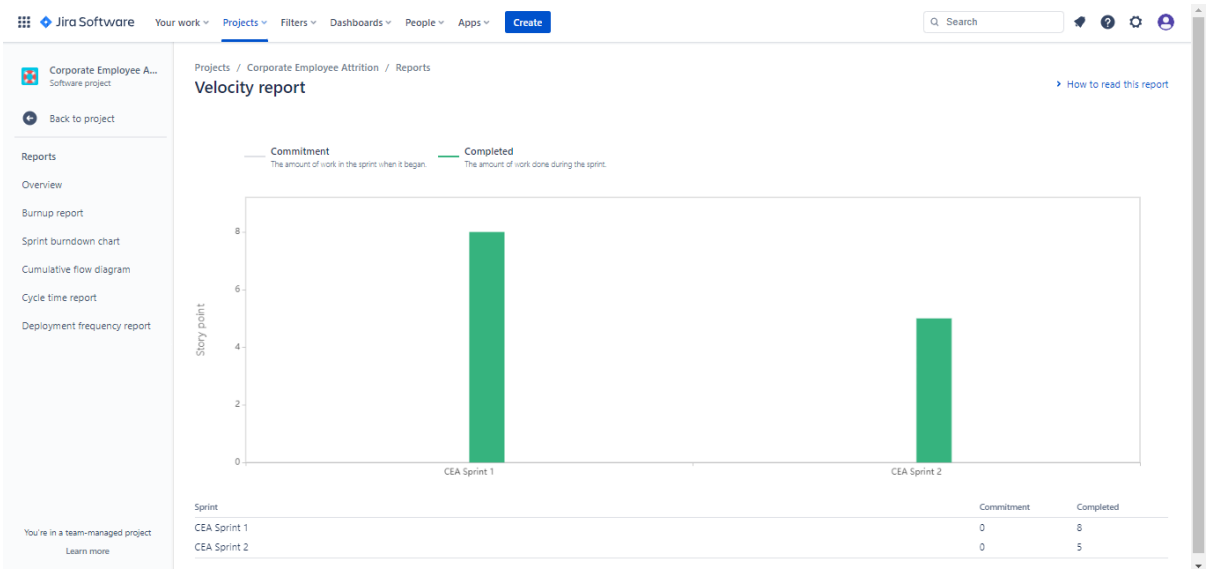
4
Nov 01
Nov 03
Nov 05
Nov 07
Nov 09
Nov 11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Burnup report
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Cumulative flow diagram
Cycle time report
Deployment frequency report
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Velocity report
How to read this report
Commitment
The amount of work in the sprint when it began.
Completed
The amount of work done during the sprint.
Story point
0
2
4
6
8
CEA Sprint 1
CEA Sprint 2
Sprint
Commitment
Completed
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CEA Sprint 2
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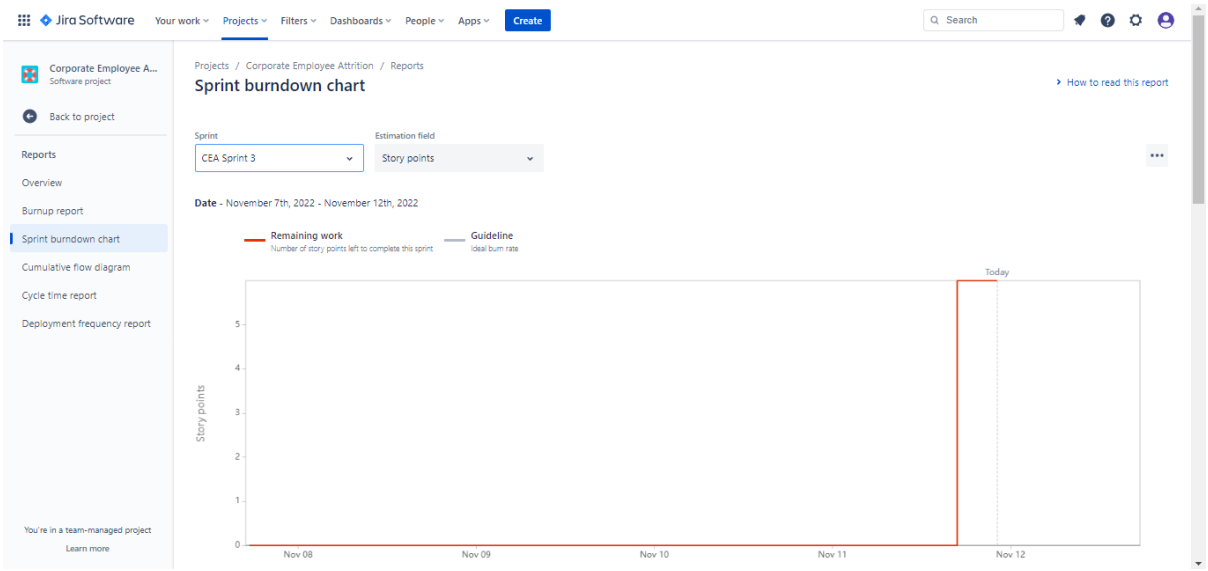
Sprint 3 :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Cumulative flow diagram
Cycle time report
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Sprint burndown chart
How to read this report
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CEA Sprint 3
Estimation field
Story points
Date - November 7th, 2022 - November 12th, 2022
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Number of story points left to complete this sprint
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Ideal burn rate
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Story points
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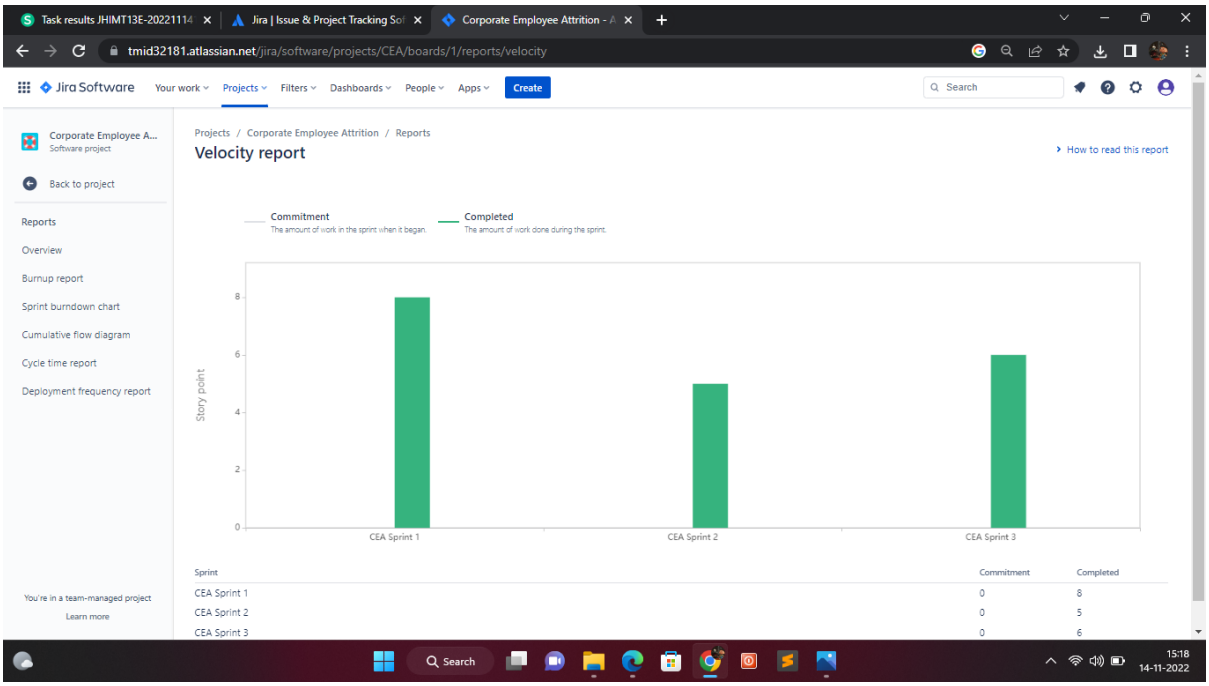
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CEA Sprint 2
CEA Sprint 3
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Commitment
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CEA Sprint 3 0 6
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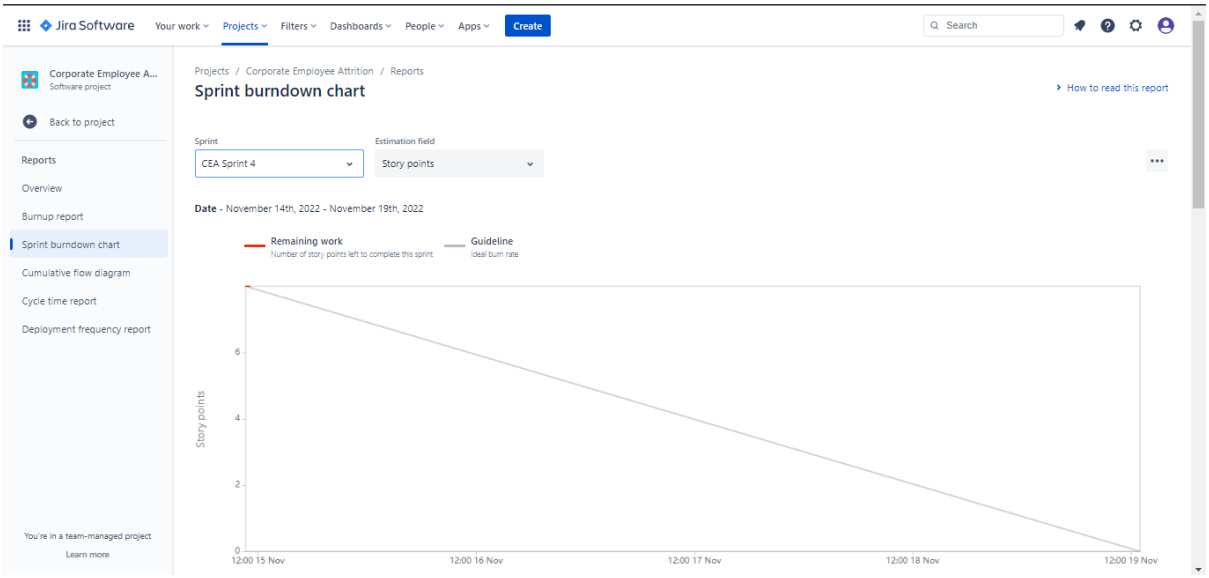
14-11-2022

Sprint 4: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How to read this report
Sprint
CEA Sprint 4
Estimation field
Story points
Date - November 14th, 2022 - November 19th, 2022
Remaining work
Number of story points left to complete this sprint
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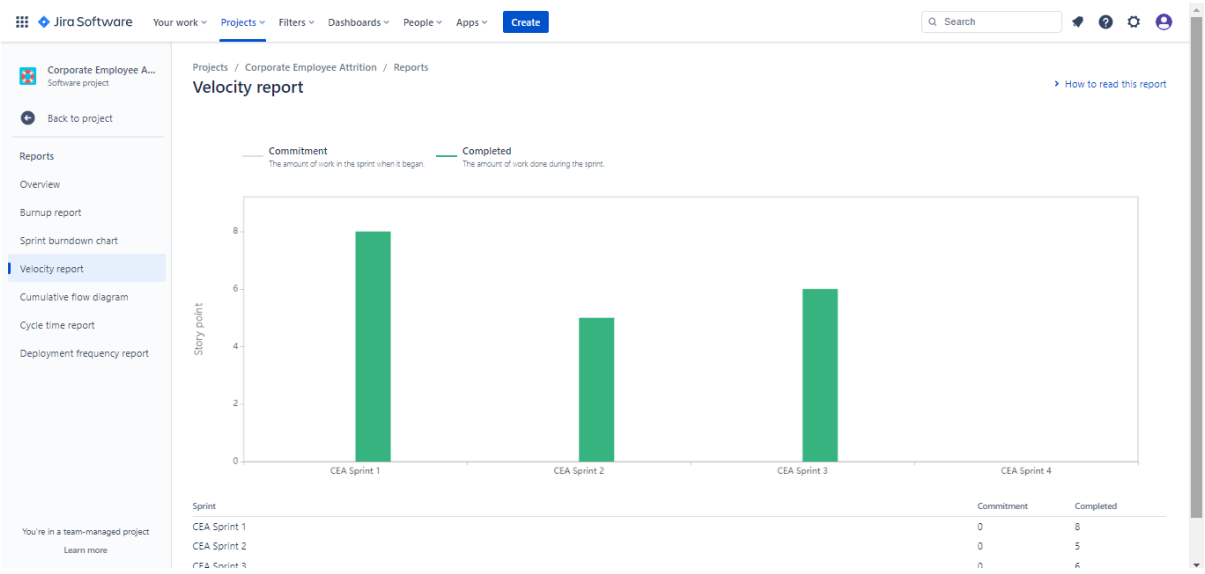
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Story point
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CEA Sprint 1
CEA Sprint 2
CEA Sprint 3
CEA Sprint 4
Sprint
Commitment
Completed
CEA Sprint 1
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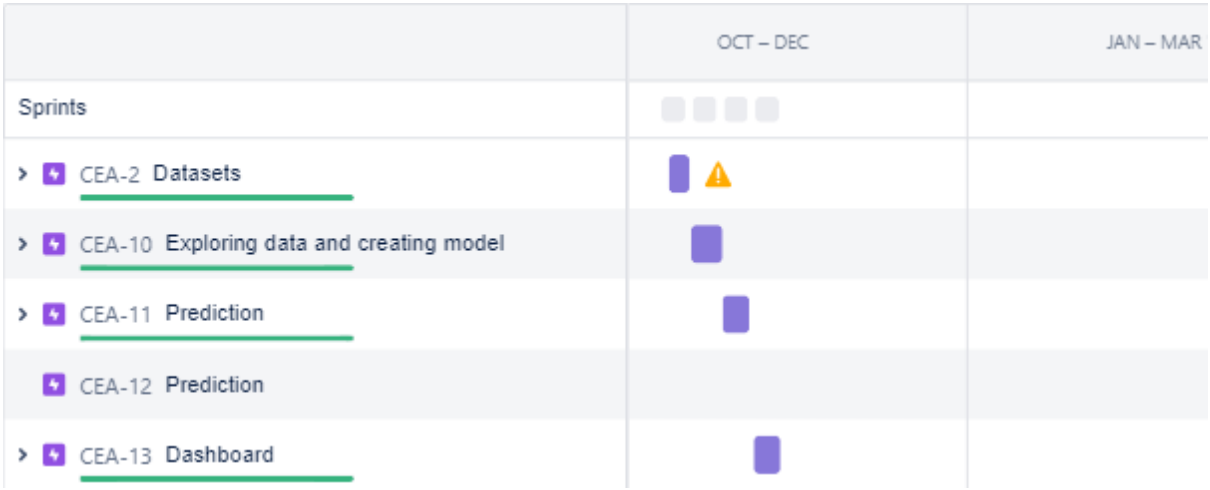
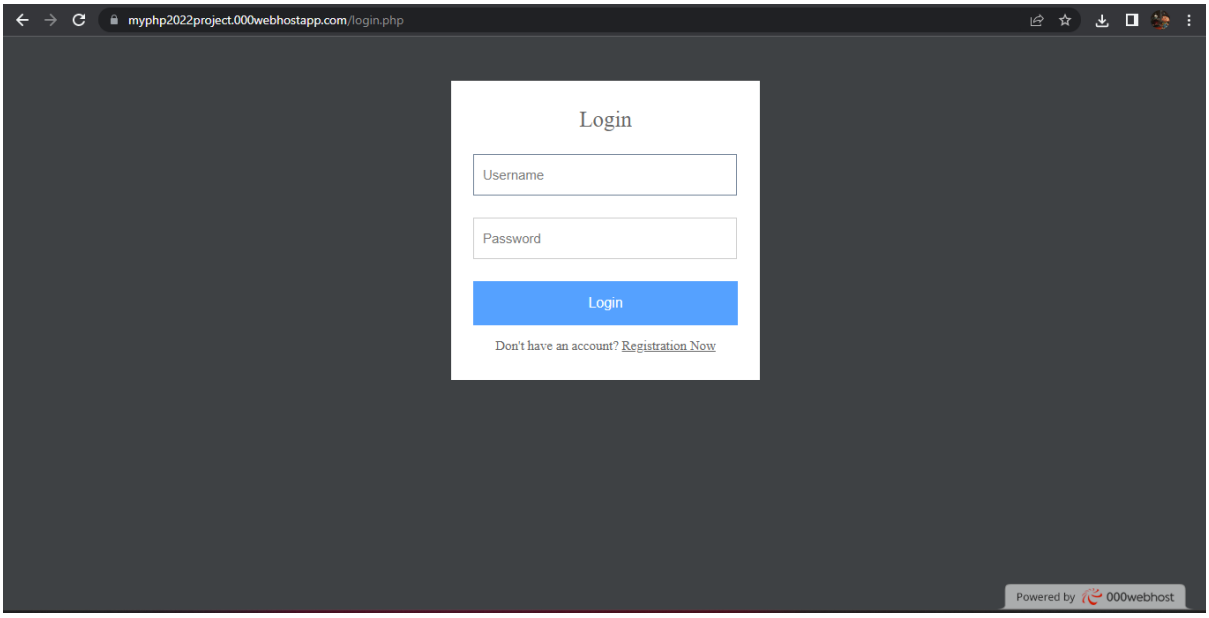
8
CEA Sprint 2
0
5

Road Map :

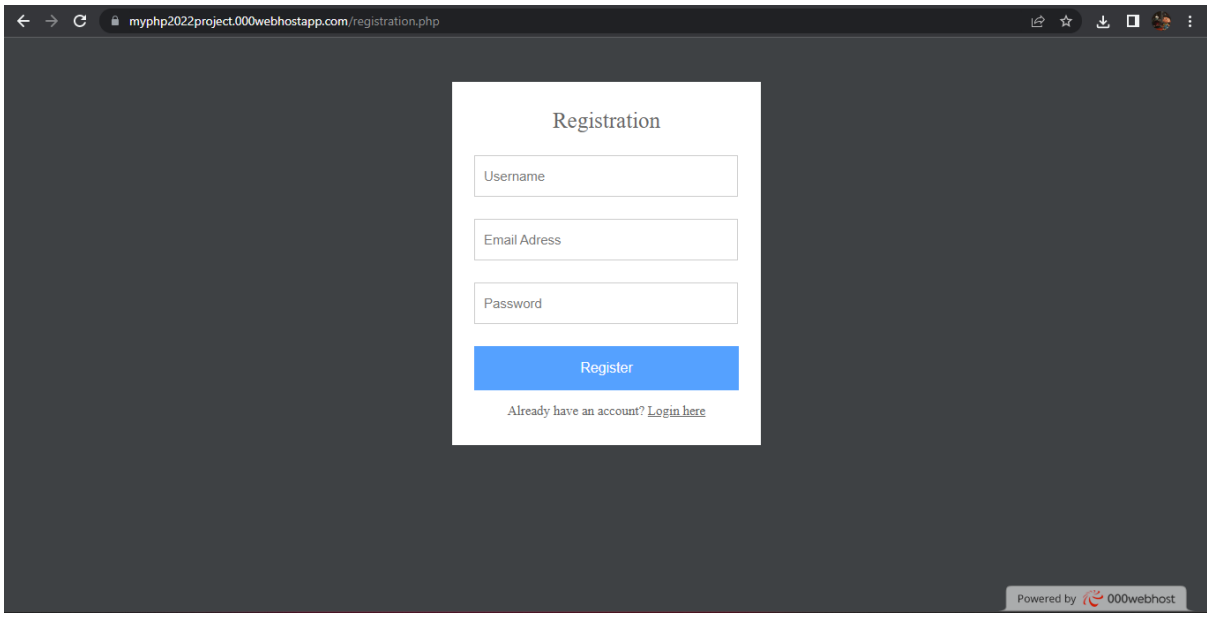


7. CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1



7.2 Feature 2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Registration
Username
Email Adress
Password
Register
Already have an account? Login here
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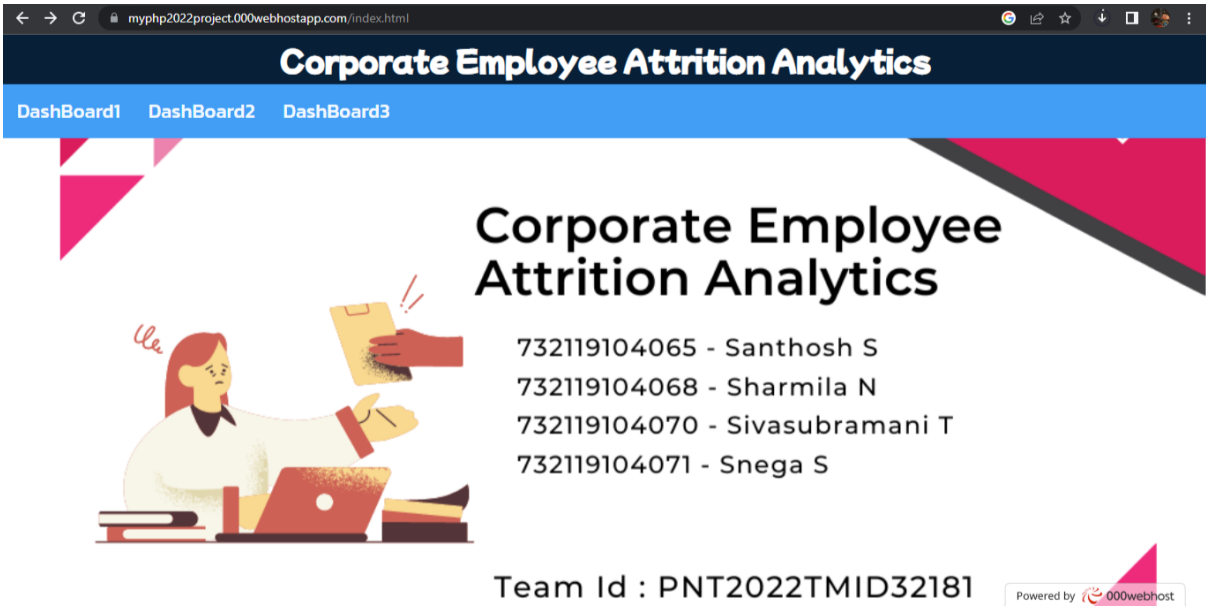
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DashBoard1
DashBoard2
DashBoard3
Corporate Employee Attrition Analytics
732119104065 - Santhosh S
732119104068 - Sharmila N
732119104070 - Sivasubramani T
732119104071 - Snega S
Team Id : PNT2022TMID32181
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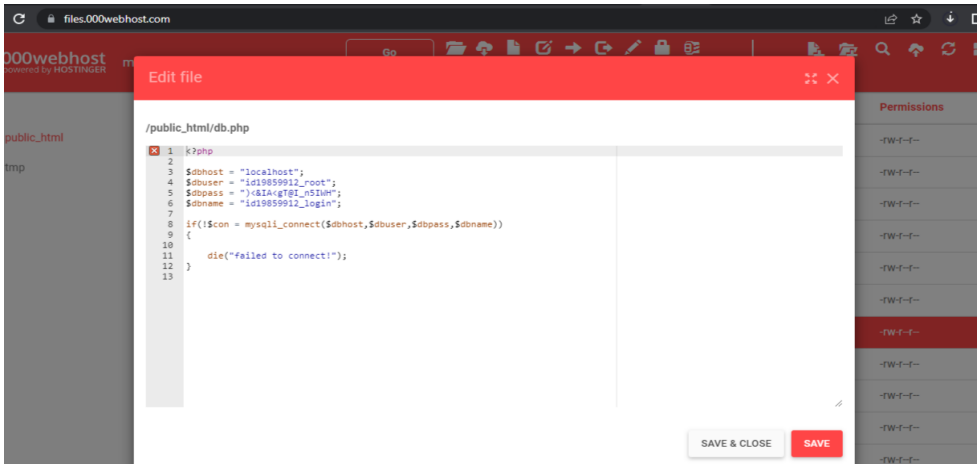
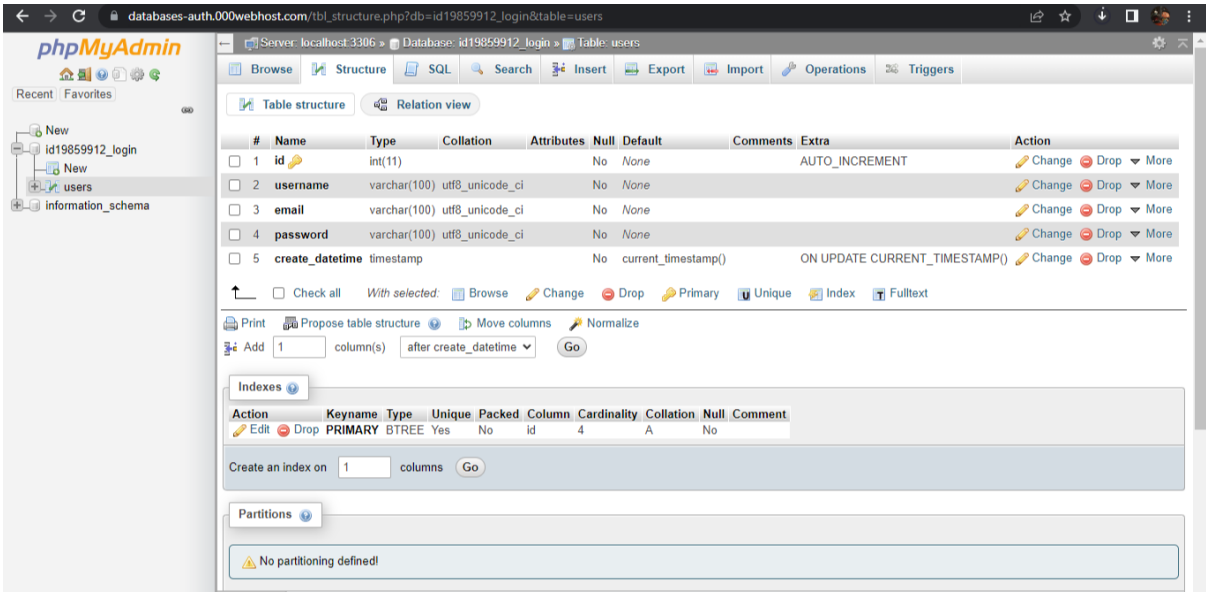
7.3 Database Schema





8. TESTING

8.1 Test Cases

A Test cases is a set of actions performed on a system to determine if it satisfies software requirements and functions correctly.The test cases are the following the usability testing, Functionality Testing, Compatibility testing, Database testing, Security testing, Performed Testing.

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visualizations /Graphs – 7 – 8 visualization /7 – 8 Graphs
2.	Data Responsiveness	Users and Analyst or Developers
3.	Amount Data to Rendered (DB2 Metrics)	Data(200MB)
4.	Utilization of Data Filters	Simple Mathematics and distribute the datasets
5.	Effective User Story	No of Scene Added – 7 stories
6.	Descriptive Reports	No of Visualizations / Graphs – 8 Graphs/ 3 - graph

8.2 User Acceptance Testing

User Acceptance Testing (UAT),also called application testing or end-user-testing,is a phase of software development in which the software is tested in the real world by its intended audience.The purpose of this document is to briefly explain the test coverage and open issues of the [Corporate Employee Attrition Analytics] project at the time of the release to User Acceptance Testing (UAT).

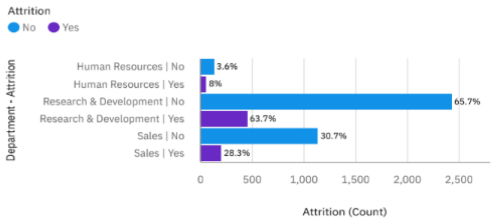
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	9	3	2	3	17
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	10	2	4	20	36
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	22	13	13	26	74

9. RESULTS

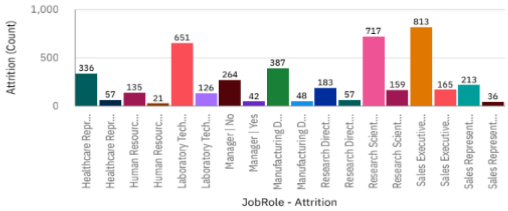
9.1 Performance Metrics

Dashboard 3

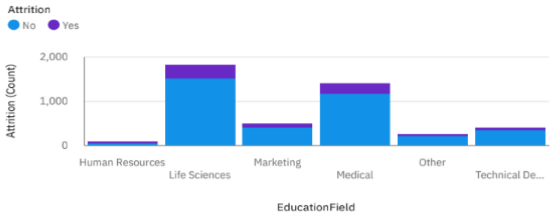
Attribution by Department



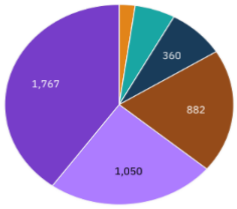
Attribution by JobRole



Attribution by Education Field

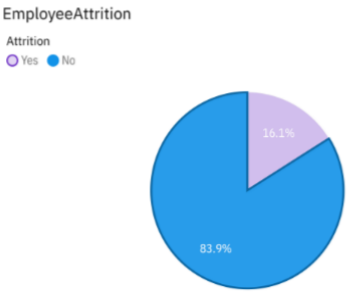


Attribution by Marital Status

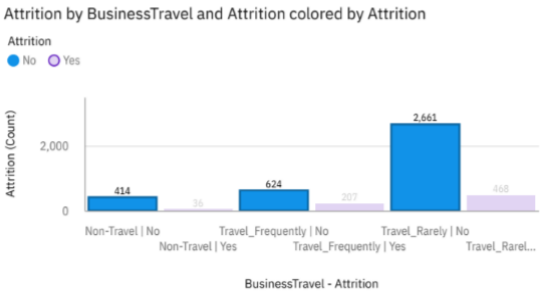


Dashboard 1

EmployeeAttrition

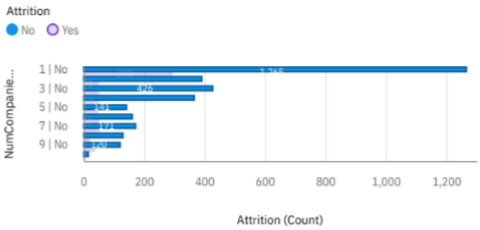


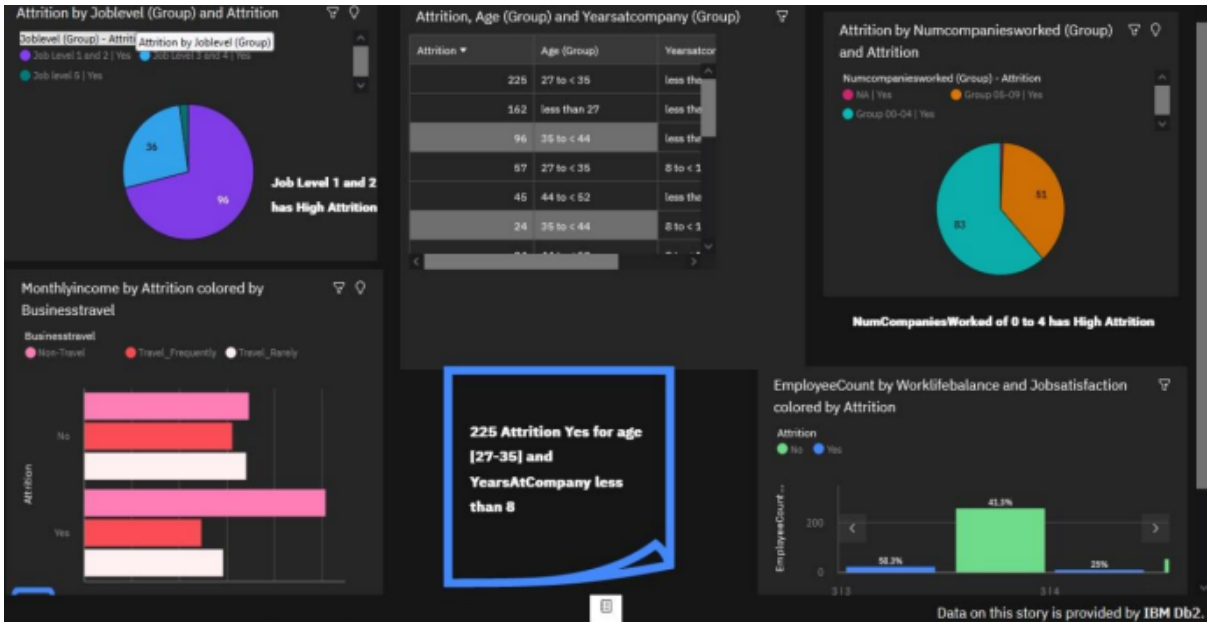
Attribution by BusinessTravel and Attrition colored by Attrition



Based On Salary Hike Percent

Attribution by NumCompaniesWorked and Attrition colored by Attrition





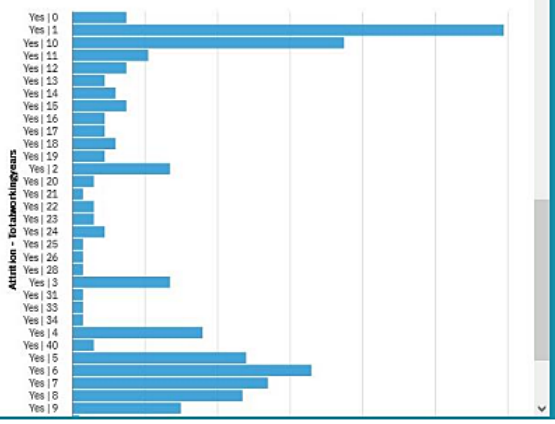
Report

Filters

Analysis of Total Working Hours by attrition and Gender

Attrition	EmployeeCount	Totalworkingyears (Group)	Gender
Yes	176	Group 00-09	Female
Yes	293	Group 00-09	Male
Yes	72	Group 10-19	Female
Yes	114	Group 10-19	Male
Yes	12	Group 20-29	Female
Yes	27	Group 20-29	Male
Yes	9	Group 30-39	Female
Yes	6	Group 30-39	Male
Yes	1	NA	Female
Yes	1	NA	Male

Analysis of attrition by total working years



10.ADVANTAGES & DISADVANTAGES

Advantages

1. The metrics offer accuracy in terms of the reasons given by employees themselves
2. It brings to fore the cause of employee disengagement.
3. Enables HR managers develop long term strategies to reduce attrition.
4. Develops & Shapes drills that benefit both the management and the employee.
5. Enhanced work culture.

Disadvantages

1. The might be radiation al reduction in the strength of the workforce.The employees might loss interest and sincerity.
2. The remaining employees might face an increase in the workload and feels stressed about it.

11.CONCLUSION

The may fail to perform at their job. This eventually leads to attrition. Organizations should state the requirements and expectations Employees as well as organizations must be clear with their expectations regarding unambiguously. This helps candidates decide upon to accept the job position or not. This eventually avoids further conflicts in the employment terms.job profile. Any sort of mismatch leads to discrepancy and employees.

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12. FUTURE SCOPE

Research findings suggest that attrition reasons in IT organizations primarily revolve around professional growth and challenges in the organization. Although economic factors happen to the most influential factor, professionals may settle for second best criteria of their preference that is career growth and supportive work policies in the organization. On the other hand, candidates who aspire to have a better job than the one in hand are more interested in securing the next job. Young talent wants to work on latest technology and functional domain. professionals who are young career makers are less Research findings suggest that attrition reasons in IT organizations primarily revolve around professional growth and challenges in the organization. Although economic factors happen to the most influential factor, professionals may settle for second best criteria of their preference that is career growth and supportive work policies in the organization. On the other hand, candidates who aspire to have a better job than the one in hand are more interested in securing the next job. Young talent wants to work on latest technology and functional domain. IT professionals who are young career makers are less.

13. APPENDIX

Source Code :

index.php

```
<?php
header("Location: login.php");
?>
```

login.php

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8"/>
    <title>Login</title>
    <link rel="stylesheet" href="style.css"/>
</head>
<body>
<?php
    require('db.php');
    session_start();
    // When form submitted, check and create user session.
    if (isset($_POST['username'])) {
        $username = stripslashes($_REQUEST['username']);    // removes backslashes
        $username = mysqli_real_escape_string($con, $username);
        $password = stripslashes($_REQUEST['password']);
        $password = mysqli_real_escape_string($con, $password);
        // Check user is exist in the database
        $query    = "SELECT * FROM `users` WHERE username='$username'
                    AND password='" . md5($password) . "'";
        $result = mysqli_query($con, $query) or die(mysql_error());
        $rows = mysqli_num_rows($result);
```

```
23        if ($rows == 1) {
24            $_SESSION['username'] = $username;
25            // Redirect to user dashboard page
26            header("Location: dashboard.php");
27        } else {
28            echo "<div class='form'>
29                  <h3>Incorrect Username/password.</h3><br/>
30                  <p class='link'>Click here to <a href='login.php'>Login</a> again.</p>
31                  </div>";
32        }
33    } else {
34 ?>
35    <form class="form" method="post" name="login">
36        <h1 class="login-title">Login</h1>
37        <input type="text" class="login-input" name="username"
   placeholder="Username" autofocus="true"/>
38        <input type="password" class="login-input" name="password"
   placeholder="Password"/>
39        <input type="submit" value="Login" name="submit" class="login-button"/>
40        <p class="link">Don't have an account? <a href="registration.php">Registration
   </a></p>
41    </form>
42 <?php
43    }
44 ?>
45 </body>
46 </html>
```

logout.php

```
1  <?php
2      session_start();
3      // Destroy session
```

```
    if(session_destroy()) {
        // Redirecting To Home Page
        header("Location: login.php");
    }
?>
```

registration.php

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8"/>
    <title>Registration</title>
    <link rel="stylesheet" href="style.css"/>
</head>
<body>
<?php
    require('db.php');
    // When form submitted, insert values into the database.
    if (isset($_REQUEST['username'])) {
        // removes backslashes
        $username = stripslashes($_REQUEST['username']);
        //escapes special characters in a string
        $username = mysqli_real_escape_string($con, $username);
        $email    = stripslashes($_REQUEST['email']);
        $email    = mysqli_real_escape_string($con, $email);
        $password = stripslashes($_REQUEST['password']);
        $password = mysqli_real_escape_string($con, $password);
        $create_datetime = date("Y-m-d H:i:s");
        $query    = "INSERT into `users` (username, password, email, create_datetime)
                    VALUES ('$username', '" . md5($password) . "', '$email',
'$create_datetime')";
        $result   = mysqli_query($con, $query);
        if ($result) {
            echo "<div class='form'>
                <h3>You are registered successfully.</h3><br/>
                <p class='link'>Click here to <a href='login.php'>Login</a></p>
                </div>";
```

```
30          } else {
31              echo "<div class='form'>
32                  <h3>Required fields are missing.</h3><br/>
33                  <p class='link'>Click here to <a href='registration.php'>registration</a>
    again.</p>
34                  </div>";
35          }
36      } else {
37  ?>
38      <form class="form" action="" method="post">
39          <h1 class="login-title">Registration</h1>
40          <input type="text" class="login-input" name="username"
    placeholder="Username" required />
41          <input type="text" class="login-input" name="email" placeholder="Email
    Adress">
42          <input type="password" class="login-input" name="password"
    placeholder="Password">
43          <input type="submit" name="submit" value="Register" class="login-button">
44          <p class="link">Already have an account? <a href="login.php">Login
    here</a></p>
45      </form>
46  <?php
47      }
48  ?>
49  </body>
50  </html>
```

db.php

```
1   <?php
2   $dbhost = "localhost";
3   $dbuser = "root";
4   $dbpass = "";
5   $dbname = "loginsystem";
6   if(!$con = mysqli_connect($dbhost,$dbuser,$dbpass,$dbname))
7   {
8       d
9   }
```

DashBoard.php

```
<?php
//include auth_session.php file on all user panel pages
include("auth_session.php");
?>
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Dashboard - Client area</title>
    <link rel="stylesheet" href="style.css" />
</head>
<body>
    <div class="form">
        <p><b><i>Hey,</b></i> <?php echo $_SESSION['username']; ?>!</p>
        <p><b><i>You are in user dashboard page.</b></p>
            <form method="POST" action="indexx.php">
                        <center><input  type="submit"  value="DashBoard"  name="submit" /></center>
            </form>
        <p><a href="logout.php">Logout</a></p></i>
    </div>
</body>
</html>
```

GitHub & Project Demo Link :

GitHub : https://github.com/IBM-EPBL/IBM-Project-12544-1659453304

Project Demo Link : https://clipchamp.com/watch/ArJJqbx2qIf