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Web-based Automated Time and Effort Tracking Software for a Software Project

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Abstract: A time tracking software is the one that permits users to record time spent on tasks. This software is used by many people such as individual employees or workers, project management team members in a company for a software project, professionals who charge their customers by the hour, and hourly workers. A time tracking software epitomizes an automated version of the conventional paper timesheet. It helps in increasing productivity, boosts responsibility for big companies, and allows company managers to save time-related data at a central location, which helps in straightforward analysis of data. This study aims to develop a web-based automated time and effort tracking software for a software project. This study also discovers the advanced thoughts to measure time and effort of a project member in a project.

Keywords: effort tracker; project; software; time tracker; web

I. INTRODUCTION

A time tracking software is the one that permits users to record time spent on tasks. This software is used by many people such as individual employees or workers, project team members in a company for a software project, professionals who charge their customers by the hour (e.g., solicitors, auditors, and freelancers), and hourly workers.

A time tracking software epitomizes an automated version of the conventional paper timesheet. It helps in increasing productivity (i.e., companies are able to better understand what practices or methods waste time), boosts responsibility for big companies, and allows company managers to save time-related data at a central location, which helps in straightforward analysis of data.

Time and effort tracking of a project in a company is a challenging task. There are several reasons why a company may need to track time.

Each company's reasons for tracking time will have large impact on the details of their own best time tracking solution. Tracking time—no matter the reason—is a big step toward corporate cost accounting experience.

The real value of your time data is its accuracy and completeness. The process of tracking time has to be easy. Dedication to time tracking has to start at the top of a company [1].

However, it is not easy to gage effort spent on a project in a company for determining a valid and concrete status since the traditional system of tracking effort experiences ambiguities and inaccuracies leading to confusing results. Uncertainty in information cannot be used to make strategic decisions.

Effort measurement expended on a project is vital to predict progress, which helps in analyzing the success factor of a project at a later stage [2].

In this study, we aim to develop a web-based automated time and effort tracking software for a software project. This study also discovers the advanced thoughts to measure time and effort of a project member in a project, which helps in providing a transparent view of a company's effort on a team project.

The remainder of this paper is organized as follows. Section 2 explains the proposed system, Section 3 describes the block diagram of the proposed system and system requirements, Section 4 explains the working of the proposed system, and Section 5 concludes the study with scope for future work.

II. PROPOSED SYSTEM

Our effort tracker system (www.efforttracker.co.in)—a smart way to track all your project efforts—not only tracks individual efforts but also team efforts of a project in a company.

It helps in picturing comprehensive data analysis with colorful histograms and pie charts. It provides an automated entry and shows real-time project data on a dashboard.

It can be used for data analysis, time and effort analysis, analyzing an individual's productivity, and comparative study of productivity and project hours.

In other words, it helps in organizing, managing, and analyzing information.

The advantages of our proposed system are as follows:

- Free from manual task
- Time saving
- Managing extensive amount of qualitative data
- Increased flexibility
- Improved validity and auditability
- Easy accessibility

The proposed system comprises different modules such as *Edit Projects*, *Project Sheet*, *Project Chart*, *Generic Chart*, *Request Box*, and *Custom Chart*.

Each of these modules comprises sub-modules. The detailed explanations of these modules and their respective sub-modules are explained in the later section of this paper.

A. Block Diagram of the Proposed System

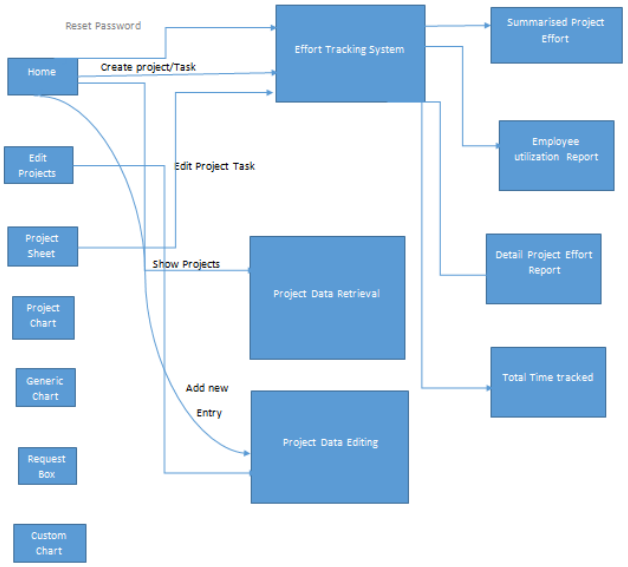


Figure 1. Block diagram of our proposed system.

B. System Requirements

Table I lists the system requirements for the proposed system.

Table I. System Requirements for the Proposed System

Hardware Requirements	Software Requirements
• A computer with 1.9 GHz or higher processor with 2 GB RAM • Approximately 80 GB hard disk space • A server machine with 99.99% uptime	• Microsoft ASP.NET 4.0 • Windows 7 or higher • .NET framework 4.0 or higher • Internet with minimum 2 Mbps speed (to send packets to the server) • Mailing server • JQuery and HTML5 support

III. WORKING OF THE PROPOSED SYSTEM

Our proposed system can be gained access via http://www.efforttracker.co.in/Login/Login?ReturnUrl=%2f, which transmits a user to the login page—on intranet—of our proposed system.

```
public ActionResult LogOutSystem()    //Login and logout from the effort tracker
{
try
{
FormsAuthentication.SignOut();
return RedirectToAction("Login", "Login");
}
catch (Exception Exc)
{
Elmah.ErrorLog.GetDefault(System.WebHttpContext.Current).Log(new  Elmah.Error(Exc));
return RedirectToAction("Login", "Login");
}
}
```

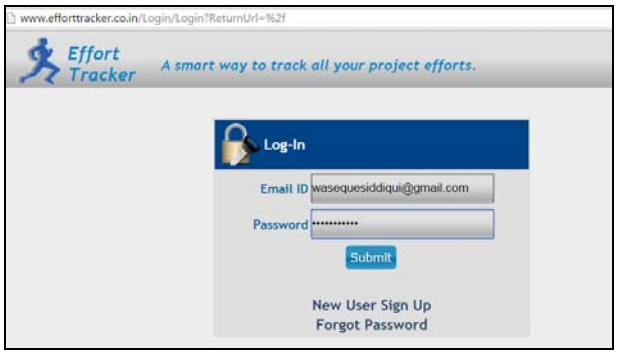


Figure 2. Login page of the effort tracker.

Figure 2 shows the login page of the effort tracker where a user needs to enter his valid email ID and password to "sign in" the system. For first-time users, they need to "sign up" (i.e., create an account) and then they can "sign in" the system.

A. Home Page

```
namespace EffortTracker.Controllers
{
  public class HomeController : Controller
  {
    //
    // GET: /Home/
    [Authorize]
    public ActionResult DashBoard()
    {
      Session["CurrentPage"] = new DashboardLogic().getMenuId("DashBoard", "Home");
      return View("DashBoard");
    }

    /// <summary>
    /// Dashboard Function to create Project
    /// </summary>
    /// <param name="Collection"></param>
    /// <returns></returns>
    [Authorize]
    [HttpPost]
    public ActionResult DashBoardCreateProject(FormCollection Collection)
    {
      try
      {
        new DashboardLogic().saveProjectData(Collection);
        ViewBag.Error = "Project Saved Sucessfully!";
        return View("DashBoard");
      }
      catch (Exception Exc)
      {
        Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
        ViewBag.Error = Exc.Message;
        return View("DashBoard");
      }
    }

    /// <summary>
    /// Update Project Log Data
    /// </summary>
    /// <param name="id"></param>
    /// <returns></returns>
    public ActionResult updateProjectLogData(int id)
    {
      try
      {
        ViewBag.ClientId = DateTime.Now.Day.ToString("D2") + "_" +
DateTime.Now.Month.ToString("D2") + "_" + DateTime.Now.Year.ToString("D2") + "_" + new
Random().Next(100000, 999999);
        EditData Data = new EditProjectLogic().getAllProjectEditData(id);
        return View(Data);
```

```
        }
        catch (Exception Exc)
        {
          Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
          ViewBag.Error = Exc.Message;
          return View("DashBoard");
        }
      }

      /// <summary>
      /// Update project entry data.
      /// </summary>
      /// <param name="strprojectId"></param>
      /// <param name="strclientId"></param>
      /// <param name="struserId"></param>
      /// <param name="strUpdateTime"></param>
      /// <returns></returns>
      [HttpPost]
      public ActionResult updateProjectEntryData(string strprojectId, string strclientId,string
strUpdateTime)
      {
        try
        {
          int userID = Convert.ToInt32(new
ProjectDL().getUserId(System.Web.HttpContext.Current.User.Identity.Name));
          EditProjectLogic.updateProjectTimer(strprojectId, strclientId, userID.ToString(),
strUpdateTime);
          return new JsonResult();
        }
        catch (Exception Exc)
        {
          throw;
        }
      }

      /// <summary>
      /// Get the server date timer values.
      /// </summary>
      /// <returns></returns>
      [HttpPost]
      public JsonResult getServerTime()
      {
        try
        {
          return Json(DateTime.Now.ToString(), JsonRequestBehavior.AllowGet);
        }
        catch (Exception Exc)
        {
          Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
          return Json("");
        }

}

/// <summary>
/// Update the currently opened project.
/// </summary>
/// <returns></returns>
[HttpPost]
public JsonResult updateClosingProject(string strclientId, string userId, string strprojectId)
{
  try
  {
    new EditProjectLogic().disableProjectEntry(strclientId, strprojectId);
    return Json("");
  }
  catch (Exception Exc)
  {
    Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
    return Json("");
  }
}

/// <summary>
/// Logout from the application
/// </summary>
/// <returns></returns>
public ActionResult LogOutSystem()
{
  try
  {
    FormsAuthentication.SignOut();
    return RedirectToAction("Login", "Login");
  }
  catch(Exception Exc)
  {
    Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
    return RedirectToAction("Login", "Login");
  }
}

/// <summary>
/// Create a new Entry for time sheet in project
/// </summary>
/// <param name="projectId"></param>
/// <param name="fromdate"></param>
/// <param name="fromTime"></param>
/// <param name="toDate"></param>
/// <param name="toTime"></param>
/// <returns></returns>
[HttpPost]
public ActionResult createNewEntry(FormCollection Collection)
{
        try
        {
          string fromdate = Collection["txtNewFromDate"];
          string fromTime = Collection["txtNewFromTime"];
          string toDate = Collection["txtNewToDate"];
          string toTime = Collection["txtNewToTime"];
          string projectId = Collection["ddlProjectNames"];
          int _projectId = Convert.ToInt32(projectId);
          bool result = new DashboardLogic().createNewLogEntry(_projectId, fromdate, fromTime,
toDate, toTime);
          return RedirectToAction("DashBoard");
        }
        catch (Exception Exc)
        {
          Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
          return RedirectToAction("DashBoard");
        }
      }

      /// <summary>
      /// Reset the password for the user.
      /// </summary>
      /// <param name="newPassword"></param>
      /// <returns></returns>
      [HttpPost]
      public ActionResult resetPassword(string newPassword)
      {
        try
        {
          string password = newPassword;
          new DashboardLogic().ChangePassword(password);
          return Json("success");
        }
        catch (Exception Exc)
        {
          Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
          return Json("failure");
        }
      }
    }
  }
```

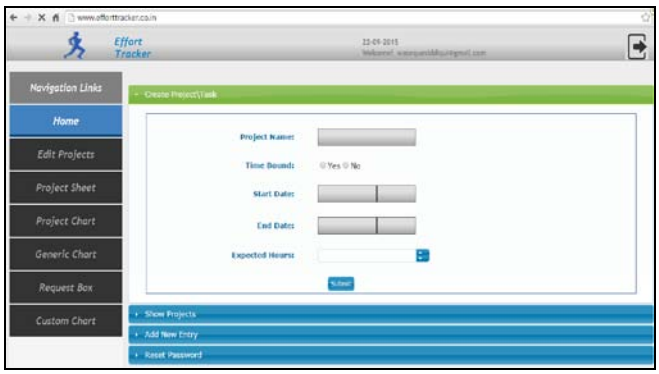


Figure 3. Dashboard of the effort tracker system.

Once a user has successfully "signed in," he/she will be able to view the dashboard or control panel of the system, as shown in Fig. 3. The dashboard comprises modules such as the *Home page* and other pages for example *Edit Projects*, *Project Sheet*, *Project Chart*, *Generic Chart*, *Request Box*, and *Custom Chart*. In addition, the date and the email ID of the logged in user are shown at the top right corner of the effort tracker system. Furthermore, the *Home page* comprises sub-modules such as *Create Project\Task*, *Show Projects*, *Add New Entry*, and *Reset Password* (Fig. 3).

```
public ActionResult DashBoardCreateProject(Form Collection Collection) // Create project/task
{
try
{
new DashboardLogic().saveProjectData(Collection);
ViewBag.Error = "Project Saved Successfully!";
return View("Dashboard");
}
catch (Exception Exc)
{
Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
ViewBag.Error = Exc.Message;
return View("Dashboard");
}
}
```

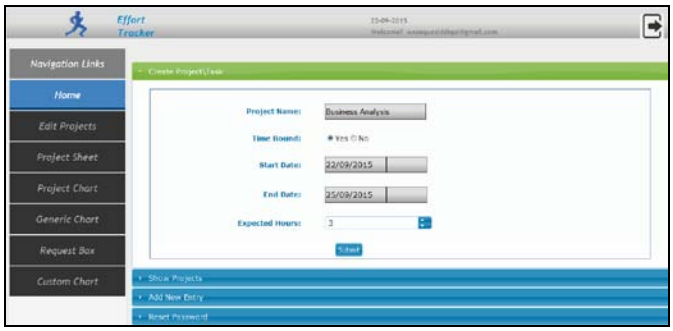


Figure 4. Home page→Create Project\Task.

Figure 4 shows how a user can create a project in the system by adding the *Project Name*, *Time Bound (Yes/No)*, *Start and End dates* for a software project, and *Expected Hours* for a software project.

Once the user has successfully entered all the project details, the user can view his/her newly created projects. Figure 5 shows the list of all projects that are successfully created by users. In other words, *Show Projects* display all active projects that a user has created. Moreover, there is a play button (➢) that enables the logger—*a device or computer program for making a systematic recording of events*—to be shown.

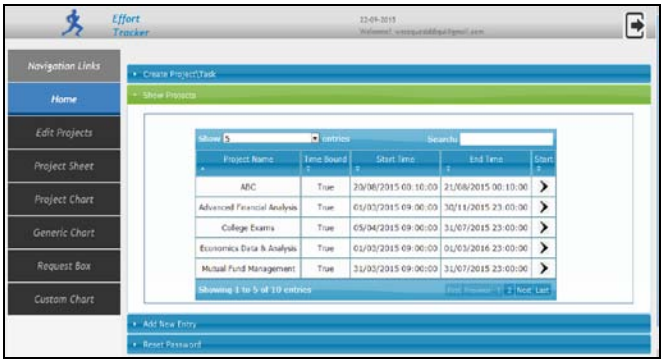


Figure 5. Home page→Show Projects.

For every successfully created project, there is a timer that helps in keeping a track of time (i.e., our system has made a provision of a timer that helps in maintaining a start and stop time for a software project). If a user has selected *Time Bound (Yes)*, then only the timer can be activated for a software project. However, if a user has selected *Time Bound (No)*, then the timer will not be activated for a software project. Figure 6 shows the activation or working of a timer for a software project.

```
public JsonResult getServerTime()   //Timer
{
try
{
return Json(DateTime.Now.ToString(), JsonRequestBehavior.AllowGet);
}
catch (Exception Exc)
{
Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
return Json("");
}
}
```

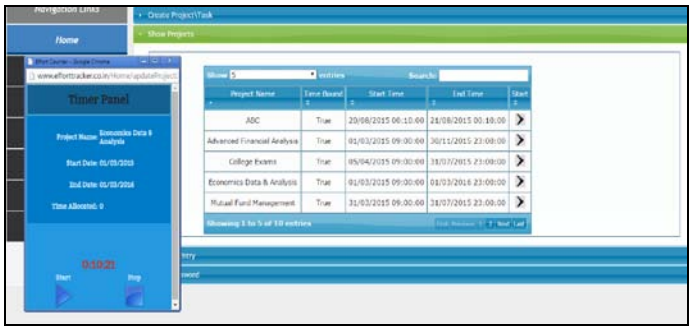


Figure 6. Home page→Show Projects→Timer.

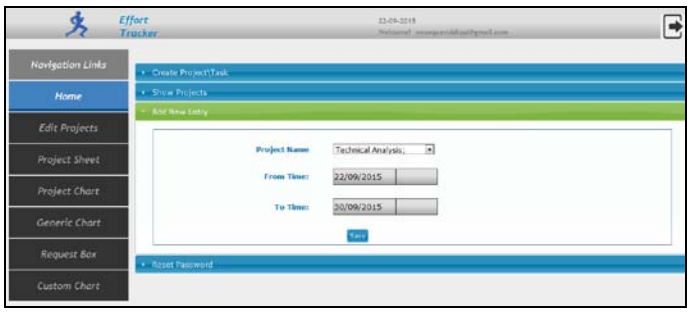


Figure 7. Home page→Add New Entry.

Furthermore, the user can add a new entry for a software project, as shown in Fig. 7. Alternatively, if the user has forgotten to initiate the logging process for a software project, then his/her respective project manager can do the needful. This feature in our proposed system acts as a safety backup. The user can also reset his/her password, as shown in Fig. 8.

```
public ActionResult resetPassword(string newPassword)   //Reset password
{
try
{
string password = newPassword;
new DashboardLogic().ChangePassword(password);
return Json("success")
}
catch (Exception Exc)
{
Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new  Elmah.Error(Exc));
Return Json("failure");
}
}
```

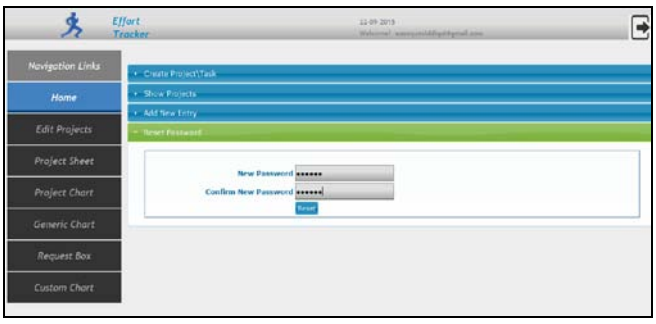


Figure 8. Home page→ Reset password.

B. Edit Projects Module

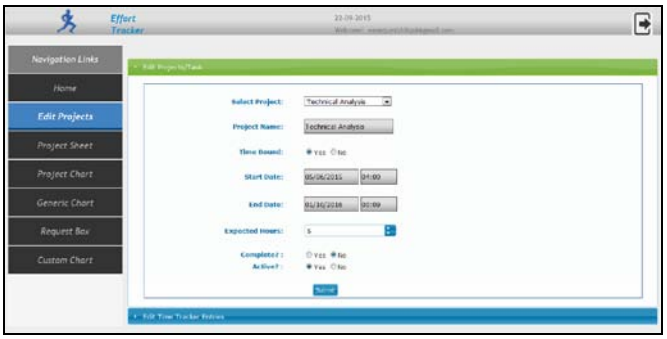


Figure 9. Edit Projects→Edit Projects/Task.

For any project that a user has successfully created, he/she can edit or modify the project details in the *Edit Projects* module. The parameters that can be modified for a software project are the *Project Name*, *Time Bound (Yes/No)*, *Start and End Dates*, *Expected Hours*, *Complete (Yes/No)*, and *Active (Yes/No)*. When the *Submit* button is pressed after making the necessary changes, the new changes are reflected for a specific project, as shown in Fig. 9.

```
public ActionResult EditProject(FormCollection Collection)  // Edit time tracker entries
{
try
{
new EditProjectLogic().UpdateData(Collection);
ViewBag.ProjectData = new EditProjectLogic().GetCurrentUserProjects(User.Identity.Name);
return PartialView("_EditProject", new EditData());
}
catch (Exception Exc)
{
ViewBag.ProjectData = new EditProjectLogic().GetCurrentUserProjects(User.Identity.Name);
Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
ViewBag.Error = Exc.Message;
return View("_EditProject", new EditData());
}
}
```

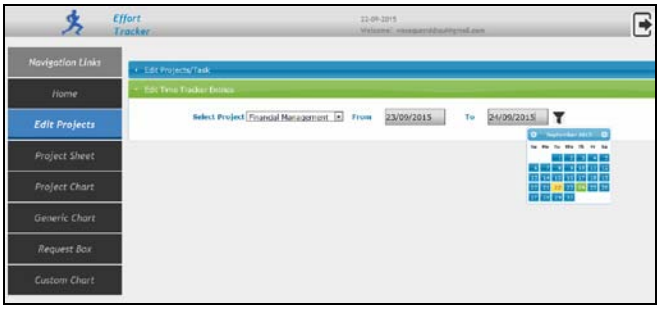


Figure 10. Edit Projects→Edit Time Tracker Entries.

Figure 10 shows how time tracker entries can be edited or modified *(i.e., how the start and end dates can be changed)*. Moreover, if the incorrect start and end dates are entered, then *Incomplete Data Warning* is showed—*end date should be greater then start date*, as shown in Fig. 11.

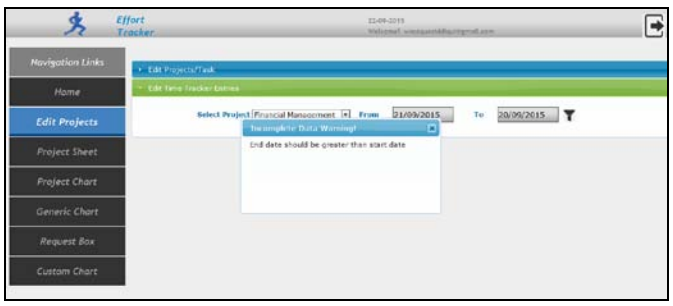


Figure 11. Edit Projects→Edit Time Tracker Entries→Incomplete Data Warning.

C. Project Sheet Module

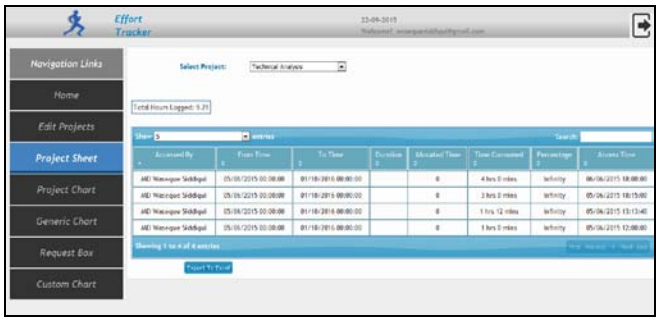


Figure 12. Project Sheet.

Figure 12 shows the total number of entries done for a specific project, which include the *name of the user* who entered the details, the *From and To* time, *duration*, *allocated time*, *time consumed*, *percentage*, and *accessed time*.

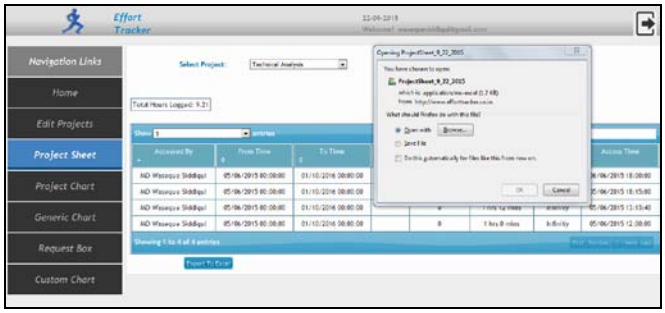
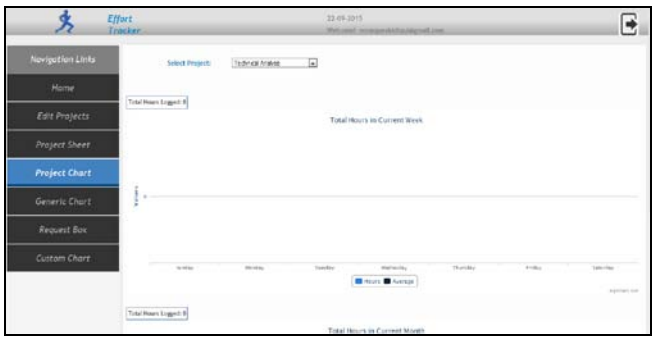


Figure 13. Project Sheet→Export to Microsoft Excel Sheet.

An important or unique feature included in the proposed system is the data entered for a software project can be exported to a *Microsoft Excel sheet*, which can be used for analysis at a later stage, as shown in Fig. 13.

D. Project Chart Module

```
public ActionResult ProjectSpecificChart()  // Project chart
{
try
{
Session["CurrentPage"] = new DashboardLogic().getMenuId("ProjectSpecificChart", "Charts");
ViewBag.ProjectData
EditProjectLogic().GetCurrentUserProjects(User.Identity.Name);
return View();
}
catch (Exception Exc)
{
Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
Return View();
}
}
```



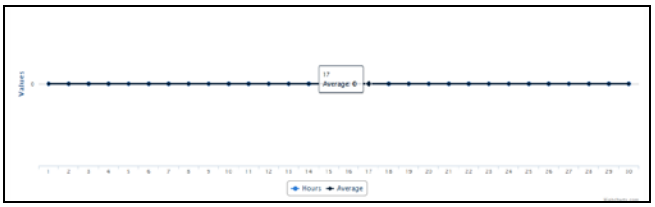


Figure 14. Project Chart.

The *Project Chart* module shows the graphical representation of a project. As the project name *Technical Analysis* was *Time Bound (No)* (i.e., Total Hours Logged: 0), there are no solid graphical lines shown (Fig. 14).

E. Generic Chart Module

Figure 15 shows the generic/general chart (i.e., the pie chart) that shows data for all project names that are entered by different users. It also mentions the *Total Hours Logged*.

```
public ActionResult GenericCharts()    // Generic chart
{
try
{
int userId = UserInfo.getCurrentUserId();
GenericDataChart Chart = new GenericDataChart();
Chart.Weekly = ChartingLogic.GetGenericProjectDataChartWeekly(userId);
Chart.Monthly = ChartingLogic.GetGenericProjectDataChartMonthly(userId);
Chart.TotalProjectSharing
ChartingLogic.GetGenericProjectHourSharing(userId);
Session["CurrentPage"] = new DashboardLogic().getMenuId("GenericCharts", "Charts");
return View(Chart);
}
catch (Exception Exc)
{
Elmah.ErrorLog.GetDefault(System.Web.HttpContext.Current).Log(new Elmah.Error(Exc));
return View();
}
}
```

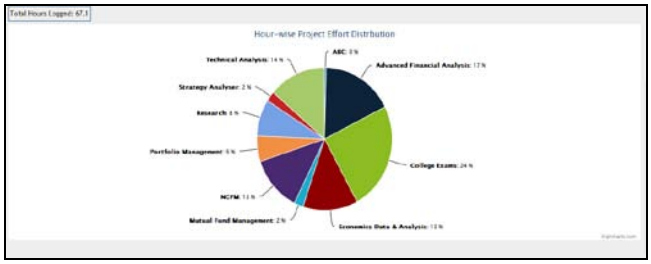


Figure 15. Generic Chart.

F. Request Box Module

This module is responsible for handling all requests that are sent by the users. This module is basically helpful for a software project manager or project leader or coordinator to keep a track of all pending or received requests. At the same time, the user can create a new request, as shown in Fig. 16.

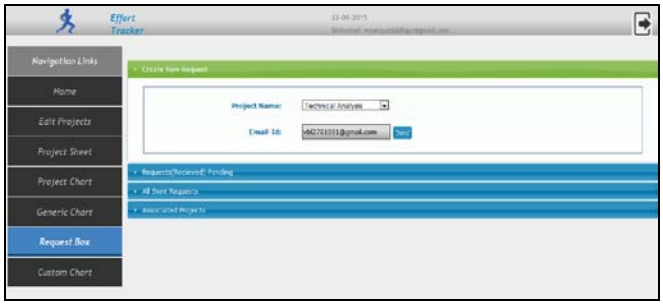


Figure 16. Request Box→Create New Request.

The project manager/leader/coordinator can view pending or received requests (Fig. 17).

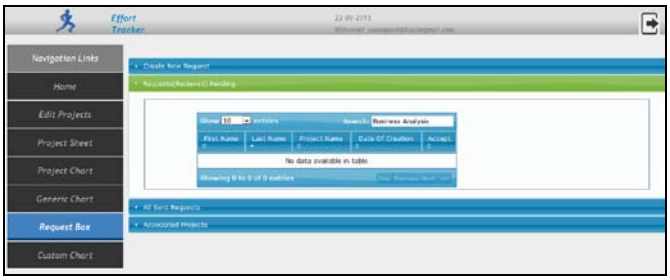


Figure 17. Request Box→Requests (Received or Pending).

Figures 18 and 19 show *All Sent Requests* and *Associated Projects*, respectively. Here, the project manager/leader/coordinator can view all requests that are sent by his/her team members for a software project. Simultaneously, he/she can view related or associated projects for requests.

Figure 18. Request Box→All Sent Requests.

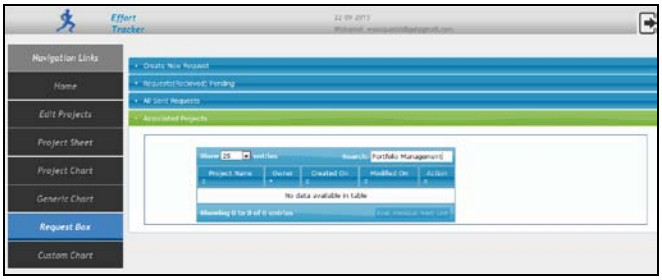


Figure 19. Request Box→Associated Projects.

G. Custom Chart Module

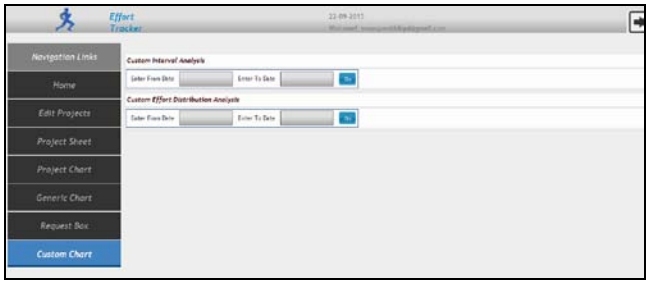


Figure 20. Custom Chart.

Figure 20 shows the customization chart for a software project. It includes two sub-modules *(i.e., Custom Interval Analysis and Custom Effort Distribution Analysis)*.

Figure 21. Custom chart→Custom Interval Analysis.

In the above figure, the graph shows the total hours for a software project in a given time (i.e., for a period of eight months). It represents the statistical data on *y axis* and the total hours on *x axis*. The *average numbers of hours* are represented by dark blue and the *hours* are shown by light blue.

Figure 22 shows the *Custom Effort Distribution Analysis* for all projects represented in the form of a pie chart.

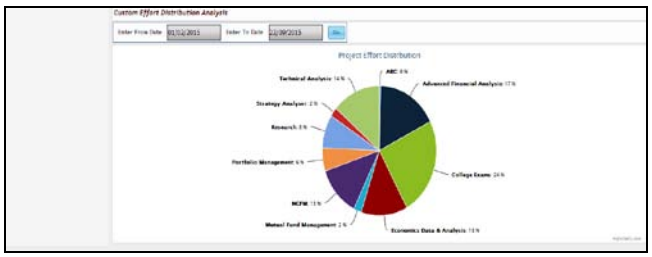


Figure 22. Custom Chart→Custom Effort Distribution Analysis.

IV. CONCLUSION

We have successfully developed a web-based automated time and effort tracking software for a software project that will track effort and time spent on a project and will help a company to better understand the productivity of an individual or team members in a project. This in turn will help the company's manager to analyze resources to various projects and will also help to better understand and evaluate an individual's or team performance. In future, we plan to integrate this software in biometric attendance system.

V. REFERENCES

[1] B. Peterson, "Best Practices for Time Tracking," A Journyx White Paper, pp. 1-14. Available online: http://www.rbryanpeterson.com/files/Best_Practices_for_Time_Tracking.pdf.

[2] S. Gupta and N. K. Dokania, "Challenges and Implementation of Effort Tracking System," In International Journal of Engineering Research and Technology, ESRSA Publications, vol. 2, no. 10, October 2013.