

The Electronic Telecommunication Management System
Analysis, Design and Implementation
Customised for PLUS Communication S.A

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ABSTRACT

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This thesis is an illustration of electronic human resource system management in telecommunications. While the challenge of the previous decades was the digitization of data, nowadays the real challenge is managing this large amount of data gathered in systems. This is the focus of my thesis which is developed for a very specific case : one of the main companies in the telecommunications field , PLUS Communications. This software aims to simplify the management of one of the most valuable assets of the company: human resources. It is also one of the most complicated assets to manage because of the many processes that need to be synchronized and interconnected with each other. My software's approach solves this major management complication. It consists of all the objective and static functions that a management system is expected to do.

Key words: Management of system, telecommunication, human resources, software

ABSTRAKT

Fakulteti i Arkitekturës dhe Inxhinierisë

Udhëzues: Igli Hakrama

Kjo tezë është një shembull i menaxhimit të një sistemi në fushën e telekomunikacionit. Nëse sfida e dekadave të mëparshme ka qenë dixhitizimi i të dhënave, sfida e ditëve të sotme është menaxhimi i këtyre të dhënave të mbledhura në sistem. Ky është fokusi i tezës sime, e cila është e zhvilluar specifikisht për një nga kompanitë kryesore të telekomunikacionit në Shqipëri: PLUS Communications. Ky software ka për qëllim të lehtësojë menaxhimin e një nga vlerave më të rëndësishme të saj, burimet njerëzore të kompanisë. Ky aspekt është gjithmonë i komplikuar për shkak të vetë strukturës së tyre të ndërlikuar të organizmes, sinkronizimit dhe nderthurjes së kerkesave të vleresimit të performancave . Software im ka për qëllim të zgjidhë këtë komplikim menaxhimi dhe përbëhet nga të gjitha funksionet objektive dhe të pandryshueshme që pritet të ketë një sistem menaxhimi.

Fjalët kyçe: Menaxhim i sistemit, telekomunikacion, burime njerëzore, software

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DECLARATION

I hereby declare that this thesis is my original work and all the content is my own. Every piece of information obtain from other sources is declared in the references section. This is the first and only submission of this thesis in any academic institution.

Dea Nurçe

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Chapter 1

Introduction

This thesis is about electronic human resource management software application in the field of telecommunication, specially customized for one of the four telecommunication companies in Albania: Plus Communication S.A.

Naturally any type of management requires a database of information to manage in the first place. Back in the day, dealing with any type of management tasks in big companies meant going through voluminous ledgers, whether the task included registering new information, withdrawing or searching for specific data or a large chunk of data for analytical reasons. It would take hours for employees to locate and pull out the needed information to fulfill their tasks. As the saying goes time is money so companies started looking for new ways to save time and subsequently their money, but also gain efficient results. Therefore they chose to invest in software programs with management purposes. The first software programs were quite simple and generic whereas the latest ones of the kind's complexity and specifications are engineered and customized to the company's needs. At first they were programmed in Java and were installed and used in standalone computers, or maybe a small network of computers communicating with each-other to keep the data synchronized. As every major company globally is moving most of their business into the internet, e-services evolved. Computers users started communicating with each other through the internet. By using the same software and tools by accessing a url link which directs the user to the central server where the software is installed, rather than installing it to every computer separately, many processes were simplified, which boosted the productivity and efficiency of the workflow. The administration is free to work from any location, independent of any other work process in the same web based software application. It is important to underline that the e-human resource management is often just one of the modules of a greater and Omni-inclusive software application. Standalone e-human resource management can only be found in smaller companies with locally limited activities.

The usual approach to human resource management software is the modulation of this module itself in smaller parts such as the payroll module, time and attendance module,

benefits administration module, training module, performance evaluation etc. These modules are implemented differently in every case but they are absolutely necessary. Extra modules can be added as required by the client.

The reason why I chose this specific department is to contribute in the maximisation of profits for the company by providing an efficient e-HRM, by giving ideas on how to perfect the actual software, to use in very simple way of management. Its complexity and immensity makes it necessary to have a software that helps to keep everything organized and in sync in the company. Management software in general enables an up-to-date connection between several departments of a company, which aids the communication between employees and the work efficiency all in all. Electronic HR management system helps Hr managers to understand all employees' best work-related skills, to stimulate them towards continuous professional growth to contribute in the economical performance growth, to harmonize the politics of career promotion's as strategically viewed by the company to develop better candidate search strategies and to discover unrevealed talent within the company.

Chapter 2

Research

2.1 Literature Review

2.1.1 Introduction

HR is not treated as a single function; it is a collection of highly specialized capabilities each with distinct objectives, tasks and needs. HR optimization ,which is about implementing new technologies that maximize efficiency, reinforce return on investment, and accelerates the growth. E-HRM is all about supporting your HR functions; better manage resources for the greater good of organization as a whole (Sareen, P. & Subramanian, V. 2012). There are similar functional definitions of E-HRM including the composite of databases, computer applications and hardware and software used to collect, store, manage, deliver, present and manipulate data for Human Resources, defined as The administrative support of the HR function in organizations through the use of internet technology (Voermans& Van Veldhoven, 2007). According to Strohmeier (2007), E-HRM technology is a way of implementing HR strategies, policies and practices . E-HRM technology supports the human resource function to comply with the human resource needs of the organization across web technology-based channels (Katou,A. 2008). E-HRM technology provides a portal that allows managers, employees and HR professionals to watch, view, extract, or adjustment information which is necessary for managing the human resources of the organization. In addition, with the use of E-HRM, fewer human resources professionals are needed, due to the fact that E-HRM eliminates the ‘HR middleman’.

E-HRM includes personnel communication via electronic mails. The penetration rate of online communication, mainly e-mail, which is higher than 75 percent in corporate environments and e-mail has emerged as the communication medium of choice did. [1]

In this chapter I will introduce a few electronic Human Resource Management Systems, which have had a major impact internationally, and therefore are quite a good reference and example for my own electronic Human Resource Management. These two cases are SAP ERP (HCM) – SAP Enterprise Resource Management and Orange HRM.

2.1.2 SAP ERP HCM

My internship in SAP ERP has been a great opportunity and a learning experience that keeps on giving. SAP is a great platform for enterprises, because of its all-inclusive modules that are quite helpful in their management. It is rather intended for enterprises, because it is very expensive and requires SAP-trained specialists to custom-tailor it to the company's needs. All enterprises implementing it have a different version of SAP, as their business activities are very unique. One of the many modules of SAP that I was introduced to is Human Capital Management. This is also one of the most important modules of the software that plays a key role in the creation and maintenance of an organized management in enterprises. It handles employee records and automates HR functions such as benefits, leave, payroll, trainings etc. SAP is always a step ahead of the game, and has evolved into a more modern type of web application – a cloud application. Consequently, the application can be accessed not only via a web browser but also via custom built apps installed on Internet connected devices such as mobiles and desktops.

SAP HCM Modules consist of:

1. Organizational Management, which defines an organized way to make different people work under a common platform towards achieving a pre-defined goal. It ensures a smart management of time and resources in the workstation.
2. Personnel Administration, which defines the process through which the human resource of an organization is managed. From the stage of recruiting through compensation, benefits, new employee orientation, performance-appraisal and more, everything can be recorded and tracked through this process.
3. E-Recruitment which is an automated web-based recruiting process that assists HR professionals in hiring appropriate talent. It opens up innovative ways of recruitment processes in an organization.
4. Time Management which assists one in the processes of planning, recording and valuation of employee's performance for a certain period of time. The impact of employee's presence and absence in the organization is evaluated in this process. Also attendance management, calculation of wages, log-in and log-out report etc., are included in this process.

5. Payroll, which is all about the pay-scale and compensations given away to employees. From salary to overtime pay, comp-off pay and compensation program, everything is calculated in this process.
6. ESS (Employee Self-Service) and MSS (Management Self-Service) , which helps employees individually track various data of their tenure in an organization. On the other hand Management Self-Service is a vital process for the managers to create and maintain the data of employees.
7. Reporting, which allows HR team to deliver comprehensive and up to date information of all its employees. The reporting tool also enables one to track the hierarchal structure followed in an organization.

2.1.3 Orange HRM

Orange HRM is user-friendly, flexible HRM software for small to medium-sized businesses and a lot less expensive than the abovementioned SAP. This software provides a customizable solution that involves the entire employment lifecycle while discreetly aligning with the workflow. Just like SAP, it is organized in modules and can be adapted to the needs of companies operating in various industries by customisation.

Orange HRM is distinguished by its Open Source architecture. It constantly uses feedback from community members to develop and upgrade features incorporated in the software, guaranteeing a precise system designed to drive revenue. Orange HRM has very user-friendly interfaces for both administrative staff and the employee self-service module. Its functionality is backed by knowledgeable, professional support.

2.1.4 E-HRM in USA

[2]In 1995, a study proposed that from 700 publicly traded firms in the U.S., those that implemented HR accomplished a yearly shareholder return of 9.4 percent (versus 6.5 percent for firms utilizing less practices) and their gross rates of profit for capital were more than 50 percent bigger than firms that did not.

The definition of strategic HRM in North America tends to perceive the term in a broad vision. Researchers have come into the common ground of identifying four features that distinguish and

separate the function of HRM. To begin with, strategic HRM, as a macro-level concept requires further specifications when it comes to the concept of organization. It doesn't matter if the organization is a company, institution, business unit or corporate, the specifications should be defined for it. Secondly, the objective of strategic HRM stresses the need of match between horizontal and vertical alignment. Horizontal alignment is the concept of fitting practices of HRM, whereas vertical fit requires a match of HRM and other strategies of the organization. Mainly, the focus is on business strategy since the aim of the companies is to become as more influential in the competitive market as possible. Thirdly, strategic HRM focuses on HRM systems, a collection of practices and HR functions, which for different perspectives may vary in terms of characteristics. Finally, strategic HRM emphasizes organizational performance outcomes. [3]

Considering all the characteristics and definition of strategic HRM, Americans have built a HRIS that would fit the needs of their market. In the USA, which is the model on which I have conducted the research there exists a general framework including all the functions required to have the appropriate design for an E-HRM application.

The framework evaluates seven different aspects that an application dealing with the management of the duties of HRD has to have. Starting with the measure of success, it is clear that different people in the organization have different metrics of measuring the success. It is not the same what a system user requires with what a decision maker need. American companies focus on setting a common, solid ground so that all the actors with defined roles in the company get what they need. Another important feature implemented in the American HRIS, is settling the type of design. Whether it is system or information related is just a general, basic categorization, left open to any change reflecting the nature of the organization [[4], [5]]. Another concern whilst developing a system is the way of implementation. Usually, the approach taken is to create an easily implemented application that would also leave space for improvements as the company grows further. HRIS design characteristics may differ according to their level of validity [6]. Applications in the market are in between of being universally applicable and contingently designed.

2.2 PLUS Communication

This chapter is a scrutinized analysis of the structural organization of the company's human resource department. To consolidate this analytical subchapter I have read and reviewed a lot of the company's rules and regulations on the topic of human resource management, which I cannot publish for confidentiality reasons. Therefore I wrote this summary that consists of the most important information, which helped me get a clearer idea of how the human resource department is organized.

This department is a part of the basic structure of PLUS and is directly dependent on the CEO. It consists of these sectors:

HR Administration sector prepares the payrolls, maintains the personnel files, prepares the job contracts for every employee, the declaration of the currently working and the ones who no longer work in the company in the respective government offices, as well as the administration of the yearly leave and other leaves.

HR Recruitment sector plans the workforce yearly, coordinates the recruitment process for all the departments of the company, finds the right communication channels to later use them to communicate vacancies, develops job descriptions and requirements, internship programs, developing and maintaining partnerships with universities, local agencies and educational institutions to acquire the newest talents in the market, organizes the orientation process for the newcomers, coordinates the process of vacancies with the other sectors such as the finance, legal, it, administrative or security sector.

HR Performance, Compensation and Benefits sector creates performance related procedures and indexes; guarantees the performance evaluation for all employees; develops strategies for the employees' professional growth and on how to identify the most significant people in the company and continue to keep them by having personal development and professional growth for them; prepares and monitors the procedures of Health and Safety at work; follows, updates and implements the schema of commissions for all the sale workers.

HR Training sector is responsible for the coordination of all trainings developed, whether from the company itself or through local or foreigner agency for all the employees, training the PLUS sale and customer care workers. It gathers and processes training and development needs for all employees and designs a yearly training plan.

Recruitment

The number of people in the job recruitment jury depends on the type of vacancy but the minimum is 2 people, which usually consists of a HR representative responsible for the recruitment and a superior employee for the sector of the vacancy.

The recruitment process aims to attract and keep the most qualified staff possible. Its purpose is to guarantee a full accordance with the Albanian jurisdiction, equal standards and staff recruitment practices, maximal priority in the personnel choice and recruitment, attract new employees with an intense growth potential as well as the evaluation and development of the actual employees.

The process starts with the work force budget planning and designing by HR department at the end of every year. This plan foresees all staff necessities for the upcoming year, such as new recruitments, redundancies or possible structural changes. Every request for new employees made by the sector managers goes through an approval process by the HR director and the company's CEO. The approval is only confirmed if the request is in accordance with the yearly budget assigned for the HR department. Therefore, all sector managers have to precisely and objectively anticipate these changes as during the yearly recruitment planning. After the request has been approved the HR director initiates the recruitment process as explained below.

Recruitment method definition – HR director in cooperation with the executive director and department directors decide whether to use inner human resources or to look for candidates out of the company

Announcement preparation – After the recruitment is defined, the recruiters start to prepare the vacancy announcement. The announcement consists of the job title and department, tasks description, criteria, the address and application deadline. It is published at least 15 days before the deadline.

Application gathering and filtration – After the deadline, the recruiters and the sector manager prepare a compressed list of candidates based on the filtration criteria.

Testing – The compressed candidates list goes is used for the second phase of selection: the testing phase. The tests include the English language test and the Belbin test for all

newcomers and professional and intelligence test for specialist vacancies. The professional tests are created by the respective department director. The Belbin test is used to identify the role of the candidate in the team, i.e creative, group member, coordinator, executive, etc.

The interview – The candidates who pass the testing phase are then interviewed. 4-5 of them are called for a second interview.

Selection – After the second interview, the final decision is reached for the winning candidate. The proposal is sent to the CEO and he approves the job offer to the candidate.

Job offer – The HR department offers the job to the candidate and negotiates if necessary. Usually the negotiations are about the salary, since every other compensation and benefit element in the company is well defined. If an agreement is reached, the candidate is employed. In the contrary, the second candidate in the final selection list is offered the job.

Job offer acceptance – The recruitment process is closed when the candidate starts working in the company. They are equipped with personal credentials to access the company's e-HRMS software.

After this phase the new employee starts a detailed orientation program managed by HR department. It consists of theoretical details which introduce the employee to the mission, vision, objectives, procedures and policies and ethical code of PLUS, as well as the practical part which consists of the introduction to the department and the personnel's functions in it, the relations of their job with other functionalities of the company and the concrete everyday tasks that they are to complete.

At the end of a 3 month trial period, the employee goes through an evaluation process by the direct superior who points out what was well done and what needs to be improved. If the employee does not receive a positive evaluation, the trial period has not been passed and the job contract is cancelled. Consequently, a new recruitment process is initiated, unless there was more than 1 selected candidate for the 3 month trial period.

The employees are categorized as :

1. CEO
2. First level managers
3. Second level managers
4. Sector managers

5. Specialists
6. Technical/ support staff

Employee promotion and salary raise is based on the yearly performance evaluation, which is explained below.

The performance evaluation process in PLUS is a continuous activity aiming to manage and hopefully improve the performance of our staff. This process is considered as dialogue during which the performance, setting and achieving goals and the recognition of development needs are discussed. It is important that every employee understands their exact responsibilities and expectations and is fully aware of the full support of their supervisors to achieve the goals they have set.

This process begins with the job description. Every supervisor and employee has to refer their work and the required functions, as this is the only way to have an objective performance evaluation. The job requirements and importance have to be given priority and considered instead of the person in charge of that job, to understand what the expected result from this job are. The supervisors have to define the direction that their staff has to follow to fulfill those expected results.

The definition of the Key Performance Indexes is necessary for the improvement of every skill and the contribution to the creation of a favourable professional environment. Every employee has to understand that the bare minimum is not enough and does not represent the company's standards.

This process helps the HRD and the company to:

- Assess the employees' performance
- Understand if the employees know their responsibilities
- Identify training needs that result from the evaluation
- Plan and coordinate possible promotions and/or change of job positions, keeping in mind the main professional and personal characteristics of the employees and their achievements
- Understand the reason of a job not well done, trying to motivate the employees
- Support their professional growth and career

It is a dialogue between the main director and the employee where common objectives responsibilities and obligations are discussed. Good communication is important!

The evaluation process is not a momentary procedure that can be treated as an isolated case with a deadline. On the contrary it is a continuous activity, an everyday task for the director. It is obligatory for all the employees of PLUS. The directors carry the responsibility of filling in The Performance assessment form and must always be informed and aware of their staff's performance and work. The Performance, Benefits and Compensations expert organizes, initiates, analysis and monitors the process.

The structure of the evaluation form is illustrated below:

- Level classification – 5 levels of evaluation and 1 unclassifiable level(less that 6 months working)
- Business objectives evaluation and definition
- 3 known and previously accepted objectives, deadlines
- Definition and assessment of the basic rights
- Choosing 3-4 rights related to the job profile
- Definition of the opportunities for personal development
- Development and improvement of professional skills

Trainings

For newbie's -- In the new employee's second day of work, there is a 1 day introductory training called "PLUS Induction" which informs the employee about the official schedule, yearly leave, performance assessment, company's ethical code, employee's benefits, company 's procedures, staff contacts, inner communication. Afterwards the employee is sent to the corresponding department and introduced to their job by the manager. They are also instructed on how to use the systems and on the department procedures.

For existing employees -- Training needs are identified by the direct supervisor and reported to the training sector. The main needs come up after the performance assessment.

2.3 Conclusion

To implement a good electronic human resource management system (also found as eHRMS), it is important to know how the HR department is organized in the respective company. After the detailed research I conducted, I came to a few conclusions of my own.

For effective, efficient and well organized electronic Human Resource Management software in telecommunication, the most crucial modules of the department must be included in the software. Therefore I will implement the organizational management, personnel administration, e-Recruitment, time management, employee self service, manager self service and reporting modules into my own software application and tailor them to the company's needs.

Chapter 3

Software Analysis and Design

3.1 System Analysis

Telecommunication Electronic Human Resource Management is a web based of software. The main page of the software gives you the option of login in as a user or going to the Vacancies page.

The vacancies page contains new vacancies and an application form. The vacancies are created and updated by the system administrator account, which is by default the account with unlimited competences.

The user accounts in the software will consist of personal information such a username, password, name, surname, gender, birthday, email, company card identification number, job position, department, sector, and whether the user is a full time or a part time employee in the company.

The departments of the company are:

1. The Finance department
2. The IT department
3. The Commercial department (Sales and Marketing)
4. The Human Resource department
5. The Legal Resource department
6. The Interconnection department

The administrator can create, read, update and delete all user accounts in the software.

User accounts vary as below:

1. Team member
 - a. Assistant
 - b. Senior

- c. Supervisor
- 2. Manager
 - a. First Level Manager
 - b. Second Level Manager
 - c. Sector Manager
- 3. Leader
 - a. CEO
 - b. Department Director

He can send emails to other users, create leave types, gather and filter job applications that come in from the vacancies application form. He will also create the juries that are going to recruit the employee for the vacancy.

Other than the administrator account there will be manager accounts and employee accounts.

Other than the personal profile, employees can change their password, send emails, send reports from the task page report form, apply for leave, view tasks, view reports and comment on tasks or projects page to interact with other users. The profile will also contain the number of days used from the leave and the number of days that remain.

A manager views, declines, approves leave requests that come in from the employee.

Leaves are categorized as paid, unpaid, sick and extraordinary leaves in case of marriage/death/evil diseases. The type of leave will be assigned by the user in the leave application form. Paid leaves are 4 weeks long and the minimum time length of a paid leave request is 1 week. The software will show a total of the paid leave used and unused days as well the unpaid leave days of each employee.

He creates, views projects and tasks, creates and updates the project team which will consist of a team leader and other team members. The manager will also send new vacancies to the administrator to post them in the vacancies page.

He can also propose new trainings to the Head of HR via a form.

The types of trainings available will be:

- 1. External trainings
 - a. Conference/ meetings

- b. In-house training
- 2. Trainings under contract
- 3. Workshops
- 4. Internal training
 - a. On the job trainings
 - b. Induction training
 - c. Development training

A training participation, evaluation form and a list of available trainings will be shown to the user.

Performance evaluation is another competence of the manager. The manager will fill in some forms for every employee. At the end of the process, the calculations and the category will be shown. There will be six performance evaluation levels :

1. PTSH: I patestueshem – Untestable
The employee has been working in the company for less than 6 months
50% of the checked boxes are in the the PTSH column.
2. NPP: Nuk permbush pritshmerite
The employee has not reached the expected goals, negatively impacting the sector's or department's objectives.
3. KP: Kerkon permiresime - Improvement Needed
The employee has not fulfilled his duties, but unlike the above category the needed improvements are short-term.
25% of the checked boxes are in the the PJ column.
4. PP: Permbush pritshmerite - Fulfilled Expectations
The employee has fulfilled most of his duties.
75% of the checked boxes are in the the PP column.
5. TP: Tejkalon Pritshmerite – Exceeds Expectations
The results exceed the job position's expectations, the employee has fulfilled most of his duties and has a stable performance.
75% of the checked boxes are in the the TP and PP column.
6. PJ: Performance e Jashtezakonshme – Extraordinary Performance
Extraordinary and significantly higher performance than his co-workers.
7. 75% of the checked boxes are in the the PJ column.

The manager also fills in a performance evaluation form which has previously been filled in by the employee and is then published in the employee's personal page. The form can be edited throughout the year by both parties until the final submission. The form is either approved or disapproved by the manager. In the case of a disapproval the employee's form page will show a disapproval message.

The HR administrator records working hours for employees.

The Head of HR account is mostly responsible for the recruitments and the training approvals.

In the recruitments menu item of the Head of HR page, there will be a list of all the vacancy applications from the vacancy page and a list of all the candidates in interviewing phase and an interview calendar.

3.2 Functional Requirements

3.2.1 Administrator functionalities

The administrator is provided a menu with 4 major options. The first functionality is sending an email, by filling in a form with the subject, the receiving email address and the message. The next menu item is a drop-down menu that gives you the options of managing employees. By selecting one of the items the administrator is redirected to a different page where he can create a new employee, update or delete an existing employee or read all existing employees. The administrator can also view vacancy suggestions by managers and approve them. He can view work reports from his team in a special page. Lastly the administrator can also fill in the working hours of the employees.

3.2.2 Employee functionalities

The employee account is also provided a menu with 6 options. The first option is changing personal information such as email, birthday, password, username etc. The second submenu in the menu offers the opportunity to view previous leaves and apply for a new one or cancel

a pending leave. The third submenu allows the employee to apply for a training, view all trainings that he has participated in, or cancel a pending training application. The fourth submenu allows the employee to fill in work reports, view the previous work reports. Another section allows the user to view projects and tasks. The employees can also comment on a specific projects page and communicate with each other. Lastly the employee can also send emails to other co-workers.

3.3.3 Manager functionalities

The manager account is provided with a menu of 7 options. The manager can create a new project, update it, delete it or view a list of all the projects he is responsible for. He can also comment on a project page. He can create a project team in a separate section and associate it to a new or existing project. In the suggestion page he can suggest a vacancy or request new training to the administrator by posting a vacancy with the status as ‘Pending’ that is restricted by the system. Another submenu allows the manager to view all the leaves and approve or disapprove pending leaves. The manager can send emails to other co-workers in a dedicated form. In the last sub item of the menu the manager can fill in evaluation forms for the employees he is responsible.

3.2.1 Usability Requirements

The interface is very simple and user-friendly. It will consist of a full documentation of the users information and come with an instruction manual and an attractive design.

3.2.2 Performance requirements

The web application has to be very fast and responsive. It has to support over 400 users. The changes made to the information must be updated really fast in the database to avoid delays in the general work process of the employees.

3.2.3 Security Requirements

Only the administrator can create other user accounts. He is the one responsible for the maintenance of most processes in the software. All users can access their account by entering their username and password. To reset the password users have to confirm their old password first.

3.2.4 Interface Requirements

The software will consist of different types of layout for every type user account because of the different functionalities. The menus, buttons and forms will change as needed throughout the software's web pages.

3.2.5 Functions

Command	Functionality
Log in	The user logs in with the respective credentials.
Add Employee	The administrator creates a new employee account.
Change Password	Any user account has the opportunity to change their password.
Post Vacancy News	The administrator posts a new vacancy on the vacancy page, after the HR Director's approval.
Apply for Vacancy	A visitor fills in an application form for a vacancy.
Manage Attendance	Fill in the attendance for the week by adding the work hours by every employee.
Create Project	The manager adds a new project.
Create Project Team	The manager creates a team for a new project.
Send Vacancy News	The manager identifies a vacancy and sends a suggestion to the administrator.
Requests a New Training	The manager requests a new training after identifying the employee's needs.
Comment on Project	The manager and the employees can comment on a project they are working on.
View Leave Requests	The manager views the leaves requested by employees.
Approve Leave	The manager approves the leave request.
Evaluate	The manager fills in an evaluation form for the user.
Read Reports	The manager reads reports written by the employees.
Apply For Leave	The employee applies for a leave.

3.3 Non-functional Requirements

In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviours. They are contrasted with functional requirements that define specific behaviour or functions. [7]

This subchapter is the set of all constraints of the system.

3.3.1 Hardware Requirements

A server is required to store all the voluminous data. It should be running at all times and recover in less than 3 minutes in case of problematic situations.

3.3.2 Reliability Requirements

The system has to be responsive. The data has to be synchronized.

3.3.3 Supportability Requirements

The software needs to be understandable by all employees, clear and easy, integrated with a manual.

3.3.4 Security Requirements

The employees' personal data has to be secure and private. Only authorized users can access the system.

3.3.5 Availability Requirements

The system has to be available at all times.

3.3.6 Compliance Requirements

The system has to be compatible with every possible operating system used by devices nowadays.

3.4 System Requirements

1. All system users are identified via a username and password.
2. Every employee is assigned to a department.

3. Every employee has a respective manager.
4. Job vacancies are posted in the vacancy page, which does not require logging into the system.
5. Leaves are managed by the managers.
6. Trainings are created and assigned to departments by the administrator.
7. Every project is assigned to a project team.
8. Evaluation of employees is done by their superior via prepared forms found in the system.

3.5 UML diagrams

This section illustrates all the essential UML diagrams needed to visualise the details of this e-HRM software. Unified Modelling language is a general purpose language used in software engineering to provide a visualisation of the system.

3.5.1 Use case diagram

Use case diagram shows the main functionalities available for each user. It shows the relationships between users in different use cases that might be presented. It also helps in the process of implementation and coding because of the simplicity of its presentation.

All the relationships of the users are concretely shown in the use case diagram below.

There are four actors in total: the administrator, the employee, the manager and the external user.

These actors interact with each other and with the system as well.

The administrator is responsible for the creation of both employee and manager accounts, which are later handed to these staff members with the responsibility to update any personal information and responsibly participate in other activities that are posted on their page.

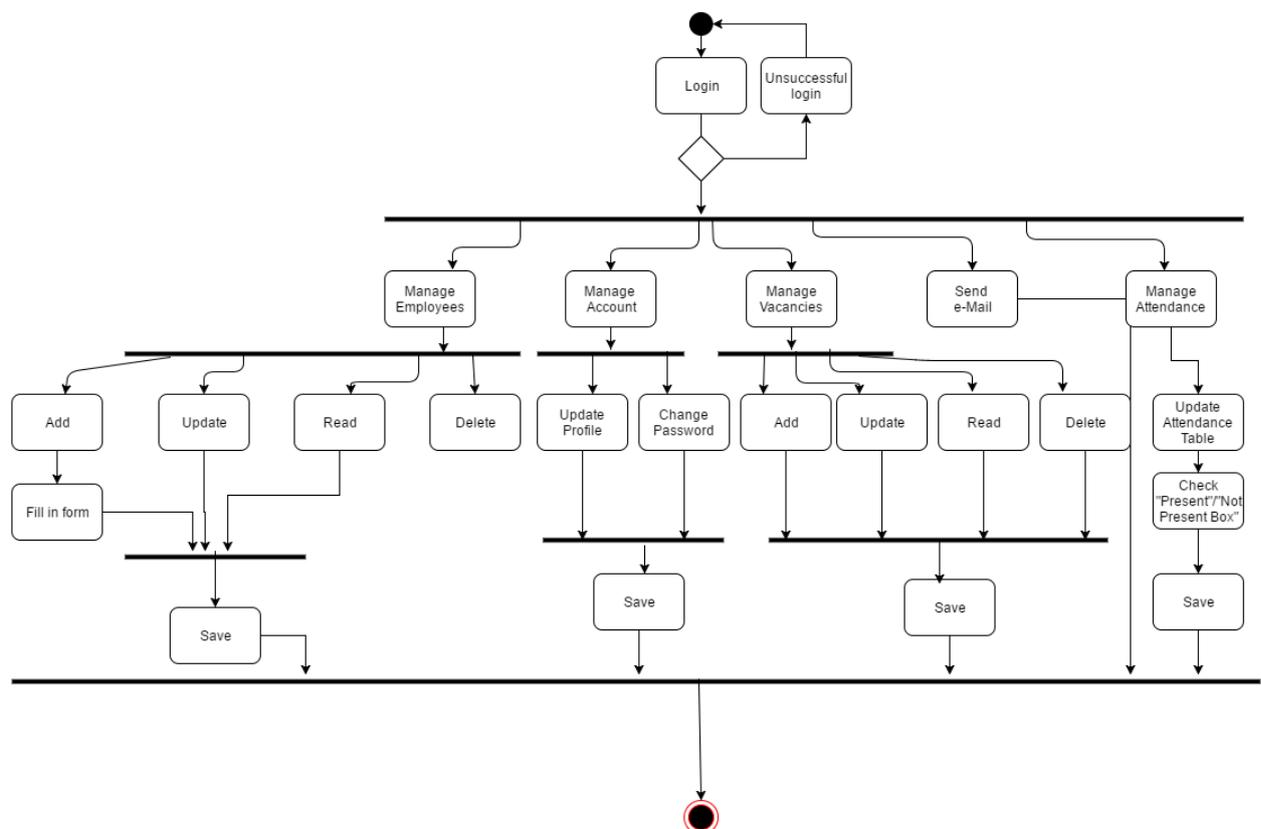
3.5.2 Activity diagrams

Activity diagrams describe dynamic aspects of the system. It consists of flow charts which visually describe the process of passing from one activity to the other.

3.5.2.1 Administrator's activity diagram

The first step shown in this diagram is logging in, which can only result in a successful or unsuccessful log-in. In the case of an unsuccessful log-in it returns the administrator to the start to retry. In the case of an successful login in presents the administrator with 5 options.

The first option is Manage Employees, which also presents the administrator with 4 more options. The administrator can choose to add, update, delete or read employees by filling in the respective forms. The second option is to manage their own account, where the password or username can be changed as desired in the corresponding text fields. The third option is Manage Vacancies, which is quite similar to the first option. In this section the administrator can add, update, delete vacancies by filling in the forms or read them. Lastly, the administrator can choose to manage employees' attendance by filling in the text fields at the end of the row to add in hours of work.



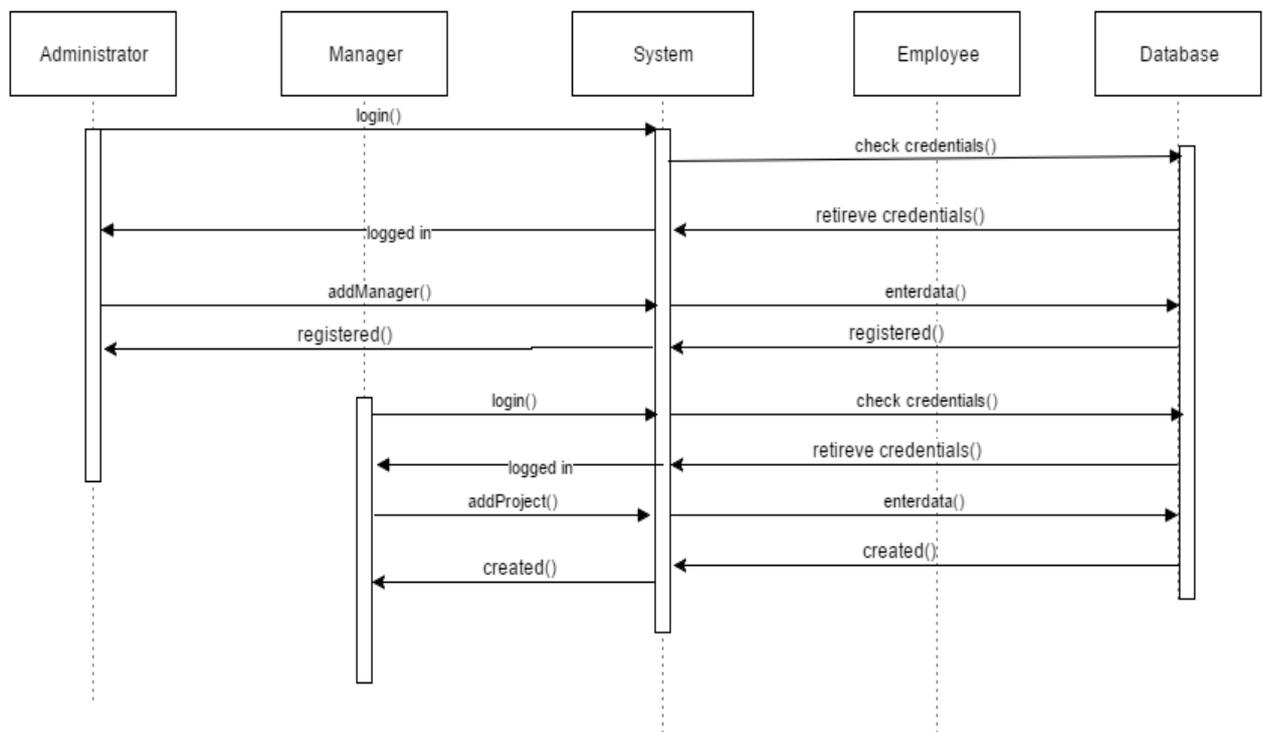
Administrator Activity Diagram 1

3.5.3 Sequence Diagram

Sequence diagrams represent the sequence of actions that derive the completion of a task. In the diagram below, the main actors are the administrator, the system and the manager.

The administrator enters her username and password in the system. The system initiates a query in the database to check if the credentials are valid and the database returns a response. If the response is not null, the administrator gains access to her personal page and chooses to create a manager account. She enters the respective data in the system and the system enters the data in the database. The database returns the confirmation of a successful registration to the system and the system returns it to the administrator.

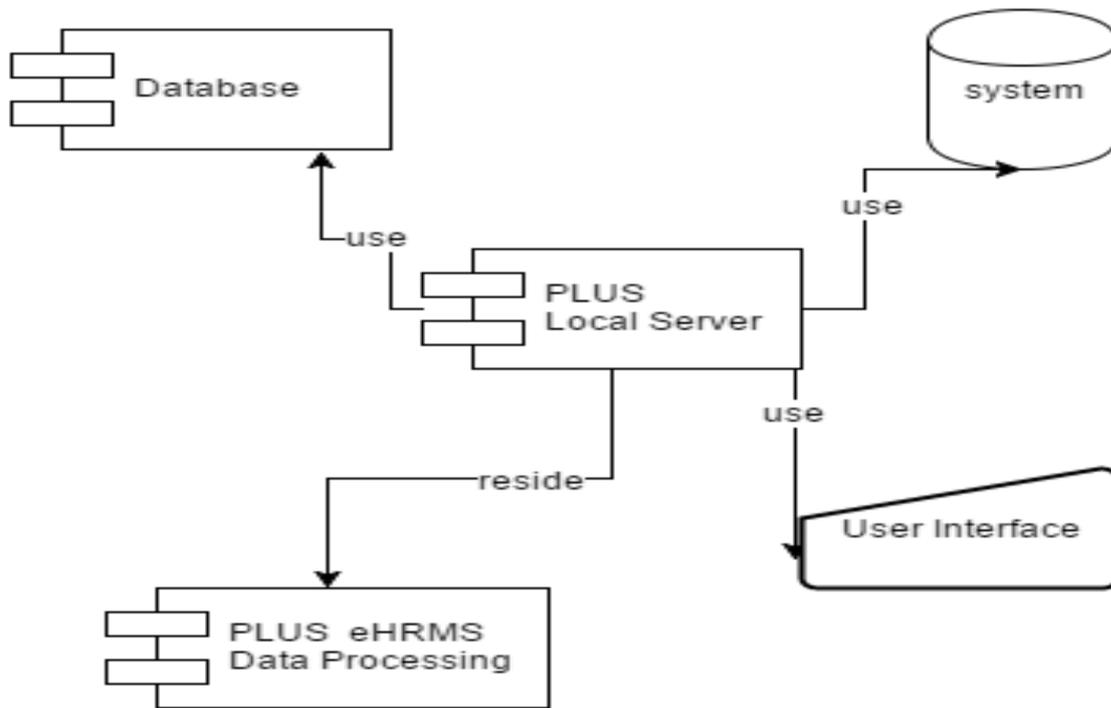
The manager enters her login credential The system initiates a query in the database to check if the credentials are valid and the database returns a response. If the response is not null, the manager gains access to her personal page. The manager select the option of creating a new project. She enters the respective data in the system and the system enters the data in the database. The database returns the confirmation of a successful registration to the system and the system returns it to the manager.



Sequence Diagram 1

3.5.4 Component Diagram

A component diagram is very helpful in complex system in the illustration of their structure. In this picture some of the software' components are represented, notices the local server and the database.



Component Diagram 1

Chapter 4

Implementation

Being a web application, this software is meant to be accessed via a web browser. As such, this application is constructed via programming languages which are supported by the web browser. The languages used in this software application are a commonly used combination of server-side script (PHP) and client-side script (HTML, JavaScript, CSS). The web browser (thin client) relies on the web server components installed on backend infrastructure systems for the heavy lifting in providing its core functional web services.

4.1 HTML

HTML is a mark-up language mainly used by the web browser to process the client side of the web pages. Therefore HTML is only useful for the website description and layout.

4.2 PHP

PHP is a server side language which enables the web page's functionality. It enables the collection of the data entered by the user in the client side and interaction of the user with the database to retrieve information and use it accordingly.

4.3 CSS

Cascading Style Sheets (CSS) is a simple mechanism for adding style (e.g., fonts, colors, spacing) to Web documents. The code is written in a separate file and is then imported in the script of every page.

4.4 JavaScript

JavaScript is helpful for all the extra features that HTML itself cannot provide. It is used to make the web pages more dynamic.

4.5 MySql

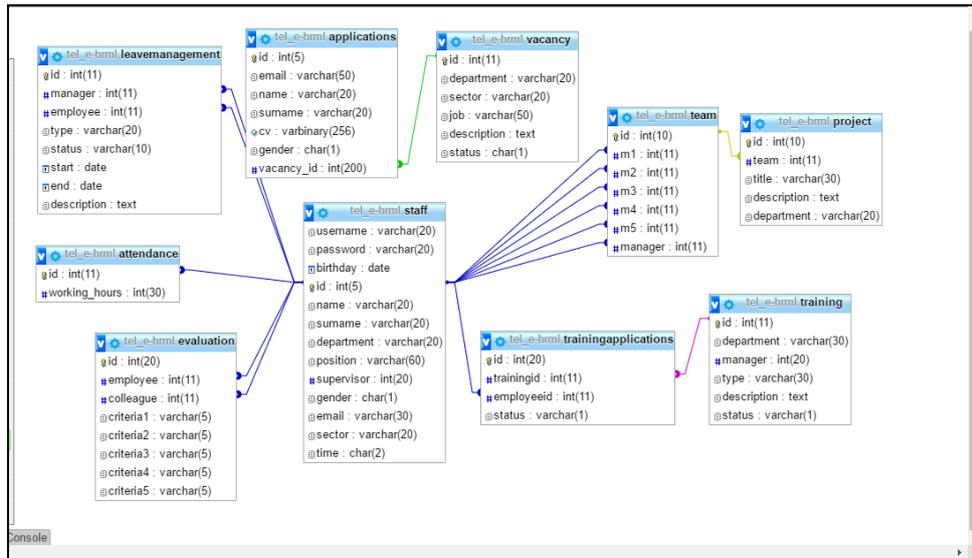
MySql is an open-source relational database widely used in web applications which require a full-featured database management system.

4.6 Database

The database is a very crucial component of a software. It stores all the valuable information related to company's staff and activity. The information in the database can be updated, added deleted and viewed according to the credentials given to users in the system.

My software's database is in MySQL.

Below you may find a screenshot of the database schema as an entity and a screenshot of a table of the database.



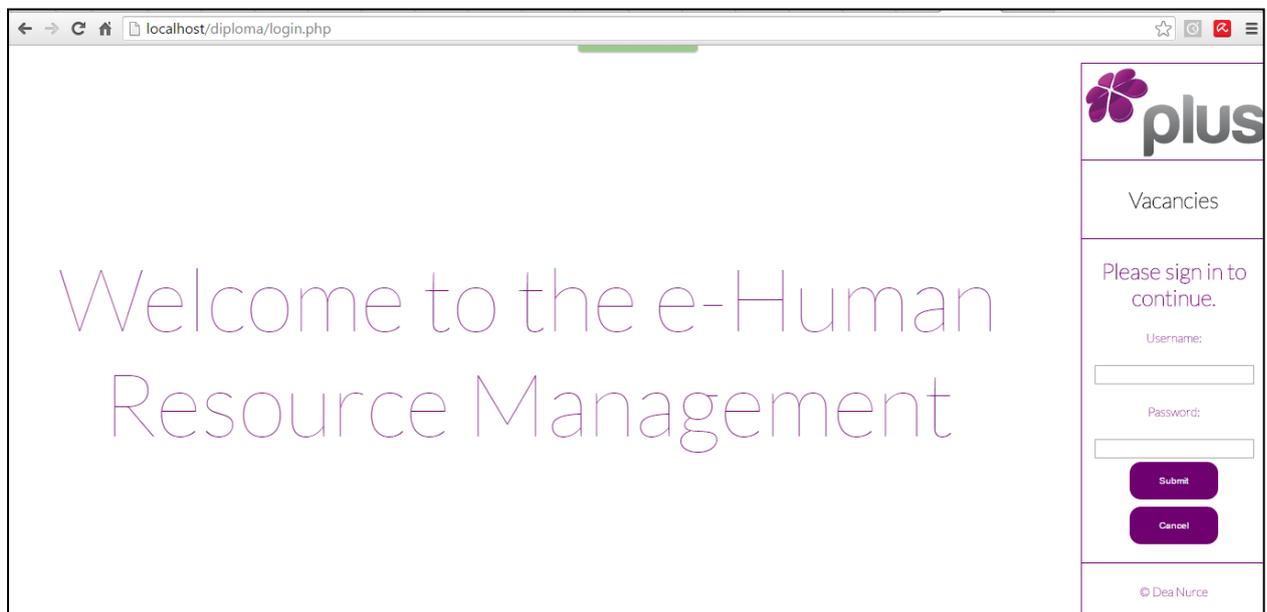
Database schema 1

Table	Action	Rows	Type	Collation	Size	Overhead
applications	Browse Structure Search Insert Empty Drop	3	InnoDB	latin1_swedish_ci	32 K	-
attendance	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	16 K	-
evaluation	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	16 K	-
leavemanagement	Browse Structure Search Insert Empty Drop	6	InnoDB	latin1_swedish_ci	48 K	-
project	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	32 K	-
staff	Browse Structure Search Insert Empty Drop	8	InnoDB	latin1_swedish_ci	16 K	-
team	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	112 K	-
training	Browse Structure Search Insert Empty Drop	3	InnoDB	latin1_swedish_ci	16 K	-
trainingapplications	Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	48 K	-
vacancy	Browse Structure Search Insert Empty Drop	4	InnoDB	latin1_swedish_ci	16 K	-
10 tables	Sum	29	InnoDB	latin1_swedish_ci	352 K	0 B

Database schema 2

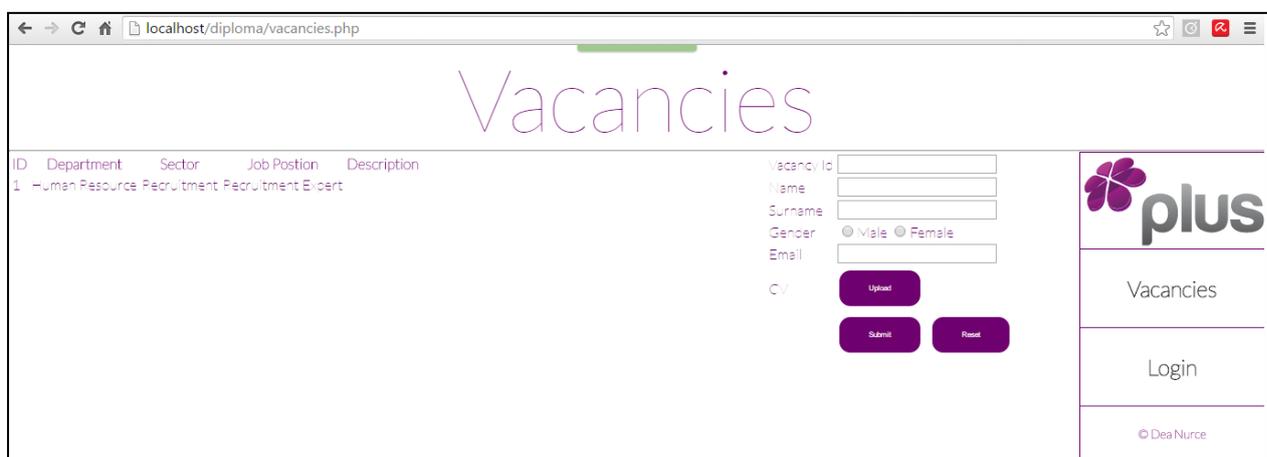
4.7 User interface

This is the welcome page. On the sidebar menu, any user can see the vacancies or login to their personal accounts.



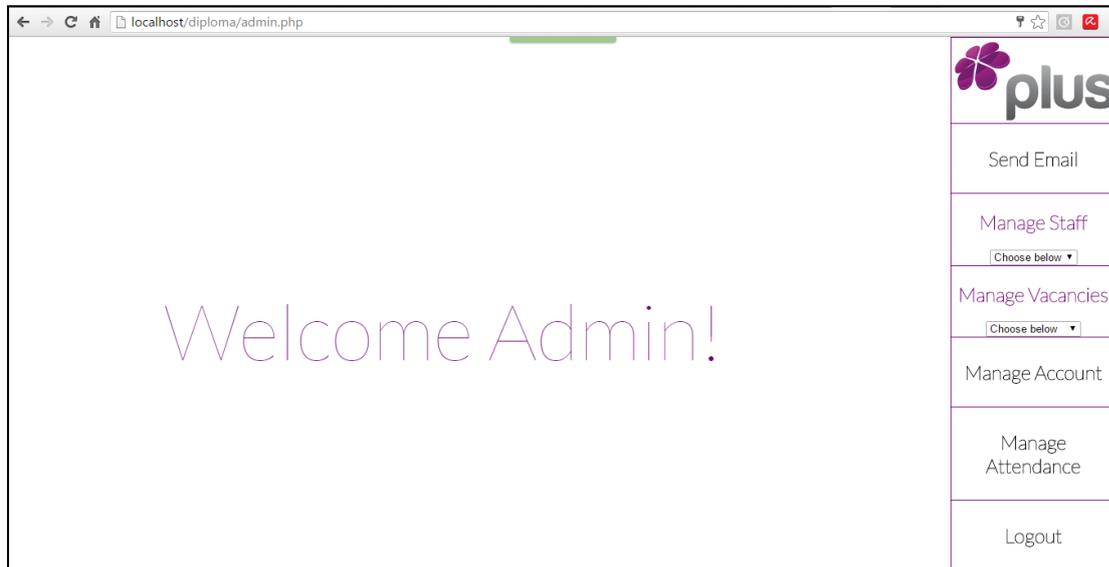
Interface 1

The vacancies page allows you to view all active vacancies and apply via the form.



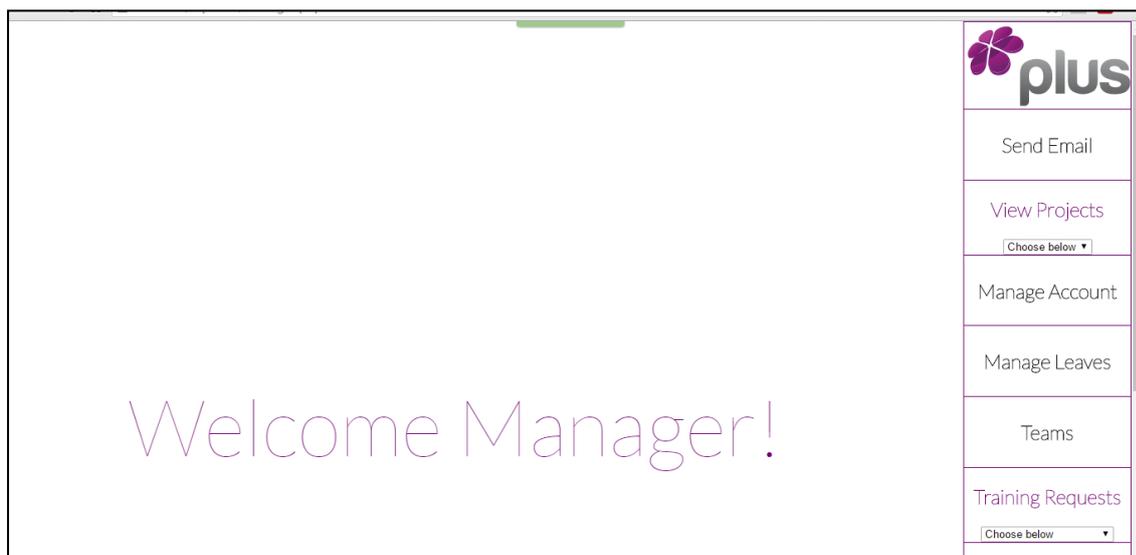
Interface 2

The admin welcome page has a sidebar menu with all the admin functionalities.



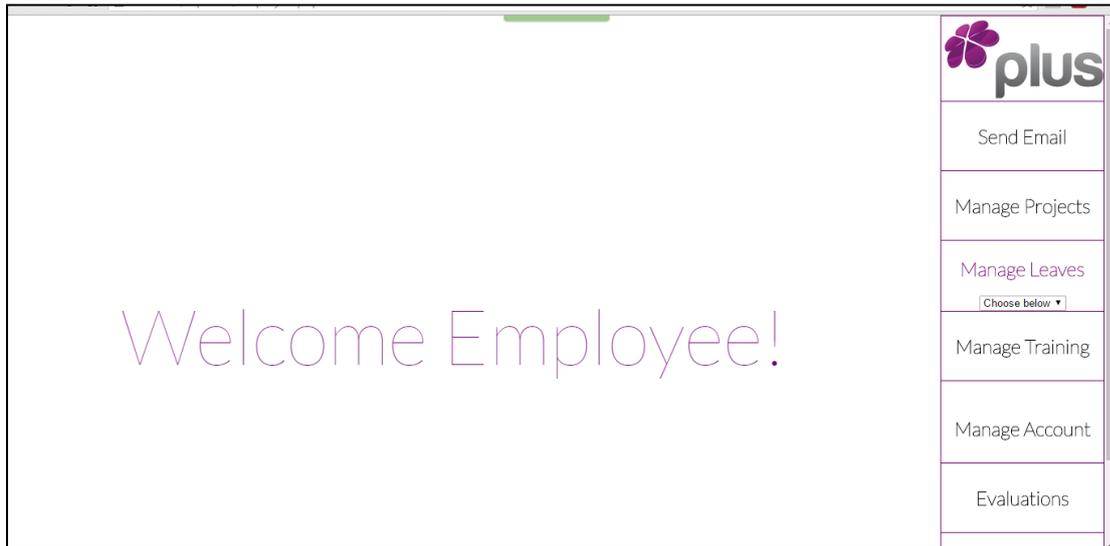
Interface 3

The manager welcome page has a sidebar menu with all the manager functionalities.



Interface 4

The employee welcome page has a sidebar menu with all the employee functionalities.



Interface 5

Chapter 5

Conclusions and Future work

This web application software is only the first version of my work, done with all the knowledge I as a student have gathered in my university, which is mostly theoretical. It is very simple and only contains the basic functions that the company requested from a human resource management software.

With time this company is going to evolve and consequently change many structural and organizational details in the human resource department to maintain its success, to improve its efficiency and effectiveness. These concrete changes will have to be reflected in the web application as well, which will be included in my future work on this software.

Other than that the information systems are always changing, being improved and innovated as a result of many studies in computer engineering, information technology and business field.

A web application for companies of this dimension is always going to bring up complexities and special features that will need to be adjusted according to the companies needs. Regardless of the many difficulties an engineer might find while preparing this web application, the gains are priceless. There will always be something new to learn while developing it, sometimes it might even inspire engineers to come up with innovative ideas of their own, rather than use those of others.

I, too, have come up with several ideas of improvement during my work on this diploma thesis.

A precise job description for ever job in the company is very hard to achieve but if that were to happen, the development of a feature to forbid the repetition of a job description would be very profitable for any company.

The identification of professional training needs according to the social legislations, industrial needs, job positions and the company's hierarchy could be an extra feature in a management software. After the identification on these training needs, there should be an analysis of the requests to enable the implementation of technological innovations and one of the cost/profit ratio referring to the company.

A payroll module could be added to the software, in which the employee's personal tasks and goals are directly connected to the salary. The calculation of a salary bonus if the employee exceeds the number of sales set for him/her as a personal task, could be a use case of the payroll module.

Chapter 6

References

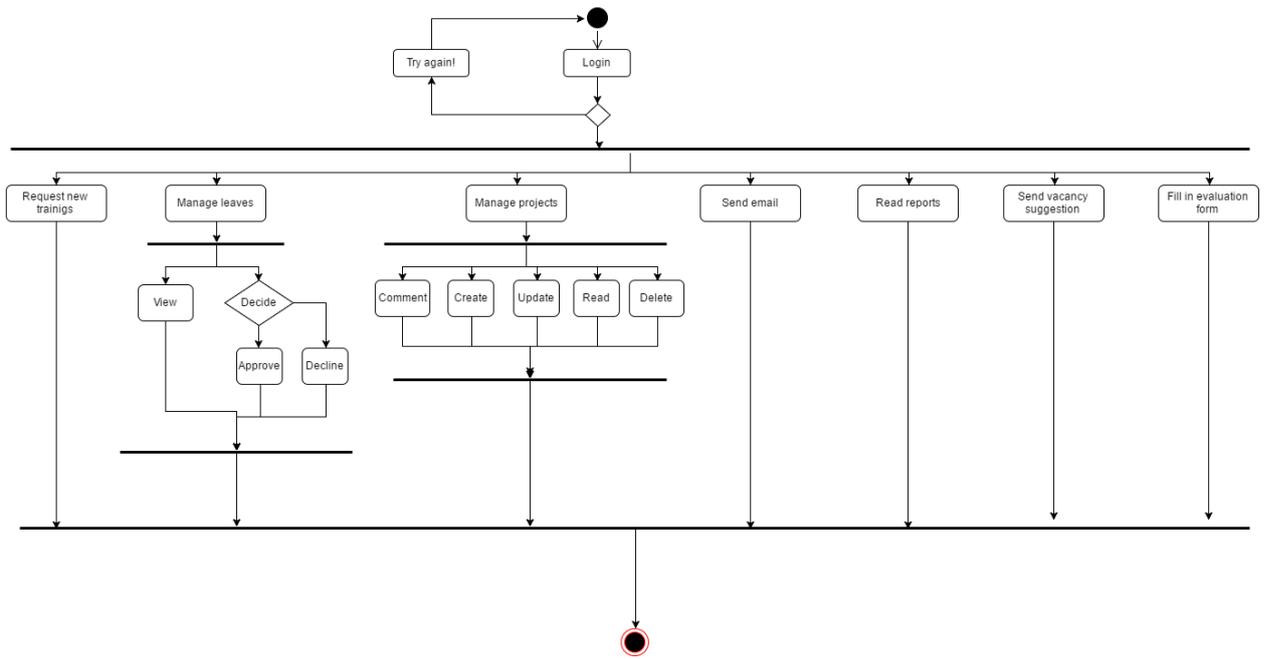
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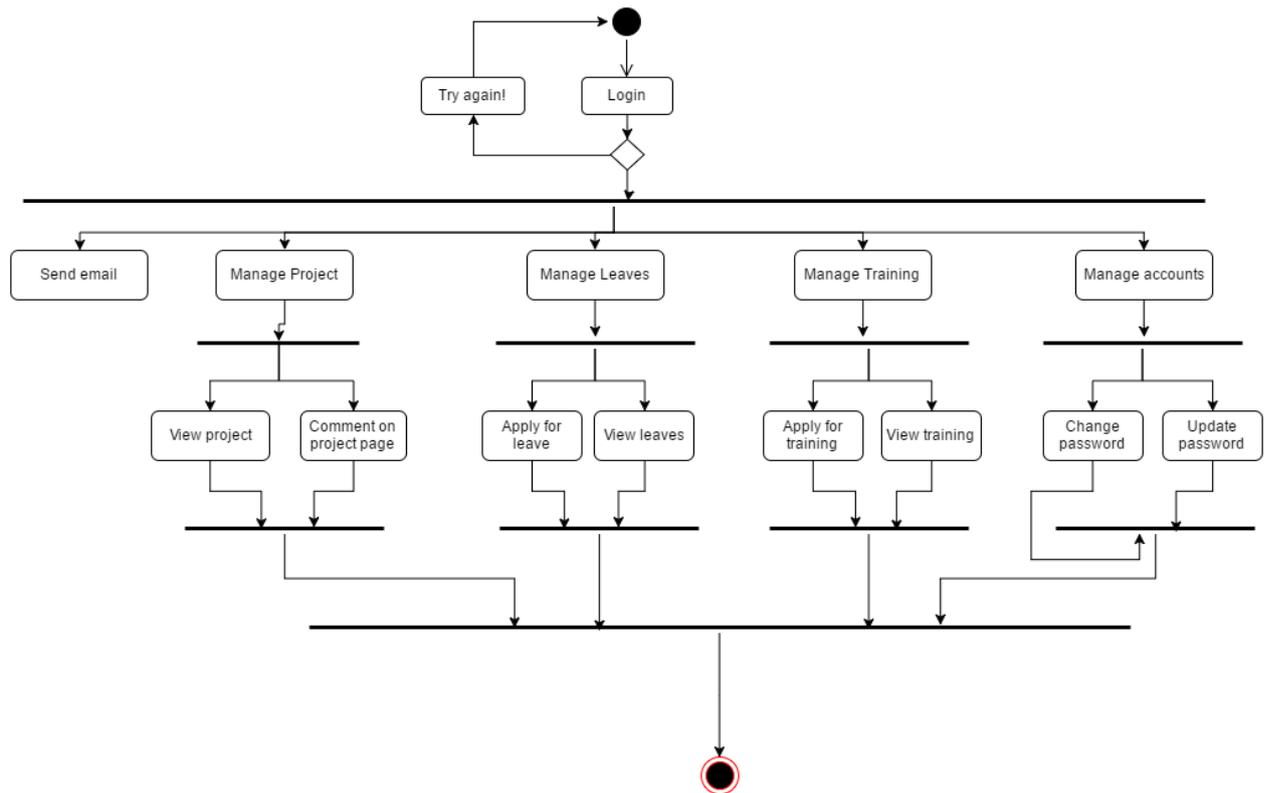
Appendix A

UML Diagrams

A. Manager's activity diagram

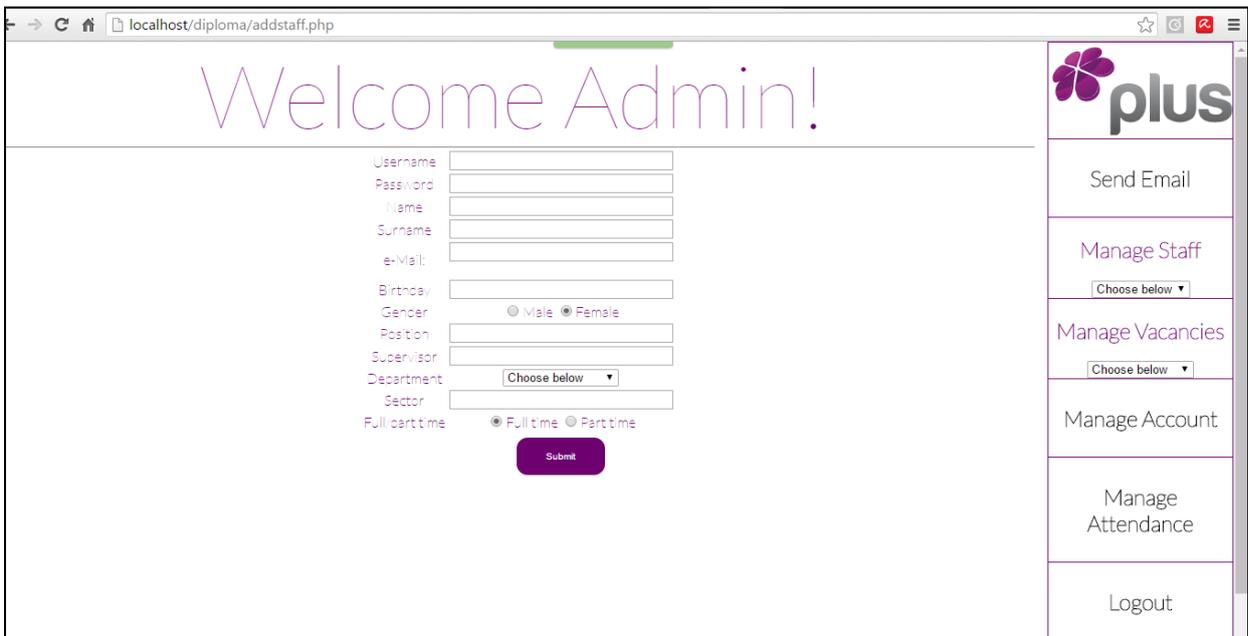
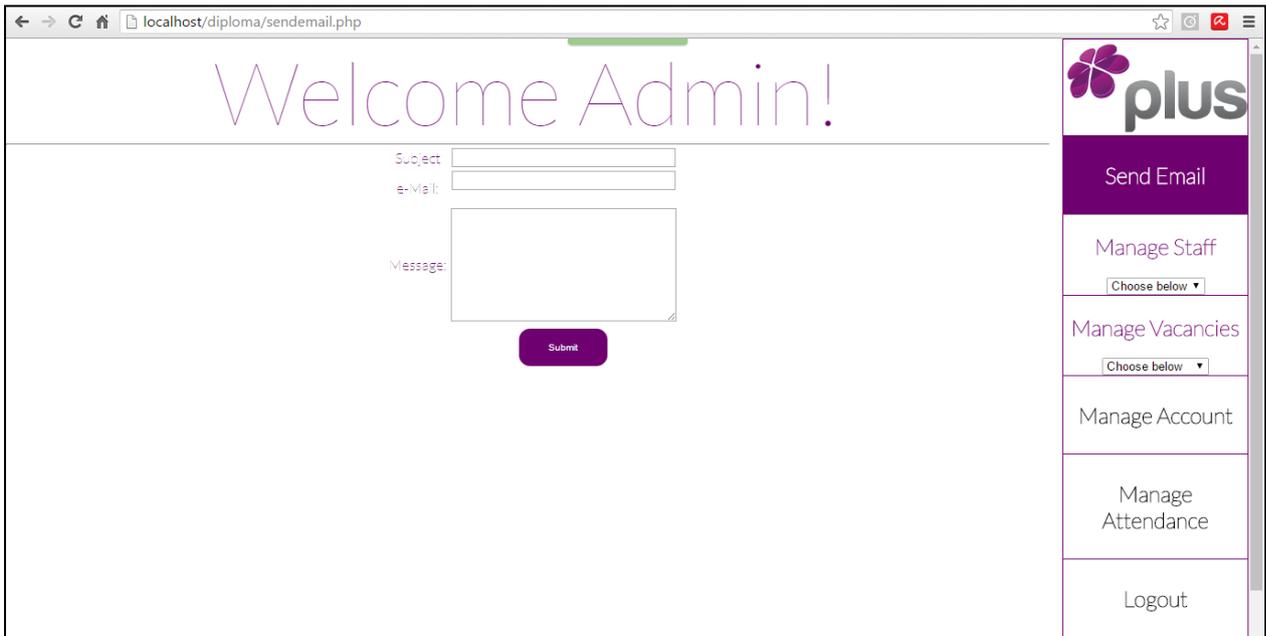


B. Employee's activity diagram



Appendix B

Screenshots



localhost/diploma/manageleaves.php

Welcome Manager!



ID	Employee	Type	Start time	End time	Description	Status
1	3	Paid	2014-01-01	2014-01-14	Enter project description	Pending
4	3	Unpaid	2014-01-01	2014-01-04	Unpaid leave application	Pending
5	3	Sick	2014-01-05	2014-01-15	Enter project description	Pending
6	3	Extraordinary	2014-01-01	2014-01-23	Enter project description	Pending
7	3	Paid	2014-01-01	0000-00-00	Enter project description	Accepted
9	3	Paid	0000-00-00	0000-00-00	Enter project description	Declined

Leaves:

- Send Email
- View Projects
- Manage Account
- Manage Leaves
- Teams
- Training Requests

localhost/diploma/evaluation.php

Welcome Manager!



Learning and critical thinking

Employee ID:

Committed to learning new skills and improving his/her performance:

Requests performance feedback from colleagues and moves in development areas:

Is proactive and takes advantage of training and development opportunities:

Looks for opportunities to learn from other colleagues in different sectors, departments and backgrounds:

Follows a continuous personal development plan:

- Send Email
- View Projects
- Manage Account
- Manage Leaves
- Teams
- Training Requests

localhost/diploma/leaves.php

Welcome Employee!

Type: Paid Unpaid Sick Extraordinary

Start Time:

End Time:

Description:

- Send Email
- Manage Projects
- Manage Leaves
 - Choose below
 - Choose below
 - Add leave
 - View leaves
 - Edit leave
 - Delete leave
- Manage Account
- Evaluations
- Logout

localhost/diploma/trainings.php

Welcome Employee!

ID	Type	Department	Description
3	workshop	human resources	Workshop proposal

Training ID:

- Send Email
- Manage Projects
- Manage Leaves
 - Choose below
- Manage Training
- Manage Account
- Evaluations
- Logout