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Diploma Thesis Abstract

Information System Design in UML

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Summary

The web information space is rapidly growing in size and the diversity of both its data and its audience. A consequence is that web information systems in many cases replace existing traditional information systems. Since the Web information systems differs from the nature of traditional information systems, there is a big demand for design methodologies specifically oriented towards Web Information Systems. One of these methods is UML-based web engineering, an extension of UML used in this document to design a proposed information system. The UWE method uses UML notation and diagrams to express phases of web information system design such as requirement analysis, conceptual model, navigation model and presentation model. This document introduces implementation phase which covers the visual view of the system. Due to high demand and effectiveness of Web Information system, it is covered a design of Web based Human Resources Management System. Regarding to the complexity and the size of the system, it is not possible to present all concepts in details. The focus will be to build models for different views of the analysis and design phase. It will contain the design of three main modules of Web based Human Resources Management System such as Personnel management, Leave management, and Payroll management, which are closely related to each other and other modules of the Web based Human Resources Management System. This document also covers the comparison in terms of usability and development of the Web based Human Resources Management System developed as SaaS and desktop based Human Resources Management System with the same functionality developed in desktop platform.

Keywords: Web Application, Human Resources Management System, Web design, UML, UWE, Project Proposal

Introduction

As result of high cost and limited functionality of traditional software systems, it has been an increased demand of web based information systems. One of these systems is Human resources management system. Due to high demand of small and medium organizations to have a Human Resource Management system which covers all requirements and has low cost, this document covers the design of Web based Human Resources Management System as a replacement of traditional Human Resources Management System. The system has in overall ten modules, but due to complexity there are covered three of them. The difference between Web information systems and traditional information systems is that a huge number of information are organized in a web structure which is served to the users via web pages and hyperlinks. To make this process simpler, for the development and implementation phases, UML as a core modelling language of information systems is not enough to achieve this goal. As a result it is used UML-web based engineering (UWE) methodology to create a conceptual structure of information, navigation structure, and presentation structure of the system. UWE methodology is an extension of UML that covers different design phases of web information system analysis and design.

Nowadays, organizations are located in different places separated in branches, and the need for managing human resources separately is very high, in this case web human resources management system using SaaS technologies will allow HR employees from each branch to manage their own human resources. The main users of the system are Employees of Human Resources department. System contains user roles, where each role has different views in the system. The hierarchy of users is managed by an administrator which is also member of human resources department. This document covers different views of the system from the user perspective, starting from the requirement analysis, when it is described the system and the user interaction using use case diagrams and activity diagrams, and continue with conceptual model, navigation structure and presentation model. Each process uses UML notation and diagrams for presenting the main functionalities of the system as well as user interaction with a system.

Objectives and Methodology

In diploma thesis, Information system design in UML is covered by a case study, the design of Web based Human Resources Management System. There are a number of human resources management systems developed as desktop based applications which are mainly used from organizations who are located in one place and have a big number of employees, but this doesn't cover the demand of the small and medium organizations which are located in different places and have a smaller number of employees. The main objective of this thesis is to analyse and design a type of web information system ready for development, that allows small and medium organizations to manage human resources and as well as cover organization requirements and spend less money using this type of information system.

The objective of the first part of this thesis, is to summarize theoretical background of analysis and design methodologies such as UML and UML-web based engineering used to model web information systems, while the objective of the second part is to describe human resources management system in details, and the demonstration of the processes and the final outcome of the application design using UML diagrams and UWE phases. The core idea of the second part is to demonstrate the advantages by highlighting the particular notation and extensions of the UML focused in web information system design.

The objective of the last and the third part of this document is to present the comparison of the proposed web based information system with the existing information systems created in other platforms (different from web). And also to compare them in terms of technologies. The comparison analysis is meant to be in terms of web information systems having the same purposes, but built on various technologies by emphasizing their diversities.

The methodology of the thesis is based on research of relevant information resources. Practical process will be derived from results which will be given by the research study. Based on the synthesis of the theoretical and the practical knowledge, final conclusions will be formulated. In the first part the necessary information about the UML and web information systems was collected. The further step is to define requirements of the application in order to exactly characterize the system processes. This process is fulfilled based on analysing the specifications concluded in the previous research and study.

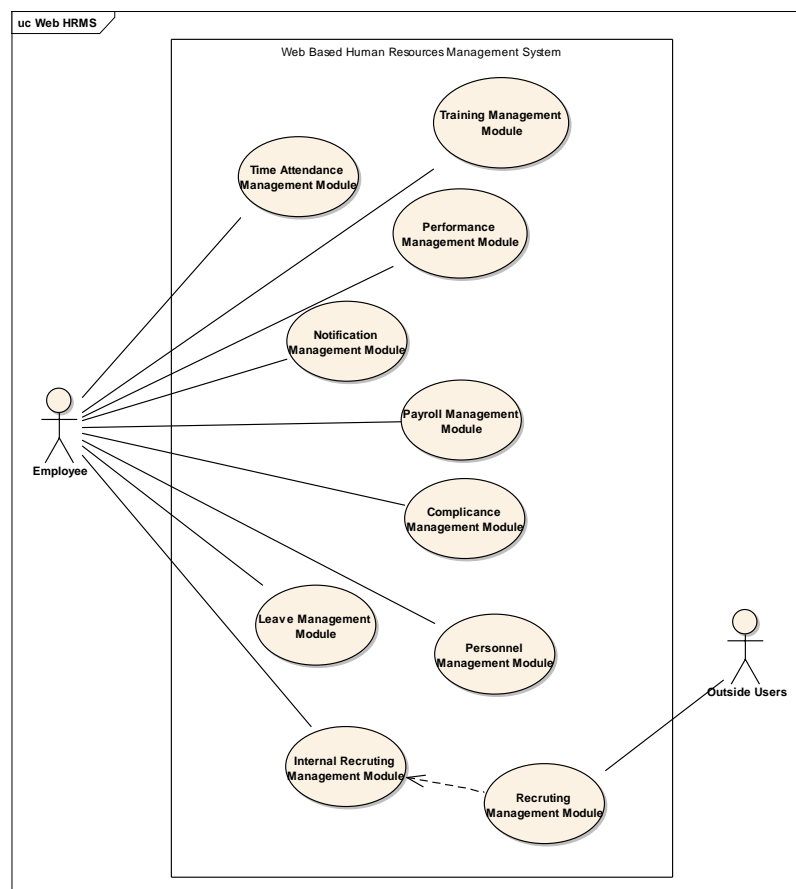# Design of Web Based Human Resources Management System

Web based Human Resources Management System (Web based HRMS) is an online web application for managing human resources of the organization. Web based HRMS consists of a number of modules, which are described in section 4 in this document. These modules are designed in that way that organizations can use them depending on their needs. The idea of designing Web based HRMS can be better understood by presenting the following questions:

- Organizations have different branches in different places? How can each branch manage their own employees?
- Small and medium companies nowadays are incredibly growing in all fields? How are they managing their employees?

By evaluating organisations which have different branches distributed in different places, while their main human resources department is located in one place, it is obvious that these companies need a Web information system to have control of all their employees wherever their location is, and whatever department they work in. Web based HRMS can be accurate in IT industry, Banking Industry, Mining Industry, Agriculture organizations and many others. The other reason that Web based HRMS is needed to be analysed and designed is that it fulfills the high demand of small and medium organizations. Many of these organizations nowadays do not have an appropriate software for managing their employees, they use table-based software like Excel to register and keep track of their employees. Web based HRMS is an appropriate solution to fulfill their needs while they do not have to spend a lot of money in HRMS applications, which will take time for implementation. Web based HRMS will help these organizations financially and by allowing them to manage their employees professionally while they only pay for services of the information system. The payment will be according to the modules they need and the number of users they have.

In general, analysis and design of Web based HRMS increase the productivity of both organizations, customers (users of information system) and the organization who analyze, design and develop the information system.

Web based HRMS has ten modules, described in details in Section 4, and each of them designed and developed for different purposes. In the figure below the use case diagram for the whole information system and its modules is presented.

Figure 1. Web Based Human Resources Management System Use Case *(Source: Own)*

Modules are connected with each other by using the same database that has many different tables related to each module. The main table is Employee table, which is the base of the use of the system and all of its modules. Web based HRMS is dedicated to HR department, which helps them keep track of the employees by allowing them to register, edit, and delete information about employees of the appropriate company. These are different kind of employee data such as personal information, job history, trainings, leave history,

salary, and other information related to employees, while the access to the modules is regulated with roles. Therefore, each role is configured to have access to specified parts of the system. Roles are designed by the administrator of the system, depending on the needs of the organization. The administrator of the information system in many cases is part of human resources department of an organization.

Due to the size of the Web based HRMS presented in Figure 12, it is not possible to present all concepts in details. Our focus will be to build models for different views of the analysis and design phase. We will design the Personnel Management Module, Leave Management Module, and Payroll Management Module, which are closely related to each other and other modules of the Web based HRMS. In this way, we will select the most representative parts of the application and represent them in depth in details.

Comparison of proposed system with an existing systems developed in different technologies

In this section is covered the comparison between web based human resources management system referred as Web based HRMS and traditional human resources management system referred as desktop based HRMS. Both development technologies have their advantages and disadvantages. Desktop based HRMS developed as a desktop information system is a standalone information system installed in a standalone machine. In the meantime they have been limited by hardware on which they are run.

The main disadvantage of desktop based HRMS is that they must be developed and deployed on a particular operating system, which they can require strict hardware requirements to be sure that they will function correctly. Another disadvantage is that updates or future changes of the application must be applied directly by the user to the machines of the clients where the application has been installed before. This dependency has typically a limited level of complexity in user interface. While with the invention of web information systems, the software development has changed the way (Conallen, 2002). This also changed the course of HRMS.

Web based HRMS developed in web technology using web services has started to replace desktop based HRMS. Web based HRMS use different architecture and usually are made in client-server architecture, where as a client interface a web browser is used, which is one of the reasons why web information systems are widely getting popular, not only in HRMS but in all types of software development. Following there is presented a comparison of desktop based HRMS and web based HRMS based on some predetermined parameters:

- **Maintenance** – Web based HRMS need to be installed only once in the server, while users from different organization can be connected through web browsers using internet. Traditional HRMS need to be installed separately on each client computer and can be used only by that user, also future updates of the traditional HRMS needs to be done in every single client computer which

is not a case of web based HRMS, who have to be updated in only one computer and all the users can have them instantly.

- **Security** – Web based HRMS are exposed more to security risks than desktop applications. While for traditional HRMS we can have a total control over a standalone application and protect from various vulnerabilities, this may not be a case of web based HRMS as it uses internet when a large number of internet users wide the scale of threat, even though there are security policies used to prevent it.

- **Cost factor** – Web based HRMS development and its maintenance has higher costs but is more suitable for small and medium organizations as they don't have to buy a whole system, in other hand traditional HRMS is purchased one time and the updates are harder to be done, also maintenance has a fee, which is not suitable for companies who have small number of employees and are located in different locations..

Conclusion

In this thesis the use of UML notation and diagrams and UWE methodology to design a Web based HRMS has been elaborated. UML is a standardized software modelling language but does not cover all aspects of web information design. For this reason it was needed to use an extension of UML such as UML-web based engineering which is entirely focused in design of web information system aspects. In the case study elaborated in this thesis a design of main modules of Web based HRMS has been created, where there are present all phases of web information system from a design view. The system is dedicated to small and medium organizations and it is designed to be developed as Software as a Service. This technology allows organizations to use a single information system, while they have branches separated in different places. Users can connect through internet to the system. This document also covers the research and analysis of books and papers related to UML and design method for web information system UML - web based engineering, furthermore, a detailed description of human resources management system and design of Web based HRMS is included. The work has been organized as follows.

The research and analysis of books and papers of the study are presented in Section 3. The UML notation and diagrams has been described, followed by an explanation of UML-web based engineering extension for design of web systems which has been used to design proposed web based system. In this section the description of the technology Software as a Service (SaaS) is also included, which suggests the future development and implementation of designed system. While in Section 4 a description of human resources management system including all modules related to it has been presented. This section describes the importance of human resources management system to be implemented in the organizations and the relation between modules of the system, and other systems which are not part of the HRMS. Furthermore, both sections explained above are included in section 5 which includes a practical work. This section covers the overall design of the web based human resources management system. Starting with the requirement analysis of the system explained by UML use case and activity diagrams. And then continuing with the development of conceptual model of each module described by class diagrams, followed by navigation model, presentation model and implementation design explained by the proposed web design.

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