WEB SITE DEVELOPMENT AND M-LEARNING: THE CASE OF SOFTWARE ENGINEERING DEPARTMENT IN SOFIA UNIVERSITY

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Abstract*:* This paper presents a concept for the development of a scalable web site of the Department of Software engineering (DSE) at the Faculty of Mathematics and Informatics of Sofia University. The web site scales across a wide range of screen sizes providing proper visualization both on PCs, tablets and mobile phones. In addition, it provides single point access to multiple online resources that are useful for both DSE staff and students. As a result, a base for development of m-learning is established.

Key words: jQuery, m-learning, responsive web site navigation

1. Introduction

The information and communication technologies (ICT) grow rapidly during last decades providing people with data and knowledge through intelligent devices and software products. This in turn changes the life style as well as the way of working and learning. The students of new generation enrich continuously their ICT skills, applying the software technologies in various scientific fields. That is why they prefer distance forms of learning in virtual classes and labs where the knowledge is provided through mobile devices such as smart phones, tablets, pocket PCs and so on.

The mobile learning, called m-learning, offers new opportunities for delivering of educational services. The fast development of wireless technologies and computer devices makes m-learning more and more popular in Europe [1]. As a result, a new educational methods and standards are needed in order to meet the challenges of m-learning [2].

Taking into account the modern directions in the education, the Department of Software engineering (DSE) at Faculty of Mathematics and Informatics (FMI) of Sofia University encourages the usage of e-learning resources in bachelor, master and doctoral programs. The teaching materials, student assignments and assessment tests are delivered through a Moodle platform. The graduation of master students is supported by a web-based system providing information about master thesis and internships. The department's members use a common environment with remote access to share documents related to organization of the learning process. The public web site of DSE provides information about the degree programs, the research activities, projects, etc. Additionally, the lecturers and students use several web-based systems serving organizational, administrative and research activities at FMI. Unfortunately, all these software platforms are partially connected and the access to them via mobile devices is difficult.

The goal of this paper is to present a concept for the development of a new web site, which will integrate all web recourses used by DSE and its students and will be device-independent accessible via PCs with different screen resolutions, mobile phones, tablets, etc. In order to solve this task, the web site structure should be revised and the navigation should be optimized. In addition, suitable software

technologies need to be selected and used during the implementation phase in order to provide dynamic resizing and reordering when screen resolution changes. Last, but not least, all online recourses accessible by DSE staff and students should be collected, organised and integrated in the new interface of the web site.

The paper provides initially an overview of the concept used for the DSE web site design and the organization of its online resources. Subsequently, the technologies used for development of the web site are presented. A special attention is paid on ensuring device independence, and more specifically a compatibility with different screen resolutions in order to provide proper visualization both on PCs, tablets and mobile phones.

2. Web site concept

The information published on the DSE web site is accessible through three main interface components: navigation menu, tabular area and links area. The navigation menu includes the following top-level nodes:

- About – provides an overview of the mission and history of DSE and presents the permanent staff, guest lecturers and PhD students;
- Events – announces events and news related to DSE activities;
- Teaching – gives information about bachelor, master and PhD programmers provided by DSE;
- Research – presents about the ongoing and past research projects of the department, as well as lists the research publications with students' participation.
- Graduation – describes procedures related to master graduation and internship;
- Partners – lists companies and organizations that cooperate with DSE in teaching, researching, etc.;
- Location – describes how DSE, FMI and Sofia University can be reached with public transport and provides other related information such as addresses, maps, etc.;
- Contact – includes contact information.

The tabular area of the web site provides quick access to all research topics of interest for DSE staff. Thus, the web site visitors can navigate easily to different research activities and projects of the department members.

The links area includes a set of hyperlinks to the common SU and FMI online resources used by lecturers and students (e.g. e-learning system, students administration system, research database, FMI staff research and publications data, etc.). They are divided in three main groups: institutions, systems and libraries. The map of the DSE web site is presented on Fig. 1.

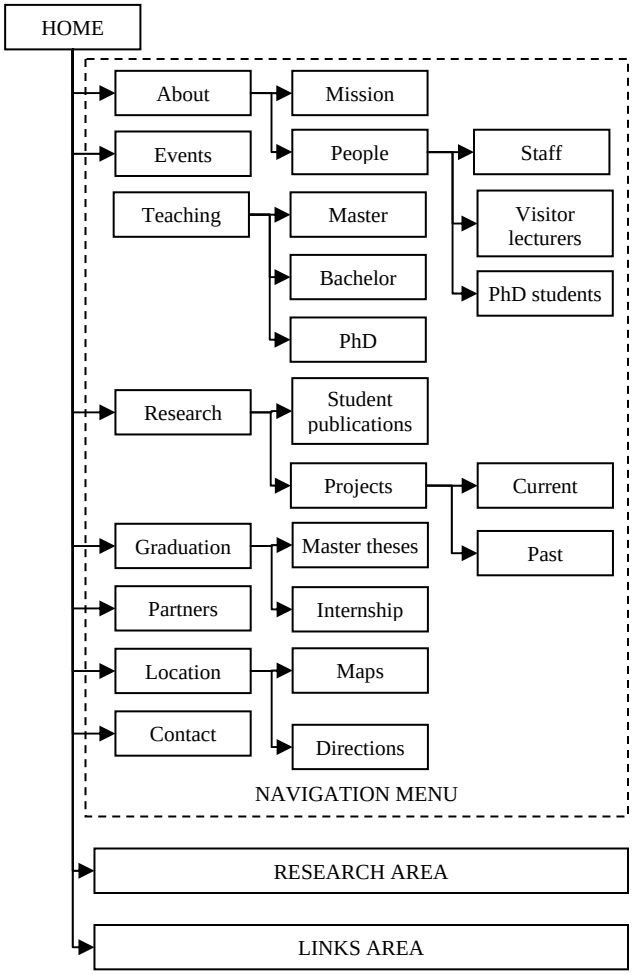

Fig. 1 Web site map

3. Implementation details

Instead of writing separate application for each smart phone, tablet, or desktop platform, DSE team has designed one responsive web site that scales across a wide range of screen sizes. The web site is build on top of jQuery library, HTML5 (HyperText Markup Language) and

CSS3 (Cascading Style Sheets). jQuery is a lightweight JavaScript library for implementation cross browser web applications. It simplifies HTML document traversing, event handling, animating, and Ajax interactions providing rapid web development [3]. The HTML5 is a new device independent version of HTML developed by World Wide Web Consortium (W3C) and the Web Hypertext Application Technology Working Group (WHATWG) [4]. It reduces the writing of scripts, minimizes the need of external plug-ins such as Flash, and provides better error handling. HTML5 supports dragging and dropping elements on a web page, generating fast, dynamic graphics using JavaScript, usage of semantic elements like section, article, aside, hgroup, header, footer, nav, etc. CSS3 is the latest standard for CSS [5]. It defines multiple new features related to text effects, backgrounds, multi-column layouts and so on.

Web sites for large screens typically use left or top menus, which are not visualized properly on small screens. Using jQuery library, a dynamic web site menu is implemented. It handles both large and small screens providing quick access to the web site content. When the browser window is narrow, the navigation in the top pane of the web site converts from a regular three level menu into a dropdown menu. Thus, the users can access easily the menu elements without need to scroll the web site. The transformation of the web site menu is shown on Fig. 2 and Fig 3.

Similar transformations are provided for the other web site elements located in the tabular area and links area. As shown on Fig. 2 and Fig. 3, all web site elements like images, titles, texts, etc., are dynamically rearranged when the width of the browser window is reduces. For example, the links in regular view of the web site are divided in three columns according to the groups presented in Section 3. When the screen becomes narrow, they are visualized in one column with separate title for each group. A similar design approach is applied in the implementation of the tabular area. In case of narrow screens, the content of each tab page is shown below the tab buttons. In contrast, the location of the tab pages in regular view is to the right of tab buttons.

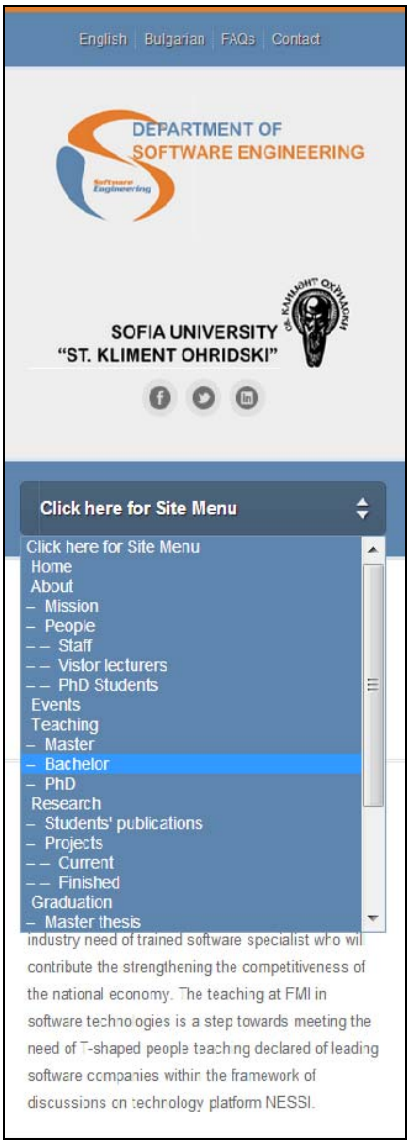

Fig. 2 Mobile web site menu

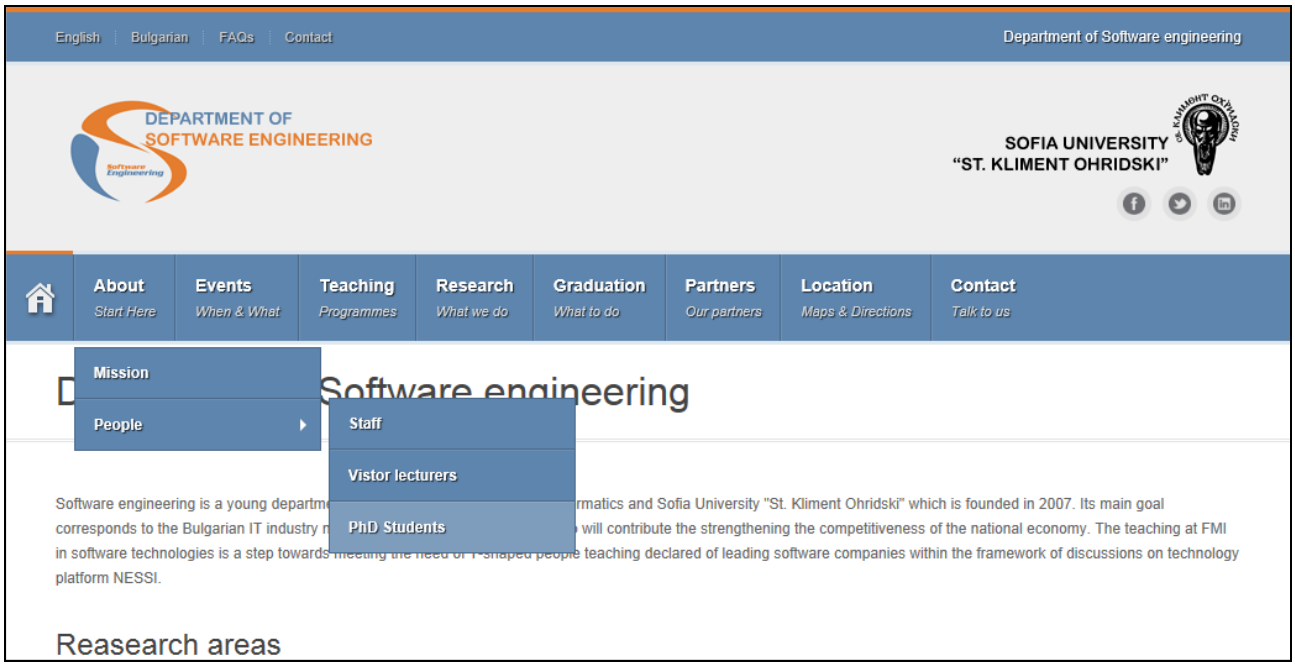

Fig. 3 Regular web site menu

5. Conclusion

M-learning utilizes a variety of devices that are naturally integrated in the students' daily life. The m-learning applications are focused on brief interactions, quick review of information, simple navigation and graphics and compatibility with multiple screen sizes. They are better suited for activities such as status check, fast request for information, classroom connection tool, etc. Taking this into account, a new concept for the DSE web site is proposed. The web site has a responsive interface that provides cross browser compatibility on variety devices with different screen sizes such as smart phones, tablets, PCs, etc. The web site components are dynamically rearranged in order to provide better view when the screen becomes narrow. Thus, the web site provides user-friendly access to the multiple online resources keeping students as close as possible to the classrooms.

The feature work of the team includes testing of the web site in order to validate its compatibility with different browsers and mobile platforms. In addition, pilot courses designed for m-learning will be offered to students and their feedback will be examined in order to improve the site.

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