PROFESSIONAL EDUCATION

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ELEARNING DEVELOPMENT

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Abstract. *Distance Learning is one of the basic components of educational process now. eLearning technology has been rapidly developing today that may effect on existing resources and has to be hardly discussed in the development of future projects. In the article analysis of modern technologies for eLearning has been represented and basic recommendation for choosing the most suitable of them to meet specific educational goals are given. Development of eLearning content is discussed in details from device-oriented up to cross-browser approaches. Analyses of available approaches for Multimedia content development in the current market are given.*

Keywords: eLearning; HTML 5; JavaScript, ActionScript; cross-browser; software; multimedia content; SEO; canvas; webGL.

1. Introduction

Education is the most essential part of human activity. People need to learn a particular set of rules to have some result. If learning process is successful it will result in new user knowledge in some sphere. This knowledge we can illustrate as a set of particular rules that will be automatically chosen according to incoming data. During the thousands of years classical learning paradigm has been applicable for any studying activity. According to that, knowledge has been resulted of a teaching lesson. This approach used visual contact with teacher during which he/she shares his/her knowledge. Formation of new knowledge has been supported with some practical tasks, which give users possibility to meet a problem and try to apply new knowledge to find optimal solution to solve the task.

2. Analysis of the research and publications

Today eLearning tech has enough instruments for total tutor dismissing from learning activity and cultivate possibility of self-studying [1, 2, 3]. Statistical information from eLearning courses usage indicates that users have ability to guide their own studying process and tune up to individual psychological ability [1, 4]. This is one of the key elements of eLearning to give a possibility of individual oriented self-studying. Result of that will be short term of studying with the guarantee of the same level of knowledge which means less cost in business terms.

3. Aim of work

During the teaching history eLearning technologies has been changing. At the most cases, it is a result of information and multimedia technologies development. Therefore, eLearning technologies which has been used ten years before, looks pure and unusual today. Technologies and approaches that are in use today also will be worst eLearning solution in ten years. Therefore, the main questions are: what eLearning approach should be used for new eLearning development? What tech will be used for creation of eLearning product to save time and money in the future? eLearning development is extremely important question because it is directly connected with lifetime of product, cost and value of future profit of this study activity usage. Today when technology is changing it may be a double stress, because there is no reason to invest money in eLearning if in 5 years it should to be moved to new technological aspects which will be realized in a new study approach. Thus, it is too short period of time to make money back. All of these facts keep eLearning development in strong rules.

4. eLearning platform

Nowadays users use plenty of different electronic devises: Desktops, laptops, tablets, players, phones, game consoles, books, TV, watches, glasses, cars

and others. eLearning products have to be accessible and visible at all of them and be ready to begin operate with user at any time. Even more, from developers' point of view a choice of device and platform will be not easy because there are plenty of different operation systems which support all of existing digital devices (fig.1): Mac OS, Linux, Microsoft Windows, Android, BlackBerry and others. All of these devices use different versions of software, have their unique settings, different input sensors and different screen sizes. One of the key elements of each of these OS is application. Application is a software that can be run only in some particular OS and supports all device features.

Because operation of application depends on current version of operation system and hardware realization and is limited by particular OS, it is not a good solution to use it as a basic for eLearning purposes. But, in some cases it has valuable benefits. It will be suitable for stable content which describes particular topic and of course is not user oriented. It is useful in case an electronic device is a part of eLearning and is proposed for user together in one package. At the most cases it will be the best solution to secure study material from sharing and ideal to classroom support service from different points of view. Organization of study activity and other expenses have valuable cost for any sphere of education.

Other eLearning development approach proposes to use independently from OS structure. At the most cases it is web based approach with user interrogation by browser. In this case specific software – browser is used inside of each OS to operate with eLearning content (see fig.1). eLearning content has to be built using web technology. Browser based structure is realized independently from OS approach. This approach helps to move from application based solution to web based. Today Web based eLearning is the most perspective way of eLearning development because it is a guarantee of content usage in any device with any OS even in the future devices which are not available now.

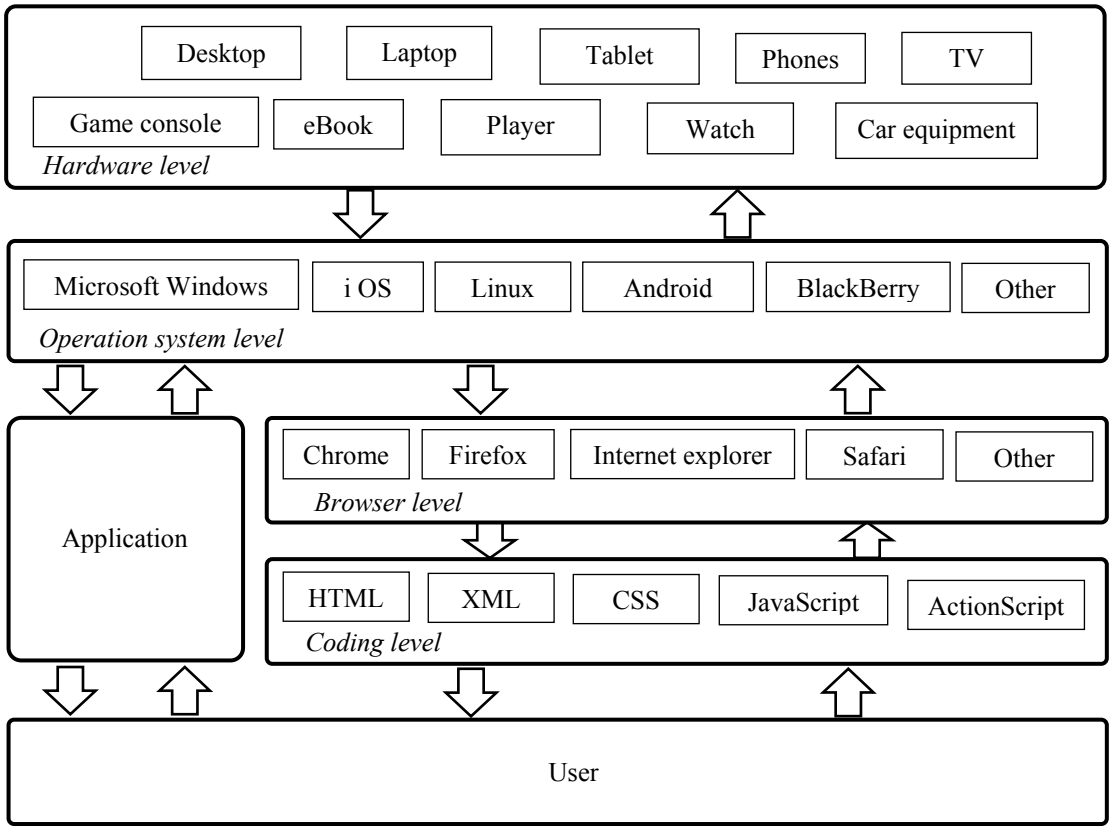

Fig. 1. Levels of eLearning software operation

5. Browser based eLearning

All browser based approaches are grounded on HTML, XML, JavaScript, ActionScript or other coding languages. eLearning content is represented for the end user in the form of web page(fig.1).

Today in the market of eLearning development there are available a lot of approaches for creation of

web based eLearning service[5]. Some of them propose fully autonomous development process and are oriented into people who don't want to spend a lot of time for coding. It is related with the use of specific templates (HTML or ActionScript based) that need to be fell out with some study information. Typically it will be unmaintainable and unchangeable in the future. At the most cases it is limited to basic functions inside of template. Of course, design and structure are closed from user and limited by a few settings. But low price and easy usage make it so popular for development.

The main problem of eLearning development in web based application is to choose available technologies for its realization. Different OS and different browsers operate with web content in different ways. All browsers support HTML but many of them are limited by some particular version of HTML. To make content interactive, browsers use specific add-ons which make possible to use JavaScript coding or visualized vector graphics with ActionScript. All of these add-ons have different versions of their functionality and quit different structure for device and hardware. Some of tech supported by limited quantity of devices give a huge possibility for eLearning and can be involved in realization of any study activity. Therefore, it is not easy thing to make a decision which of the web technology will be the basic and which one will be involved only in some parts of content. At the other hand it is a variety of different hardware for the same software that will work differently together even if OS and browser version are the same (for example webJL or Flash player).

Basic platform for eLearning has to be chosen according to possibility to use it in the most possible devices. In this case browser based approach will be the most suitable. To realize cross browser approach eLearning content has to be built with the most common technologies available and supported by all devises and OS. Basic HTML can meet all of these requirements for many years but it is quit limited for realizing of interactive content.

6. Multimedia content development

Many years all multimedia web based applications have been built with JavaScript and ActionScript support but today this approach has been changing a little bit.

Usage of Adobe flash applications in HTML page is limited in many cases. To play flash content, a user has to use specific add-on application which has to be installed on his computer and always has to be kept up to date. Vector graphics is the main advantage of flash in internet browser that became the most disadvantage now. Flash player uses CPU resources to build picture by vector data that can lead to CPU overloading and make internet browser unavailable and even to crash of application in some cases. Browser version of Adobe flash isn't supported or is supported with limited functions on mobile devices. It is very valuable today, because portable electronic devices are very popular. To the main advantages of Flash technology we can move:

- full multimedia support. For eLearning we can realise any imagine design easily and speedy.

- security. In Flash it is easy to realise limited access and secure teaching content. Simple content manager and coding approach are well known security steps in Flash applications.

But all of these advantages cannot be compared with availability of Adobe Flash player on different devises. It means that it is possible to design content but it will be invisible only for some specific numbers of users limited by particular devices. According to all of these disadvantages of Adobe Flash this developer platform is not suitable to use inside of HTML page for browser applications.

Priority in HTML rich content development is still to use JavaScript codes and HTML 5 features. For the development of new application it is possible to use standard JavaScript coding (Like in Edge Animate CC), animation in canvas or WebGL (Flash Pro 2015).

HTML 5 standard with current version 5.2 [6] is the best solution for current development of eLearning staff. Today this approach makes available to use audio and video based content inside. Video and Audio tags can easily get access to built video/audio player and encoders that is a grate solution for multi device realization. Canvas tag in HTML5 specification provides capability to dynamically generate and render graphics, charts, images, and animation. It is a low level, procedural model that updates a bitmap and makes possible to have access for dynamic multimedia integration easily. Nowadays canvas tag is the most perspective for eLearnig purpose usages. It helps to create interactive content easily which can response on user action and what is the most important to be supported by all modern versions of browsers.

Styles file in case of HTML 5 can hold the style settings that is possible to tube for different browser models and versions. It is easy for development and

in future for maintaining project when it was built with separate style file. Today styles specifications support description of interactive elements, which make it very useful.

JavaScript. Today in the most cases HTML 5 is considered only together with JavaScript coding. JavaScript code realizes dynamic calculation and tag control in user side. The language is quit flexible for development but needs special skills for programing. In many case it depends of project quality level. JavaScript machine is not heavy that means possibility for cross platform realization and doesn't need too much hardware resources in comparison with Flash Player. Other very important point is language "stability". For long period of time code stays stable and operatable on browsers in comparison with ActionScript which has been rapidly developing. Rapid development of coding language illustrates bad behaviour because developers can not forecast what will be the next. For example in case of ActionScript coding elements are different for AS1, AS2 and AS3. Moreover, different subversions support different sentences and there is no guaranty that current code will be interpreted by Flash player at the correct way in new version of software. (in case of AS it will need periodical impalements of software to keep it always in actual version of coding rules.)

All of that makes HTML, CSS and JavaScript combination the most optimal to develop eLearning application today and have at least small guarantee that it will be operatable at the near future.

7. eLearning content

eLearning content structure in the most cases depends on field of study, objectives and learning outcomes in the end. It also depends on tutor ability to organize study activity. In total eLearning resource may contain[7]:

- theoretical part,
- practical part,
- assessment,
- references to other resources for more information,
- communication part with eLearning support team,
- communication ability between users,
- additional information.

Theoretical part is the most difficult part of each learning project. It contains all sources that can produce new knowledge of user. Information can be represented in textual, visual, audio or interactive form (fig.2). Each of these forms have to be placed in each project because users may have different ability to absorb new information. Thus, only combination of all of them would be the best solution for wide audience in case of social oriented learning. Also different forms of information representation will be suitable for different purposes of study activity.

For example textural information will be much more effective than video in case of basic approach.

In this case a user can speedy navigate in information to have focus only in new knowledge from user point of view. But, only textual information can not be success it should to be combination of each of them with dominant of text. Content have to be well organized and not to overloaded with additional information. It have to be oriented on some specific level of user-based knowledge and focus all used activity into new information to meet all required outcomes in the end of study. Clear text with simple sentences is useful a lot there. Different learning tips like repeating and association are welcome, but it have to be not too much and applicable only like additional features. Use examples it is good solution to connect knowledge with practices. It has to be marked how theory can play in practice. Examples gives good understanding of situation

Practical part development also meet some difficulties, but in most cases it depends on subject. After practical tasks users have to receive some basics skills to operate in some situations in special conditions. In most cases this should include some interactive elements which provide interrogation with user.

Assessment needs to check user knowledge and detect what is difficult for user and what he doesn't know. Result of assessment should be directed into improvement of user knowledge. Therefore, learning tips or review are useful elements of assessment. This has to be user oriented and for the fruitful activity has to use statistical information about learning process for task generation.

This is a good approach do not limit user with access to information. Therefore, link to other resources will be always useful. Probably it is difficult to know exactly the level of user knowledge before study activity and there are no needs to tune all study activity to specific users based on their income knowledge. During study activity users should have ability to have more information about some specific information which doesn't meet main study subject. Users have to decide by themselves whether they know it or not. If user knows in most

cases he just misses this additional information. But in case it is interest he can be redirected to the source.

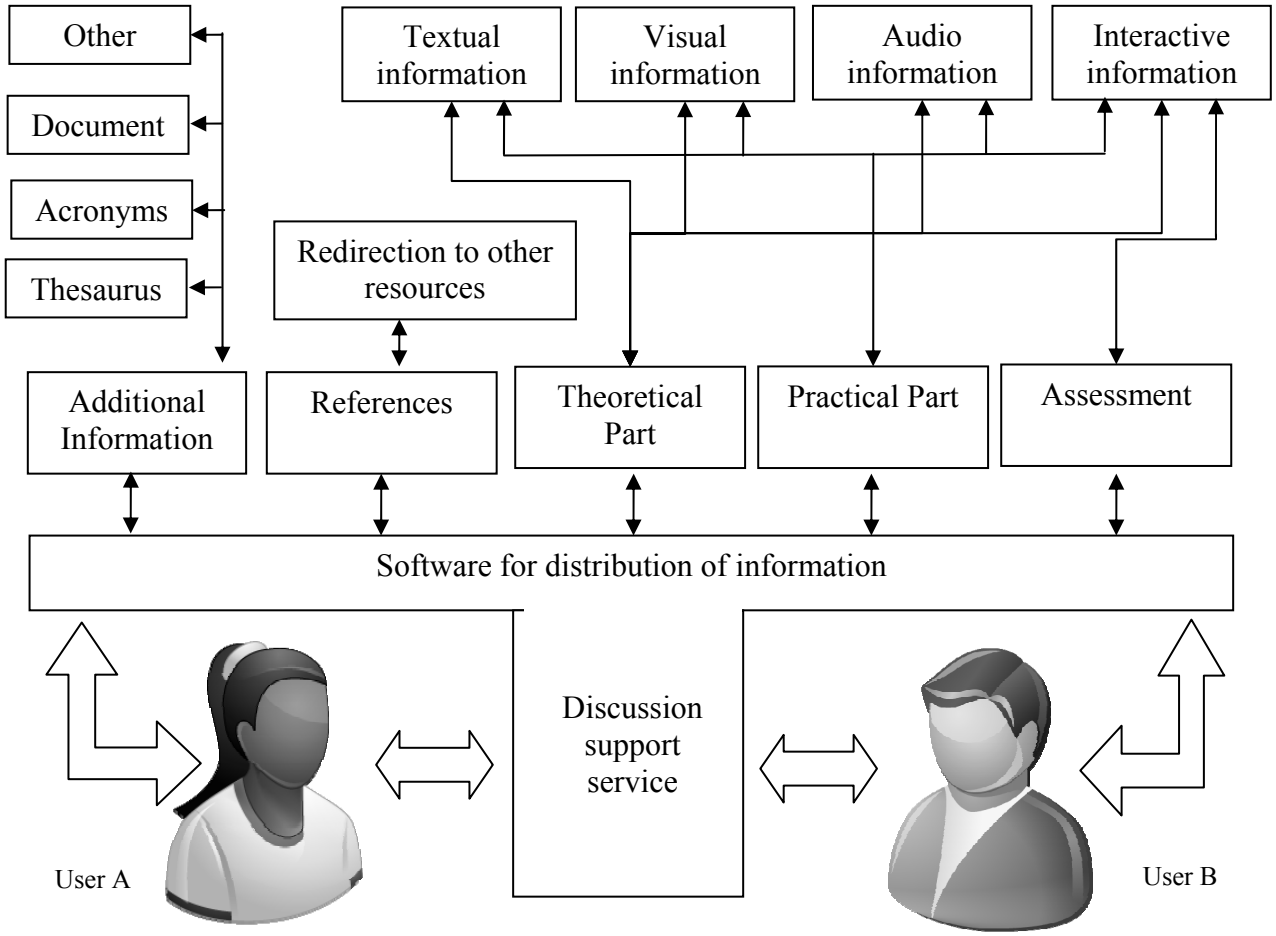

Fig. 2. Main components of eLearning resource

User's opinion and discussion always is useful trick in a lesson structure. Communication between users of eLearning activity should be very important to stimulate open dialog between all participants. Their comments would be helpful for other users in eLearning. Informal discussion in chat always stimulates to use new knowledge in practice. Also, it is helpful because usually users have different experience and initial level of knowledge and multidirectional dialog can share it between all participants.

One of the valuable parts of development process of eLearning is search engine optimization (SEO) for open resources or shared for free by internet. Usually this job did not do because result is not visible for users. SEO means including in eLearning code specific command and tags which is visible only for search engines. Also it is required from developers to use specific rules for software design and typing codes for SEO. But all of that will improve visibility of eLearning for search engine, increase trust level for resource and as result will involve more participants. Unfortunately today there is no specific group in structured data which can be related to eLearning. In case of "Schema" structured data it can be easily described at the level of Creative work. SEO puts also specific requirements for the development: Flash and JavaScript content have to be limited because are invisible for SEO, graphical and video resources are also closed for textural information inside. In any case SEO is the powerful tool in eLearning marketing and all of these SEO elements should be inside of eLearning.

8. Conclusions

In summary the most valuable part of eLearning above that have to be done at the first development stage has been discussed. Results of many years experience in eLearning development indicate that

technology are moving up each year. That in one hand move eLearning ability into the new level of operation and in other hand move down previous development. Therefore, before any kind of development in eLearning investigation of future technology and usage in development only technology that will meet strong future requirements and trends is extremely important. eLearning resources have to be not limited by device or software inside. From marketing point of view users need to have access to learning content from any different device today. Nowadays there is a plenty of them and all of them are in use by modern users.

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І.В. Остроумов. Розробка систем дистанційного навчання

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Зараз дистанційне навчання є одним з основних компонентів навчального процесу. Технології електронного навчання дуже швидко розвиваються, що може вплинути на наявні ресурси й стати предметом дискусій при проектуванні нових. У статті представлено аналіз сучасних технологій дистанційного навчання та дано основні рекомендації з вибору найбільш підходящих для досягнення цілей навчання. Особливу увагу приділено розробці систем дистанційного навчання від систем пристрій-орієнтованих до пристрій незалежних. Дано аналіз доступних на ринку підходів для розробки мультимедійного змісту.

Ключові слова: дистанційне навчання; крос-браузерний; мультимедійний зміст; програмне забезпечення.

И.В. Остроумов. Разработка систем дистанционного обучения

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В настоящее время дистанционное обучение является одним из основных компонентов учебного процесса. Технологии электронного обучения очень быстро развиваются сегодня, что может повлиять на существующие ресурсы и стать предметом дискуссий при проектировании новых. В статье представлен анализ современных технологий дистанционного обучения и даны основные рекомендации по выбору наиболее подходящих из них для достижения целей обучения. Особое внимание уделено разработке систем дистанционного обучения от систем устройство-ориентированных до устройство независимых. Дан анализ доступных на рынке подходов для разработки мультимедийного содержания.

Ключевые слова: дистанционное обучение; кросс-браузерный; мультимедийное содержание; программное обеспечение.

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