

Integration of Web Technologies in Software Applications. Is Web 2.0 a Solution?

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Starting from the idea that Web 2.0 represents “the era of dynamic web”, the paper proposes to provide arguments (demonstrated by physical results) regarding the question that is at the foundation of this article. Due to the findings we can definitely affirm that Web 2.0 is a solution to building powerful and robust software, since the Internet has become more than just a simple presence on the users’ desktop that develops easy access to information, services, entertainment, online transactions, e-commerce, e-learning and so on, but basically every kind of human or institutional interaction can happen online. This paper seeks to study the impact of two of these branches upon the user – e-commerce and e-testing. The statistic reports will be made on different sets of people, while the conclusions are the results of a detailed research and study of the applications’ behaviour in the actual operating environment.

Keywords: Web 2.0, web technology, e-commerce, online transaction, e-testing

1 Introduction

The answer for the question that makes the object of this paper, “*Is Web 2.0 a solution?*”, requires a multi-directional approach. While ‘Web 1.0’ is the synonym for “*the static web*”, ‘Web 2.0’ represents the dynamic way of creating, developing and using applications over the Internet. Extremely user friendly interfaces with full content management options are developed quickly together with complex applications that have various functionalities and require a large and sophisticated amount of resources (especially regarding the security issue). Web development technologies are constantly improving their performance and offered facilities to the end-user: next to the expansion of the dedicated development frameworks, the hardware infrastructure that keeps up with the software also gets better by the day (an example of such a technology is *cloud-computing*). This allows web technologies together with these extended capacities, to run smoothly on a reliable logistic base without any technical issues. Even though, for the moment, the hardware resources are maybe a bit too much for micro level implemented web applications (inside a financial institution or inside a

series of interconnected financial institutions, for example), these resources must be considered at the time when a classic web server will become insufficient.

The “Web 2.0” term has first been quoted by Darcy DiNucci, in 1999, when, in her article, “*Fragmented future*” [5], [6], she writes: “*The Web we know now, which loads into a [browser window](#) in essentially static screenfills, is only an [embryo](#) of the Web to come. The first glimmerings of Web 2.0 are beginning to appear, and we are just starting to see how that embryo might develop.*”. Later on, John Robb [7] says that “[Web 2.0] is a system that breaks with the old model of centralized Web sites and moves the power of the Web/Internet to the desktop.”.

In 2004, when the first official conference on Web 2.0 took place, “*O’Reilly Media and MediaLive*”, the term became unanimously accepted. Consisting of everything that “*Web as Platform*” means, a generic term (which defines web-based software applications) maybe having even better functionalities than these. According to D. Best [4], the characteristics of Web 2.0 are rich user experience, user participation, dynamic content, [metadata](#), web standards and [scalability](#). Thus, we state that, the main phrase, when referring to Web 2.0, is

“interaction”. We state this because, obviously, over the last few years, the web has become one of the most powerful means of information (in most of the cases, the most powerful), personal development mechanism, knowledge enrichment tool and so on. If ten years ago the Internet was just a sum of plain, static web pages, almost irrelevant for the user, nowadays the access to information is extremely simple and can even be enriched by editing the pages while browsing (e.g. Wikipedia). This way, the Web 2.0 technologies encourages and amplifies the user’s role in the browsing experience:

- Instant Messaging (Yahoo! Messenger, GTalk): text-based, real time communication channel between two or more users;
- Internet Telephony (Skype): real time audio communication between two or more users;
- Blogs (WordPress, Blogger): easily customizable web pages, where users can post topics and others can express their opinion and comment upon;
- Social Networks (Facebook, Twitter): web applications that create links between users that share the same interests, hobbies or other;
- Wikis (Wikipedia): web applications that allow creating and/or editing web page content, mostly used for developing website communities that are able to rapidly store massive amount of information.

What this article aims, is to present practical results obtained by interviewing users about how the new Web technologies in general, e-commerce and e-testing, in particular, were seen by them after using these software platforms.

2 Concepts and technologies

2.1. Concepts

From a minimalistic look, the Web 2.0 can be described throughout three major components:

- Service Oriented Architecture (SOA) -

defines the structure of web applications developed using the 2.0 model by implementing the functionality of mutual inclusion of the Web pages’ contents (e.g. Web services);

- Rich Internet Application (RIA) – defines the implementation of the classic software packages facilities, developed and included inside the Internet environment (the web browser);
- Social Web - defines the user as part of the web development process.

As shown above, the three listed components define the client - server architectural model, and include the concepts of client-side software, server-side software, content uniformity and use of network protocols. Newer versions of browsers have included in their standard software extensions or plug-ins that allow interaction with web 2.0 elements, elements that were missing in web 1.0 (XML, RSS, AJAX and others).

Other important concepts defined by the literature [1] are SLATES - Search, Links, Authoring, Tags, Extensions, Signals.

From a functional point of view, the available web technologies are divided into two main categories: server-side web technologies and client-side web technologies.

2.2. Server-side web technologies

Given the extremely rapid development of the Internet, new programming languages have emerged and distinguished themselves as powerful tools in order to standardize the content of web pages. Thus, languages like PHP, JSP, ASP, Ruby and others have functions and features that facilitate working with XML, RSS or JSON files, making the communication between two or more web applications possible, even if they were initially developed in different programming languages.

2.3. Client-side web technologies

Regarding the Web 2.0 technologies used on the client-side, these aimed to develop tools that facilitate the creation of dynamic, easily understandable and usable interfaces but, especially, to create visual and functional effects. The AJAX (Asynchronous JavaScript and XML), Adobe Flash, Adobe Flex and JavaScript framework and libraries (Yahoo User Interface library, jQuery, MooTools) technologies have been developed.

Each of the listed technologies have special features. The developer's decision of using one over another remains at his will, his work experience and the purpose of the software application. While the AJAX technology offers facilities for working with asynchronous requests to the server (the requests are running in the background of the browser), Flex and Flash technologies are capable of displaying large amounts of information in video and audio formats. However, essentially, what a technology has to offer better than another is only a small portion of the package, namely to work with JavaScript or DOM (Data Object Model) objects.

3. Web technologies integrated in e-commerce solutions

Electronic commerce (e-commerce) has been, since the early expansion of the Internet, a major challenge for developers. Problems like the connection between the parties, security of connection, security of transaction, the implemented mechanism, the participants in the business process all were the subject of many debates and development projects. As for the solution to these problems, the development of e-commerce solutions can be divided into four stages: the pre-web stage, the reactive web stage, the interactive web stage and the integrative web stage [2].

Each of the four stages presents special features regarding the development of the Internet, the technologies that were used and developed becoming more advanced. Table 1 summarizes the stages of the e-commerce

applications.

Table 1. Evolution of the Internet

	Pre Web
Period	Before 1990
Participants	One-to-one
Work environment	Dedicated connection
Communication	FTP, telnet, EDI
Presentation / Representation	ASCII
Programming language	Fortran, C, C++, Perl
Storage	SQL, DbaseIII
	Reactive Web
Period	Early '90s
Participants	One-to-one
Work environment	Web page, portal, company
Communication	HTTP, CGI
Presentation / Representation	HTML
Programming language	C, C++, Perl
Storage	Access, DbaseIV, Oracle, SQL
	Interactive Web
Period	Mid '90s
Participants	One-to-many
Work environment	Common market, trader, dealer, broker
Communication	SSL, Cookie
Presentation / Representation	SSI, VRML, Flash
Programming language	Java, PHP
Storage	ODBC
	Integrative Web
Period	Late '90s
Participants	Many-to-many
Work environment	Platform, community, business, industry
Communication	Wap, PKI
Presentation / Representation	XML, XHTML
Programming language	ASP, JSP, JDBC, ColdFusion, SQLJ, JavaBeans
Storage	JDBC, SQLJ

The experiment conducted towards finding an answer to the question "Is Web 2.0 a solution for e-commerce?" has been made on a sample of 20 people with ages between 20 and 45. The issue was whether, by visiting two online stores, they became convinced to order products online. The two stores have been developed using the PHP server-side technology and the AJAX client-side technology (Yahoo User Interface libraries, MooTools, jQuery). The ergonomics of the two software platforms and its role regarding the customer's decision to purchase the products offered for sale has also been tested. Appendix 1 presents the evaluation questionnaire together with the achieved scores and the metric chosen for the performed reporting.

The results of the study reveal that, for the first online store, which, on a scale of 1 to 10, has a 9.51 average in appearance and an 8.46 average on the traded products' utility, 74.6% of the customers have shown an interest in purchasing products from this store. For the second online store, which received an average of 7.34 for appearance and 6.57 for utility, the results reveal a strong correlation between these indicators and the customers' interest in purchasing the products it sells, the percentage of 47.3% of the subjects interested in buying was clearly lower than the one for the first store.

4. Web technologies integrated in e-testing platforms

Software platforms for computer-assisted learning and testing represents a special class of web applications, mainly due to different possible modes of development, integration and implementation. The above technologies are capable of developing modular platforms, easily to improve, easily to manipulate and that creates easy access to data, reports and result graphs.

A current trend in computer-assisted learning and testing processes is the standardization of the structure of these software systems. Thus, international

organizations (many of them united under a single aegis), such as IMS - Instructional Management Systems, LTSCALE - Learning Technology Standards Committees, ADL - Advanced Distributed Learning, decided to create a permanent collaboration in e-learning standards. The most common such standards are based on metadata: SCORM and Learning Design^[8]. Given the direction of standardization based on metadata the format in which the questions will be integrated into the system must be clearly defined. Thus, they can be of various types (with short, single or multiple answer, with free answer, with adding item answer and so on) and raises two issues - how will the questions be included into the application and the method or algorithm through whom they will be added into the evaluation tests. Regarding the first problem, research is conducted in the field of automation for the training process (for example, linking the taught material with the assessed one through semantic networks). Regarding the tests generation mechanism, there have been created linear test generating algorithms (the same set of questions for all those assessed), dynamic test generating algorithms (different sets of questions) or adaptive test generating algorithms (dependent on the knowledge of the assessed person, iterative [3]).

The experimental research to find an answer for the question "Is Web 2.0 a solution for online testing?" was conducted on a sample of 20 students aged between 20 and 23. The issue was that, after taking three tests using an e-testing software platform, the subjects would complete a questionnaire on efficiency, ergonomics and functionality of the web application. The platform was developed using PHP server-side technology and AJAX client-side technology (YUI libraries, MooTools, jQuery). The questionnaire, the scores and the chosen metrics defined for the reports are presented in Appendix 2.

The experimental results show that 82.5% of the subjects have rapidly adapted to the interface and functions of the

platform, which is quoted by most of them as having a high level of usability. A correlation between the answer regarding the ergonomics and the tests' scores can be seen, subjects with less good scores defining the application less ergonomic and difficult to use, while the subjects with high scores are those who have rapidly adapted to the interface. Regarding the utility of the application, 79.6% of the subjects consider it a useful tool and are willing to help on improving it by providing comments and suggestions upon it.

5. Conclusions

The present paper wants to argue, both theoretically and experimentally, that the answer to the main issue here - "Is Web 2.0 a solution in software development?". Given the results of the study for the two areas of research, electronic commerce and computer-aided testing, we can strongly say that Web 2.0 is a solution. The currently available technologies on the market and their possibilities of development, both server-side and client-side consist of valuable resources for the development of Web 2.0 and gradual transition towards Web 3.0.

Correlations between aesthetics and the desire to buy the product, on the one hand, usability and the testing's results, on the other hand, emphasizes that a good design of the user-interface creates the premises of having a rich and positive experience in interaction with the software platform, positive results increasing with the aesthetic level of the interface.

At the same time, from a functional point of view, it has been proven that the choice of implementing the software platforms using PHP as server-side technology and AJAX (YUI libraries, MooTools, JQuery) as client-side technology, has been a viable solution for the user, the impact of visual and functional effects of the applications being positive, as shown by the statistics.

Essentially, Web 2.0 is not only users interacting with each other through all means possible (instant messaging, blogs,

internet telephony, social networking or others), but especially creating an more attractive environment (aesthetically and functionally) for the user, improving the browsing experience and, obviously, convincing the user to return to the web application.

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References

- [1] McAfee, A., „Enterprise 2.0: The Dawn of Emergent Collaboration.” *MIT Sloan Management review*, Vol. 47, No. 3, 2006, pp. 21–28.
- [2] Sung-Chi Chu, Lawrence C. Leung, Yer Van Hui, Waiman Cheung, „Evolution of e-commerce Web sites: A conceptual framework and a longitudinal study”, *Information & Management*, Vol. 44, 2007, pp. 154–164
- [3] Armenski Goce, S., Gusev, M., „Infrastructure for e-Testing”, *Facta Universitatis, Ser. Elec. Energ.*, Vol. 18, No. 2, 2005, pp. 181-204
- [4] Best, D., „Web 2.0 Next Big Thing or Next Big Internet Bubble?”, *Lecture Web Information Systems. Technische Universiteit Eindhoven*, 2006
- [5] DiNucci, D., „Fragmented Future”, *Print* 53 (4): 32, 1999
- [6] Who coined Web 2.0? : Darcy DiNucci, <http://www.cole20.com/who-coined-web-20-darcy-dinucci/>
- [7] Web 2.0, John Robb's Weblog, <http://jrobb.mindplex.org/2003/08/16.html>



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