QUALITY MEASUREMENT of BUSINESS WEB APPLICATION

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ABSTRACT. With the development of the Internet culture applications are becoming simpler and simpler, users need less IT knowledge than earlier; from the 'reader' status they have reached that of the content creator and editor.

In our days, the effects of the web are becoming stronger and stronger—computer-aided work is conventional almost everywhere. The spread of the Internet applications has several reasons: first of all, their accessibility is widespread; second, their use is not limited to only one computer or network on which they have been installed.

Also, the quantity of accessible information now and earlier is not even comparable. Not counting the applications which need high broadband or high counting capacity (for example video editing), Internet applications are reaching the functionality of the thick clients associates. The most serious disadvantage of Internet applications – for security reasons — is that the resources of the client computer are not fully accessible or accessible only to a restricted extent. Still thick clients do have some advantages: better multimedia perdormance with more flexibility due to local resources and the possibility for offline working.

The new web application trend's name is Web 2.0. Nowadays Web 2.0 has a specific business model also, initially it based on the Internet users, the new Enterprise 2.0 applications are shows up at present-days. This software integrates the web 2.0 functions with the enterprise applications, like social network services, tagging and wikis with the groupware and document management systems, to reach higher efficiency level to push an advantage with the usage of modern web applications. Business always needs quality management, such as responsible software development, as well. Internet applications should meet these expectations and for that the programmer has to consider that while creating the application logic and the framework.

After analyzing of 500 web sites of Hungarian SME's and several interviews to recognize their web and IT strategy, I tried to create a web software developing method and a developing process measurement model based on CMMI model to understand how to integrate Web 2.0 technologies into business applications.

1. Business Web Application 2.0.

A. Briefly about WEB 2.0. By the time the notion 'version number' and its meaning appeared in 2004, it seemed that the creator, Tim O'Really, could not provide any breakthrough innovation—and some even believed that it was only a marketing trick as the technology behind this idea existed earlier, only it was not used. However, a lot of things have changed; alterations were still made in order to make everything easier and user-friendlier: it has become simpler to communicate, to produce texts, images, videos and to publish web content to the Internet. Consequently, it has become easier for users to open e-shops, to entertain themselves, or store documents—even without the knowledge of a programming language (for example HTML) or any other web technology. The most important is that the users have become the creators and editors of the content.

We may argue whether the changes are really so essential or are only the consequences of a natural process: the increasing number of web users and technological evolution. However, what is certain is that modern internet services and therefore products have appeared and basically these were supported by a new business model. The companies involved offer their services on the basis of this new business model, called Web 2.0 – for example Google has become one of the largest IT and media corporations by selling – among others – "web products" labeled Web 2.0 and this success has made it the most important competitor of Microsoft (taking this label from Linux).

B. What has changed with WEB 2.0? Without defining the exact meaning of Web 2.0 or agreing of the philosophy of Web 2.0, we should acknowledge that the usage of the Internet has changed and across the Internet users (employees) it influence the enterprise applications also. Initially Web 2.0 based on the Internet users; everyone became the author of the content with a basic IT knowledge. The developer should know more about the user or about the user's demands and requirements and it is not the user who has to learn web programming or using difficult web applications. Internet applications can be successful on the market if they meet these expectations. The programmer has to consider this trend they now call Web 2.0 while creating the logic of the application and the framework.

On the other hand isolated, local (enterprise) applications should move to the web.

C. Enterprise 2.0. The influence will not be as strong and democratic as HBS professor Andy McAfee thinks. He believes that bringing Web 2.0 technologies (blogs, wikis, tagging, other social tools) into the enterprise changes large bureaucracies and decentralize decisions, frees up knowledge and empowers the employees. Therefore technological alterations changes working processes.

There are some disadvantages to writing blogs and wikis, namely to write more documents takes more time to the employees without producing. Seemingly the importance of sharing the knowledge is also decreases the single user and employee; changing the way of thinking would need motivation. Browser-based software also has limitations, it needs a constant Internet connection and accessibility of the server. Rich media applications need high bandwidth.

At same time with better knowledge and work-sharing - based on social work management and communication methods - applications of the web 2.0 (like blogs, wikis, and enterprise versions of "Myspace") converted into the business form. The new and user-friendly typye of the web content management system (CMS) collects and shares the collective intelligence with wikis that are combined with the enterprise search and document container. It needs to be easily changed by the users.

Enterprise 2.0 applications are browsed-based software in the office with web 2.0 style participation on enterprise management software.

D. How to transform the enterprise into WEB 2.0? Web 2.0 should fit into the enterprise's processes, and data structures. Traditional corporate information is not mobile, not connected with others, redundant, and has more versions, standalone, complex and not always structured, and these are mainly stored in offline, isolated files on the user's non-web-based file system. A web 2.0 capable enterprise information can also be complex and varied, but should stored in relational databases, in XML or in a shared content place with document templates and schemas.

Web 2.0 based on data (content). This is the most important part of these applications. In the enterprise environment the workflows and the (data) processing are the centre of composition.

Enterprise applications should be in web 2.0 "style". All the software needs to be on the network or network enabled, and be joined together. The content should be linkable, shareable and most importantly searchable. Web 2.0 application does not have to be Web-based, but need Internet connection at least for data exchange.

In a knowledge information system, information is stored on the secure server, with access to the relevant users and less hidden (locally stored) information.

The following list shows the possible web 2.0 services and the related enterprise functions:

- Social network services: Work-, groupware and human resource management and integrated communication services. Social network services stores the user's data, skills and hierarchy of the enterprise.

- Wiki and blog services: Information and document sharing functions helps to realize faster, effective collaboration. An Enterprise content management system allows operating wiki and blog services. At the usage of integrated Enterprise 2.0 software information, the company knowledge is centrally stored on a server in wikis, blogs, or in shared and user generated and commonly edited content, such as in the case of Office documents or multimedia files (pictures, animations, music and video files). Storage is the common, ERP's company database which grant also higher security. The main goal is to reduce the locally stored, hidden and vulnerable information.

- Tagging, bookmarking services: This function helps to structure and store the created and stored information.

It is necessary for a modern project management system to contain all these services with an integrated database system.

E. The WEB 2.0 business model. As in the case of every enterprise, profit is the primary goal in online businesses as well. Money is an input resource of the system since innovations and work must be paid for, profit-expectations must be fulfilled – except for those enthusiastic amateurs whose main goal is to be discovered by the professional acquisitors. In the case of the online businesses, it is the profit-making, the method of selling, the management of the web enterprises, the administration, and the work organization of that differ from the conventional software-developing companies. The differences are small but essential. While the production of traditional software is similar to the construction of other goods and products, the creation of web application breaks off from this conception and is closer to the notion of services. In the case of software-as-service (SaaS) models, the software appears not as products but as Web-based services – which are run sometimes by the buyer but in most of the cases by the innovator as service-provider. Therefore the customers – users – pay not for the ownership of the software but for its usage. SaaS is often called on-demand software or Application Service Provider (ASP) or software hosting model also. In these models web-based productions have several advantages and probably the most significant of them is the fact that the entering fee is low. This is because the services used are usage-based or provide periodical (monthly or annual) expenses for the users. In opposition to this, in the traditional system the entering fee is given and high, because it means the purchase of the software-licenses before the usage. Another advantage: the data are stored on the Internet and provide greater accessibility a long with high safety level, because the operation is the responsibility of the developer-service-provider.

The user-centered web applications, called web 2.0 applications – that in most cases are free – make profit via advertisements, premiums and paying accessory or can integrate these web 2.0 services into the enterprise IT system. Therefore the Web 2.0 is a specific variation of the SaaS model.

F. Specialities of internet applications. There are several reasons why internet applications are spreading so fast. First of all their availability is a lot wider, does not come down to only one computer or one network on which they were installed. Also the quantity of accessible information now and before is not even comparable. Not counting the applications which need broadband

or high computing capacity (for example video editing), Internet applications are reaching the functionality of the thick clients associates. The most serious disadvantage of internet applications is that the resources of the client computer are accessible only in a restricted way, if at all.

The development of the application logic is similar to the conventional desktop, fat client development. While the code of an Internet application runs on the server, the smaller program parts, that control the input are only downloaded to the client computer when in use. One of the benefits of doing so is platform independence. Looking at it from the side of a developer another benefit is that the code runs in a tested environment, this way the behaviour of the program does not depend on the environment and is calculable. It is always the last version of the complete and constantly developed program that is running everywhere. In all other cases corrections must be sent to the user, they have to install them and this could lead to other confusions (such as compatibility problems with other applications). All this can take a lot of time and a complete upgrade is never possible.

2. A capability maturity model integration (CMMI). A CMMI model provides a structured view of process improvement across an organization with the essential elements of effective processes. The model defines 5 levels of process areas and project management methods to achieve a "CMMI Level Rating" in a developing or engineering organization. It also means system and software planning, software purchasing procedures. One of the primary goal is to reduce the operational charge and the potential troubles.

A. The 5 level of CMMI

The development of an organization's processes most of the time not mean does a significant and enormous innovation but means a set of small steps or instructions. The CMMI makes a frame for these steps to organize them into 5 levels according to the gradual organizational process development. The levels define a scale to measure the software processes and the capability of software processes.

The individual maturity levels consist of more ingredients except of the first, initial level. Every level defines particular performances and also includes several key processes as goals. The procedures have many common attributes, to achieve the target they contain some basic exercises, examples describing specific or less specific activities.

At the bottom of the scale the companies do not have repeatable processes, the work and the activities are mainly chaotic, ad hoc. At the top of the scale the corporations use well defined and repeatable processes, and collect metrics to help improving the processes constantly.

The key methods of CMMI contribute to the organization's achieving the goals concerning costs, scheduling, functionality and the quality of planning, developing and maintenance.

Every mature level defines goals the development process to stabilize the capability of the organization with a few elements of the software developing process.

3. Using CMMI to develop web applications. "*Correspondingly to the traditional software development the web applications also can capitalize with a software planning tool and with a project management method like the CMMI model*" [10]. Furthermore it presents some difficulty that only few web development systems include version tracking, reusable component libraries and collaboration management or designer tools.

A. Levels of maturity of internet applications. Many of people – including amateur developers – are developing websites and are writing Internet applications. I will show you one of the possible approaches by the following examples. The most obvious thing to do is to take a look at the development of a web-developer company. It is also a must to deal with the needs of the procurer. These expectations are the ones determining the quality level that should be reached by the developer. In case the quality level expected by the customer and the one reached by the developer are not the same, the success of the developing project can be at risk.

1) Initial level.
a) From the viewpoint of the developer. Most web programmers or even more people who are writing HTML are working on an initial level. Web-developer companies who have only a few employees and are creating simple websites for smaller customers are usually on this level. This also involves companies programming their own website. They do not use either CSS or HTML templates and most of them use only a WYSIWG editor program or a conventional word processor that is capable of saving in HTML format. These developments follow very few optimization guidelines (for example download time, legibility,

ergonomics). Creating new applications or developing new pages always starts from the beginning over and over again. Developers at this level rarely use test cases. Generally, the look, the content and the logic of the program (if any) do not differ from one another.

Most of the time those who develop static websites are found on this level.

b) *From the viewpoint of the customer.* Those customers can be on this level to whom the only thing important is being present on the Internet and who do not need dynamic content and do not want to operate a web-shop or electronic helpdesk. The content changes rarely or/and slowly. These websites are often called electronic prospectuses and do not offer much information. The disadvantage of these pages is that the rate of returning visitors is very low. The customer is not familiar with the benefits of being present on the Internet. This website does not meet the customers' business strategy nor their real business goals. This way its success is not measurable and the fulfillment of the goals can not be audited. The target audience must be determined and so should be the service offered by the website, the content and the message of the page to the visitors. All this should be done to improve the rate of visitors coming back.

Customers who have goals like these need a developer on a higher level.

2) Managed level.

a) *From the viewpoint of the developer.* The next level is reached by those developers who use reusable components, templates. Usually those reach this level who have more customers and so they have experience. They are aware of the fact that some elements and expectations are the same in different projects. On this level content and look are starting to get separated and the logic of the program is starting to appear. Application development is faster and the created applications and websites correspond more to the expectations of the customers. Compared to the initial level here the development is faster however there are more risk factors because of the use of third-party components.

b) *From the viewpoint of the customer.* Development can reach this level if the customers realize that the updating of the content is also important and maintenance of the website is necessary. The maintenance, the updating and the operation are most often done by the developer. The customer provides the content, for example via e-mail, to the developer who will upload it to the Internet. So updating will have its limits, it takes more time. If the customer

updates the website frequently its development – even if not the whole page – is also the developer's or the customer's system administrator's duty. Updating and development however require another kind of knowledge by the "updater" person. We cannot expect a person who is responsible for maintenance of a network and computers to develop professional internet applications. Another solution can be the use of content management software. With that the customer himself/herself can upload content to the site. With doing so we reach an even higher level.

Developers often make a mistake when they use the latest technology on the website and they overcrowd it with animations. From this kind of developments only web designers benefit. Animations rarely contain useful information, the page downloads will be much slower because of them and become far more complex than needed and they also distract the attention of the visitors. Using the latest technology already rules out some of the visitors and it also raises the costs of the development which takes a lot more time this way but this does not show in the value added.

3) Defined level.

a) From the viewpoint of the customer. The customer already has a forming marketing strategy and the website is accommodating to business goals. The objectives of the customers are clear; they have concrete expectations. From now on the one who is determining the application is not the developer but the demand and expectation of the customer. E-business, web-shop, electronic helpdesk and other electronic services come to the front as methods for keeping in touch with clients.

During maintenance security and constant, high availability become important aspects.

There will be higher expectations regarding web services and so the project is in need of a more professional developing group.

b) From the viewpoint of the developer. On this level companies who are dealing with development are starting to create developing procedures, methods, documentation principals mostly based on their experiences in the past. The use of these is required by continuous software-support. Determining security levels and implementing security related procedures also becomes important because of occurring failures and lacks of security. Applications are becoming better planned and testing more farseeing. Previous to development serious planning takes place and the contact with the customer is constant.

The size of the developing organization is bigger, it has more complex developing projects whose number is also increasing so the communication and management inside the organization becomes very important. Training of the members of the organization is necessary.

Documenting is in the centre because planning is a lot better, software support is available and furthermore using complete components, functions, procedures, modules etc. later is a lot easier. Another advantage is that the tracking of the project also becomes simpler for the management. This level is usually reached by middle sized developing companies. Data is stored in databases, developing roles are separated. There are separate roles like the role of the programmer, database administrator, web server administrator and designer.

4) Quantitatively Managed level.

a) From the viewpoint of the customer. With higher and higher expectations and with the increasing number of the functions of web services meeting the business goals is not possible without the Internet and without being present on the Internet. Besides, services should be measurable and other efficiency aspects should be dealt with.

In most cases a Content Management System – CMS can be used for these. These do not provide too much freedom for the company in creating the website totally as they planned, but they do fit the requirements. With CSM the customer himself/herself can upload content on the Internet and this way the customer can constantly keep the website updated.

The inside portal, the Intranet for the company itself and the outside portal for the partners, for the customers are separated. The communication and data exchange between the employees or between the company and its partners can become faster and automatic by building up an Intranet.

b) From the viewpoint of the developer. Applications appear that are optimized for the separate platforms. Complex developments are important and it is necessary for the developers to use version tracking devices.

For increasing the efficiency of the development and the reliability and decreasing the time of the project they use tools that help team management and collaboration. The outcomes of the project are evaluated and used in the future. The achievements are monitored.

The more organized developments require changes also in the developing system. The pages fully in Flash are changed to inbuilt Flash elements. The

unmanaged applications on the server side are changed to more manageable developing systems like J2EE or NET.

The development and the fact that the company's portal is organically built into the customers' business procedures and into the ERP system makes it necessary for the system to be reliable and secure and this affects every area. Free database operators are rear on this level they are switched to database operators that are scalable, more secure, manageable and more efficient.

To every task they assign time, money and other resources. They rely on these when they determine human resources and the price fot the customer.

5) Optimizing level.
a) From the viewpoint of the customer. As companies grow and develop, integrating the isolated IT systems becomes necessary. It is also important to harmonize the data enclosed in different applications and the business procedures. This is possible with services that are provided by communication systems, however this way the IT system become more complicated.

Communication between business partners is constantly flaring. The market demands quick and flexible reactions. The expectations created on the electronic market must be satisfied. IT systems must adapt to these demands. This requires a developing team that can offer appropriate services. Apart from security and efficiency it is also very important to keep schedule.

b) From the aspect of the developer. Cost effective development and the customer's higher level of satisfaction require changes and better managing on the side of the developers. With the use of development standards and project management methods developments become clearer, faster and do not suffer from so many errors.

On this level the organization is constantly improving software procedures, searching and abolishing the real reasons of low efficiency and preventing future mistakes by the experiences of the past. There are several feed-back points in the developing procedure. From all this we can expect an increasing productivity and a decreasing period-time.

To improve project efficiency they use different knowledge management and project management methods. Focus is on constant development of procedures.

This is the highest level of development. The product with desirable quality level is shipped at the right time.

The steps of a software development cycle:

1. Project planning: set up the project team, define the deadlines.

2. Define the conception of the development together with the order.

3. Define the software requirements.

4. Software planning: design the logic and the appearance of the program. At this level the content is not yet important, the order will produce it later.

5. Segmentation of the development and the optimalization of the processes.

6. Software development.

7. Testing.

8. Software delivery and installing.

9. Software support and maintenance: This is a much more important aspect when looking at web applications than at traditional desktop applications. The security definitions and levels require long access times while applications are a lot more vulnerable. Also the expectations regarding applications change faster and more often and doing so they require faster response. Therefore there are special standards to maintain web applications. When planning them we should always be aware of the fact that we can never think of web applications as finished. The content – which apart from text can also be an image, voice or video file – is uploaded by the user of the application, the customer itself without the intervention of the programmer.

10. Analysing the processes and the results. Applying the received information at the further development. Adapt the information; reform the development procedures when required.

11. Continuing the professional education of the developers.

Conclusion. There are no wide spread methods to guarantee the quality of web applications although it would be desirable as the Internet is spreading and the web based IT and business systems are becoming integrated. Customers

(enterprises) expect the developers' projects to be monitorable and measurable. For the clients, finding a suitable partner with a suitable state of maturity for their developments is significant. Otherwise, the success of the project might be doubtful. In the long term, for the majority of companies (for developers and clients alike) the goal is to achieve the highly developed level 5 – especially for those who want to keep up with the latest business challenges. Therefore, it is essential for the developers to be able to categorize themselves into their appropriate levels – beside other advantages, it also enables them to assess the steps needed for the transition between the CMMI rates. In order to reach this aim, the enterprises need – among others – professional process planning, in which the CMMI model can be a very efficient help.

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