MEASURING WEB 2.0 EFFICIENCY

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ABSTRACT: Any potential investment assumes, from the investor's point of view, answering a legitimate question: "What is the value returned by the current investment?" Investing in the new semantic technologies in the area of Web 2.0 and Enterprise 2.0 are no exception to this rule. The research at hand combines a review of the relevant literature with action research, in order to identify coherent and relevant methods for the measurement of the benefits arising from an investment in the new wave of knowledge management and organizational memory building technologies. The paper is based on the classic ROI computation, attempting to build a new computation model, well suited to measure the success of an implementation of the informational memory. The valuation model (enforced and explained by means of a case study) may be also regarded as a measurement model for the costs and benefits of building organizational memory at the economic entity level.

Key words: Organizational knowledge, ROI, computation model, Web 2.0, Semantic Web

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Introduction

Any potential investment assumes, from the investor's point of view, answering a legitimate question: "What is the value returned by the current investment?" Investing in the new semantic technologies in the area of Web 2.0 and Enterprise 2.0 are no exception to this rule. This paper is a proposal of a Web 2.0 – specific ROI computation model explained and validated by means of a case study.

Research methodology

The paper is a component of a wider research project called "*Research in the Field of Modeling And Building Organizational Memory. OMCAAF – A New Methodological Framework for Financial and Accounting Cognitive Acquis Capitalization*", and also continues a previous doctoral research in the field of computer-assisted financial audit tools and techniques, whose final results were publicly defended in order to be validated by the scientific and academic community. The main goal of the aforementioned research was the identification of some new areas of applicability for the modern knowledge-based information technologies in the field of financial audit.

When possible, practitioners' expectations identification was attempted, both by means of questionnaires and direct interviews. In case some other author's opinion was enclosed, whether in exact quotation or synthetic form, a complete mention of the source identification information was made. The case study is based on actual amounts and figures provided by a German IT company which has chosen anonymity in order not to provide such detailed "inside information" to its competitors. Some of the indicators involved by the research model were not available for the company, so the author used the industry average values, also reviewed and approved by the aforementioned company staff.

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Validation of the research conclusions was performed by means of an informal discussion with some "real life practitioners", members of a team having almost two years of experience in implementing and evaluating the success of such projects.

The author has over seven years of previous experience in the research area, and also a series of previous research results (published articles, conference attendances and doctoral research). By defending the research results at the proceedings of such a prominent scientific conference, attended by both scholars and practitioners bearing some interest in the research area, the author attempts to get further validation of his opinions, both confirmation and rejection of the aforementioned opinions' scientific and practical importance being welcome.

Literature review

The paper at hand combines a review of the relevant literature with an action research (a case study) in order to identify coherent and relevant methods for the measurement of the benefits arising from an investment in the new wave of knowledge management and organizational memory building technologies. In order to provide a set of valid and well-documented opinions about the realistic ways of augmenting the use of organizational memory by means of the modern information technologies, the author's proposals were preceded by an ample process of documentation and analysis of the field literature, allowing to get into terms with the main schools and opinion trends in the area, as well as the actual level of interconnection among the disciplines contributing to the present content of the "organizational memory", "organizational knowledge" and "Semantic Web" concepts.

As a first attempt, the author intended to gather the best and the most widely accepted definitions for a set of terms often used in the paper, as follows:

- **Blog** – (or *Weblog*) – is a type of website, usually maintained by an individual with regular entries of commentary, descriptions of events, or other material such as graphics or video. Entries are commonly displayed in reverse-chronological order. "Blog" can also be used as a verb, meaning to maintain or add content to a blog [Scott, 2008];
- **Wiki** – a website that uses wiki software, allowing the easy creation and editing of any number of interlinked Web pages, using a simplified markup language or a visual text editor, within the browser. Wikis are often used to create collaborative websites, to power community websites, for personal note taking, in corporate intranets, and in knowledge management systems [Huettner *et.al.*, 2007].
- **Enterprise 2.0** – (or *Enterprise social software*) – social software used in "enterprise" (business/commercial) contexts. Includes social and networked modifications to corporate intranets and other classic software platforms used by large companies to organize their communication. In contrast to traditional enterprise software, which imposes structure prior to use, enterprise social software tends to encourage use prior to providing structure [Buhse & Stamer, 2008].
- **RSS Reader** – (or *Aggregator*) – a program that collects news from various websites and provides it to the user in a simple form. There are two main types of aggregators: web-based aggregators and desktop/software aggregators. Web-based aggregators allow individuals to subscribe to feeds online and read feeds in a web browser. Desktop aggregators are software programs installed locally that updates when feeds are updated. The aggregator shows new information and allow for users to read feeds [Gartenberg *et.al.*, 2005].
- **Social network** – (or *social network service*) – a network service which focuses on building online communities of people who share interests and/or activities, or who are interested in exploring the interests and activities of others. Most social network services are Web-based and provide a variety of ways for users to interact, such as e-mail and instant messaging services [Porter, 2008].

The Need to Know: ROI in Adopting Enterprise 2.0

Performing an investment is mainly based on the investor's expectations regarding the returned value [Lin *et.al.*, 2006]. Investments in the new Enterprise 2.0 technologies make no exception to the aforementioned rule, as the effectiveness of a business entity or organization (on a higher level) strongly depends on its ability to measure the own business efficiency, as well as the efficiency of the own investments, may that refer to a portfolio investment, a short-term stock exchange trade, an advertising campaign or an investment in a new set of technologies [McIntosh *et.al.*, 2001].

The need for measurement and monetary quantification is unanimously accepted for each item of the new economic model, also being a constraint, an element of pressure applied by the shareholders to the executive management of any economic entity. Hence the proposal for an investment in the new semantic technologies assumes a set of explanations and predictions concerning the investment's effect on the profit and loss account [Heraty, 2004]. The adoption of the new Enterprise 2.0 technologies usually leads to important benefits at the company level, along with a set of instruments allowing for a more efficient business activity. The idea is quasi-unanimously accepted, being mentioned by almost all the major works in the field literature [Lin *et.al.*, 2006], but without a set of measurable results, there is no proof that the technologies were well-chosen and efficiently employed. As any other technology, Enterprise 2.0 has to be used correctly in order to obtain added value to the company. As a consequence, according to the author's opinion, the lack of a measurement standard leads to the impossibility of proofing that the investment in a technology resulted in a profit or a loss.

Even if the need to measure the results of an Enterprise 2.0 implementation is widely accepted, the evaluation and measurement method *per se* is still subject to debate [Amaratunga & Baldry, 2003]. The difficulty to money-wise quantify the value added to the enterprise by the so-called "spontaneous technologies" [Tikkanen & Parvinen, 2006] (like wikis, blogs, social networks etc.) is a major drawback. A simple measurement model could observe that the semantic technologies allow both the users and the employees to save time, and then use the saying "time is money" to translate the time savings in monetary values. Such an observation could become a solid starting point for the measurement of the new technologies' efficiency, based on the time and resources savings involved. According to the author, such an approach is possible, but far from being complete.

Some of the reviewed authors [Tikkanen & Parvinen, 2006] state that there is no way to measure the efficiency of the new Enterprise 2.0 technologies, either exactly or with a reasonable level of confidence. In our opinion an accurate measurement is not impossible, as long as adequate instruments and a "bit" of innovation exist. The situation at hand makes no exception to the aforesaid rule, and, as a result, we think it is possible to design and build an applicable set of metrics (a model) for the evaluation of the costs and benefits of the semantic technologies' adoption.

A first attempt in this area should be the measurement of the new investments' results based on the so-called "opportunity costs" [McIntosh *et.al.*, 2001]. Evaluating this cost implies getting answers to a set of sensible questions like:

- What were the structure and the content of the business process before the new technologies were adopted?
- What are the structure and the content of the business process after the new technologies were adopted?
- How did the new technologies affect the employees' work?
- Do the employees have more time available for other tasks as a result of the new technologies' adoption?
- Did the adoption of the new technologies lead to a more efficient use of the employees' time resources?

- Did the adoption of the new technologies lead to an improvement in customer relations and customer communication?
- Did the adoption of the new technologies lead to an increase in the value of sales or the value of the turnover?

According to the author, getting pertinent answers to the aforementioned set of questions may provide a set of indicators for the measurement of the success (or the failure) of an Enterprise 2.0 technologies implementation project.

The Enterprise 2.0 "wave" mainly assumes investing in modern technologies which allow improved access to the information (or the "organizational memory"), along with a superior communication level in the business-to-business and the business-to-consumer areas. Even if the Web 1.0 "age" tools were quite different (not totally different, though), the issue of measuring the investment's result was usually the same. A decade ago, the electronic mail services, the Web servers and the FTP servers were investments in some new technologies, requesting the same level of proof in front of the stakeholders, as the semantic technologies request nowadays [Tsui, 2005].

For example, the e-mail service took over a set of traditional communication channels, usually based on the phone, fax or other classic messaging systems. In such case it is easy to measure the efficiency of the investment in electronic mail, by means of the savings in the field of envelope processing, stamping, postal office transport etc. Moreover, the quasi-instantaneous communication provided by the e-mail may lead to a larger number of partnerships and business relations, larger sales and, in the end, larger sales revenues. Even if the relation between e-mail and profit is open to question [Tsui, 2005], it can not be denied, and, as a result the e-mail is definitely a superior means of communication compared to the standard postal service. According to the author, a similar set of metrics may be used for the measurements of the Enterprise 2.0 technologies' adoption.

Measuring the result of an investment assumes costs are compared against benefits [McIntosh *et.al.*, 2001]. For small-scale projects, such as creating a department-level wiki or a blog, the comparison is quite difficult to perform. Small-scale projects usually have small benefits, so as measuring the return on investment is, in most of the cases, difficult and unimportant. This means not the investor has to completely disregard the measure of such project's efficiency. The use of the adopted technologies and the changes induced in the productivity of the users should be measured, even if only by representative sampling. The degree of involvement from the personnel, the obvious increases in efficiency or the increase in customers' satisfaction are usually straightforward to measure by means of polls or questionnaires handed directly or by e-mail. A direct poll among the customers, performed through the corporate Web portal and usually enforced with a set of prizes or discounts has become common practice [Wu, 2002]. Even a minimal estimation of the new platform's efficiency may be enough to validate the continuation of an application or technology. In the situation of exceptionally good results, the measurement may be used to persuade the executive management to increase project funding [Heraty, 2004].

For a large project, involving multiple departments and a significant number of employees, measuring the return on investment is no longer an option, but an imperative. This situation also requests an exact or accurate value of the opportunity costs [McIntosh *et.al.*, 2001]. Though, it is of main importance for the decision makers to comprehend the resource costs involved in the measurement process (for a reasonable level of confidence) and to decide whether the efforts are worth the results.

The upper management will always request for a suitable way to measure the return on investment, for each major project. Implementing a project in the area of Enterprise 2.0 technologies is not significantly different from the implementation of any large-scale project [Krigsman, 2009]. The architect of the Enterprise 2.0 implementation has to be prepared for a harsh debate concerning the return on investment measurement methods, and also, to be ready to put these methods into practice, when asked.

When an attempt to measure the return of an investment is performed, some of the benefits are more easily measured then others [McIntosh *et.al.*, 2001]. Those benefits which are easy to define and measure should be immediately and accurately measured. The field literature defines this kind of benefits as "hard benefits" [Crawford & Pollack, 2004]. Other benefits, even if obvious, are not as easy to measure or quantify by means of money and, as a result, may be taken into account but may not be enclosed in a formal model for the computation of return on investment. These are called "soft benefits" [Crawford & Pollack, 2004].

Hard benefits may be easily traced through the business process and may be evaluated in terms of "profit" or "loss", unconditionally disclosing the manner in which the Enterprise 2.0 technologies adoption project will affect organization's general level of efficiency. As it is quite undemanding to perform an understandable relation between the costs and the revenues in the structure of the final result, the hard benefits are able to be included in a return on investment computation model. Such benefits may include:

- Increases in the sales value, due to a more intense interaction with the customers;
- Decreases in the technology costs (costs for the adoption of new technologies);
- Increases in the efficiency of the marketing and advertising campaigns;
- Significant savings in the costs of customer support services.

According to the author, in order to discover the hard benefits of an Enterprise 2.0 implementation project, one should identify the business processes intensely affected by these technologies and also should perform the necessary steps to measure the extra profit generated by the "improved" business process, as opposed to the "traditional" version of the same process [Hausera & Katzb, 1998]. If an organization already has a set of performance metrics implemented at the business process level in order to evaluate its efficiency, a comparison of the new values against the old ones (previous to the implementation) may be performed.

The soft benefits may be obvious when Enterprise 2.0 technologies are employed, but there is not enough information to be quantified as money. Such benefits may include:

- An increase in the employees' satisfaction;
- The easy recruiting of highly trained employees;
- The improvement of communication amongst employees.

In order to gain a better view over the return on investment, such "soft metrics" may be taken into account and evaluated based on a set of discussions with the employees, where the employees are explained the real benefits of the new technologies' adoption. Once identified, the soft benefits may be used as "support" for the return on investment values computed from the hard benefits.

The Need for the Adoption of Enterprise 2.0 Technologies

In order to explain the actual way of computing ROI and to validate the proposed computation model, a simulation may be performed. For example, the case of GoodWater Inc., an (anonymous) German IT company having about 5.000 employees will be taken into account.

GoodWater Inc. has 20 offices, covering almost all the areas of the country. The company has over 9.000 customers, some of them having top positions in Fortune 500 and mainly provides networking and network security-related services. The main goal of the company is to provide assistance and consultancy for its customers so as they can improve the security of their own corporate networks. The company grew fast, doubled in size during the last two years and, as a result, most of the employees started to complain about the overwhelming number of e-mail messages received and processed each day. Moreover, most of the employees state that retrieving necessary information from within the corporate network is more and more difficult, as the corporate servers hold no less than 1.000.000 documents and databases in different formats, the search and retrieving facilities being far less than satisfactory in comparison with the acquired volume of data. Most of the documents are different versions of the same content, previously

updated by different employees, rendering the retrieval of the latest version of a document almost impossible.

When GoodWater Inc. extended business area all around the country, the new employees had not the chance (and the time) to improve their experience to the level of the former employees and, as a result, each branch of the company has become quasi-autonomous, sharing information and know-how almost exclusively with its own employees. The company board thinks that the *status quo* leads to a general decrease in overall quality level of the company services, and, by consequence, to a decrease in the quality of each implemented project.

The IT department of GoodWater Inc. has identified a set of Enterprise 2.0 technologies able to lead to important benefits and to smooth the company's extensive development process. With the "blessing" of the executive management, the IT department will attempt to implement some of these technologies, as follows:

1. **A blog** will be created for each executive and for each chief of department, so as the top and middle management staff will be able to share news and announcements. Each employee will be granted access to a RSS reader allowing to connect to the aforementioned blogs and get real-time information about the business of their company. In order to complete their own view over the business process, employees will be encouraged to subscribe to blogs from other departments.
2. Each department will get **a wiki**, in order to share information and facilitate collaboration for the active projects. The wikis will allow employees to store3 and retrieve information in a dynamic environment, where each employee will be able to update, complete or comment over the existing information base. Another wiki will be created at company level, in order to manage basic employee information, as:
    - The network and computer name for each employee;
    - Contact information for each employee (phone, e-mail etc.);
    - Areas of interest, goals fulfilled and bonuses received by each employee;
    - The schedule of each employee;
    - The position of each employee in the company's organizational chart, the job description for each position.
3. Finally, a company-level **social network** will be created. Each employee will get a customizable personal profile, allowing him or her to add own elements (text, images, documents etc.). Any employee will be able to use the social network in order to find the colleagues from different branches or departments and team for a set of common-interest projects.

As a reaction to the IT department initiative, the GoodWater Inc. management identified a set of goals to be fulfilled by the adoption of the new technologies, such as:

- A 25% decrease in the number of internal e-mail messages (which are send and also received inside the company);
- An increase in the customer communication level (weekly estimations);
- The creation of knowledge bases (or repositories) concerning "key" areas from the company-level business process;
- A significant decrease in the average duration required by the retrieval of a needed document;
- A 25% increase in collaboration among employees working in the same branch office or in the same department;
- Facilitation of collaboration among employees working in different areas (offices, departments etc.).

The list above describes the set of goals imposed by the GoodWater Inc. management. If these goals are fulfilled, the management will regard the implementation as a success. In addition to this list, the management stated a set of long-term goals having direct effect on the company results:

- A higher level of product innovation, as a result of an increased interaction with the customers;
- A significant decrease in the number of GoodWater Inc. customers giving up the company's services in favor of one of its direct competitors;
- An increase in the average customer order value, enforced by an acceleration of the business cycle;
- An improvement in the recruiting process, in order to increase employees' quality.

GoodWater Inc. intends to fulfill the stated goals in nine months, until the end of the fiscal year 2008. In the author's opinion, all the aforementioned goals are more or less the benefits of a better management of the organizational memory and the organizational knowledge base.

The IT department is aware that in order to fulfill the goals by means of the Enterprise 2.0 technologies adoption, it is mandatory to identify and measure the implementation costs for the new technologies, as a crucial step in measuring the final results of the process. As a result, a series of implementation-related primary costs were identified, as follows:

- The cost of acquisition for the new hardware and software components required;
- The money value of the time resources allocated by the IT department in the new hardware and software components implementation process;
- The money value of the time resources allocated by the IT department for the employees training and familiarization with the new technologies and software components;
- The money value of the time resources allocated by the employees in order to get in terms with the new software components they are expected to use;
- The cost of the maintenance services provided by the IT department for the whole system.

Many of the software packages related to the Enterprise 2.0 technologies are quite expensive, and the ROI computation has to take into account their costs. As previously stated, the money value of the time resources each employee spends in order to familiarize with the new software applications should be taken into account and added to the total cost of the project.

A Model for Computing ROI in Adopting Enterprise 2.0 Technologies

To sum up, after nine months, GoodWater Inc. adopted a package of Enterprise 2.0 technologies, implementing blogging services, wikis and a company-level social network. GoodWater chose commercial versions of the needed platforms instead of their open-source counterparties, due to the superior security facilities commercial versions had to offer. As a consequence, the company purchased the blog, wiki and social network platforms for 250.000€ and the IT department assembled a ten people team. The ten people worked for three months in order to install, configure and test the new applications. When the deployment process was finished, the IT department assembled a new team of ten people whose task was to train the employees and familiarize them with the new software applications, in order to facilitate the adoption process. The team performed training sessions for three months. When the training sessions were over, a five people team was assigned the maintenance tasks, along with user support tasks, if user-related issues might arise.

During the five months following deployment, the degree of adoption of the new semantic technologies by the employees was estimated as "moderate", and described as follows:

- 250 wiki entities were created across the company network, enclosing more than 200.000 pages and documents;
- 120 internal blogs were created, enclosing more than 15.000 posts;
- 20 public blogs were created, including the CEO's blog, and also a blog providing news and product information for customers;

- A customer-oriented wiki was created, allowing customers to post product-related requests and questions, sharing feed-back and experience about GoodWater products;
- The company social network encloses more than 2.900 active user accounts, most of them having daily connections and interacting with the employees in all the departments.

Even if the aforementioned facts disclose an obvious success of the Enterprise 2.0 technologies implementation, the company assembled a team in order to get an exact measure of the project's costs and benefits. The team was assigned the following tasks:

- To determine whether the initial goals of the implementation were fulfilled;
- To evaluate both the "solid" and the "fragile" benefits (and measure, where possible);
- To identify and measure monetary costs of the project.

In the author's opinion, the starting point of the measurement process is to identify the implementation and maintenance costs for the Enterprise 2.0 technologies, as the adoption process involved significant human resources costs, especially in the deployment and staff training stages. Such costs have to be quantified and a monetary expression is expected for each main cost category.

The total acquisition costs of the Enterprise 2.0 technologies implementation was 250.000€, as depicted in the following table (Table 1):

Table no. 1

Total acquisition costs (in €)

COST TYPE	COST VALUE
Blogging platform	50,000
Wiki platform	100,000
Social network platform	100,000
TOTAL COST	**250,000**

Source: GoodWater Inc.

Implementing the software components inside the GoodWater Inc. corporate network involved a significant time and energy allocation from the IT department. The time allocated by the IT department for the implementation project may be also considered as time away from the team members' normal duties and, by consequence, measuring ROI asks for a metric able to monetarily quantify the time resources spent for the Enterprise 2.0 implementation. According to the author, the "best fit" model for the estimation of IT department team related costs is a basic time-value model. The model's main formula is depicted below (Formula 1):

$$Work\ hours \times Hourly\ wage = Implementation\ time\ cost \quad (1)$$

The IT department team worked for about three months in order to implement the Enterprise 2.0 platforms. To further detail the costs, the industry averages may be used and we can assume that each team member worked eight hours a day, for 67 days. Applying the formula above for a ten member team leads to the result that 5.360 work hours have been spent. In the author's opinion, the ROI computation model should not take into account only the team members wages, but also the opportunity costs supported by the GoodWater Inc. The opportunity cost is due to the fact that an employee working on the implementation project was not available for his or her daily duties and because each team member worked three months for the project, the opportunity costs will equal 3/12 of the employee's annual result. So, computing ROI implies having an estimation of the value added by each employee as opposed to the remuneration paid. The author had no such information from within GoodWater Inc., so the industry average of 10% was used instead [Buhse, 2006]. Further computation requires data about the team members' yearly wages. The final results are presented by means of the following table (Table 2):

Table no. 2

The IT department team structure, wages, results and costs (in €)

JOB	PEOPLE	YEARLY WAGE	YEARLY RESULT	IMPL. COST	MAINT. COST	TOTAL COST
IT Director	1	70,000	77,000	19,250	0	19,250
Application manager	2	50,000	55,000	13,750	13,750	27,500
Security engineer	1	40,000	44,000	11,000	0	11,000
Software designer	2	32,500	35,750	8,937.5	8,937.5	17,875
Database administrator	2	37,500	41,250	10,312.5	10,312.5	20,625
Webmaster	1	45,000	49,500	12,375	0	12,375
Network administrator	1	25,000	27,500	6,875	0	6,875
TOTAL	**10**	**300,000**	**330,000**	**82,500**	**33,000**	**115,500**

Source: GoodWater Inc.

The aforementioned costs must be completed with the maintenance costs corresponding to the assembled five-people maintenance team. The computation algorithm is the same as above, for the six months of maintenance work performed (Table 3):

Table no. 3

The maintenance team-related costs (in €)

JOB	PEOPLE	YEARLY WAGE	OPPORT. COST	TOTAL COST
Enterprise 2.0 Director	1	60,000	66,000	33,000
Application manager	1	50,000	55,000	27,500
Security engineer	1	40,000	44,000	22,000
Database administrator	1	37,500	41,250	20,625
Maintenance technician	1	20,000	22,000	11,000
TOTAL	**5**	**207,500**	**228,250**	**114,125**

Source: GoodWater Inc.

After the implementation was finished, ten members of the IT department enrolled in a team whose task was to familiarize each GoodWater employee with the new software applications. The training process was three months long. Each employee attended a business-day long training session (8 hours). The training team had the same structure as the implementation team, so the previous algorithm may be also applied here (Table 4):

Table no. 4

The training team-related costs (in €)

JOB	PEOPLE	OPPORT. COST	TOTAL COST
IT Director	1	77,000	19,250
Application manager	2	55,000	27,500
Security engineer	1	44,000	11,000
Software designer	2	35,750	17,875
Database administrator	2	41,250	20,625
Webmaster	1	49,500	12,375
Application trainer	1	30,000	7,500
TOTAL	**10**	**330,000**	**116,125**

Source: GoodWater Inc.

The final step in the Enterprise 2.0 technologies adoption process is the evaluation and measurement of the costs induced by each employee's familiarization with the new set of software applications. The training session was one day long, so for a day, each employee was unable to

fulfill his or her daily tasks. The model should allow the estimation of an average for the value added during one business day (Formula 2):

$$Number\ of\ employees \times Yearly\ Average\ Value \times \frac{1}{Business\ days} = Added\ Value \quad (2)$$

Taking into account the 5.000 GoodWater employees which have a yearly average value-added of 27.500€ (230 business days), the use of the formula above leads to a total value of 597.826€.

It is also assumed that in addition to the one day training session, each employee will spend an average of 8 hours for self-training and accommodation with the new software applications. As 8 hours usually mean a business day, the total costs will double, reaching 1.195.652€.

The following table (Table 5) performs a revision of the costs induced by the Enterprise 2.0 implementation project:

Table no. 5

The project costs review (in €)

COST DESCRIPTION	VALUE
Hardware & software purchases	250.000
Installation & implementation	115.500
Maintenance	114.125
Employees training	116.125
Employees adoption	1.195.652
TOTAL	**1.791.402**

To sum up, the total cost of the Enterprise 2.0 implementation project for GoodWater Inc. was around 1.8 mil. €. Even if the projects' „primary" costs were only 250.000€, the proposed model attempted to rely not only on the obvious costs, but to dig deeper and include the quasi-totality of the measurable costs. Computing a reasonably accurate ROI value involves taking into account the opportunity costs, as well as other cost categories related to the employees' familiarization with the new technologies and the corresponding software applications. Having a total cost of about 2 million euro, the project should generate a substantial revenue increase in order to cover and exceed the total implementation costs. The proposed model is not the only possibility, and also encloses a set of suppositions which grant a certain "pessimistic" valuation style. For example, the added value for each employee working for the project was assumed to be zero. In the author's opinion, most of the employees do not abandon completely their daily duties for familiarization with the new technologies and applications. Setting more accurate values for these indicators should significantly increase the model accuracy, and also diminish the total cost of the project.

The next important step in computing ROI involves evaluation and measurement of the project's benefits. The company stated two specific goals for the adoption of the new technologies:

- A general increase in the level of communication efficiency;
- An increase in the level of collaboration among employees.

The team will attempt to estimate to which extent the aforementioned objectives have been fulfilled, increasing or decreasing (if it is the case) the value of the revenues generated by the new platforms.

GoodWater Inc. intended to get a 25% decrease of the number of e-mail messages after the implementation, in order to reduce the "e-mail fatigue" claimed by most of the employees. A significant part of the received messages were "internal mail", daily information or know-how requests. The management staff was spending at least 30 minutes a day in order to answer all the

received e-mail messages. If the average yearly revenue of about 40.000€ (for this segment of employees) is taken into account, answering e-mail used to cost about 4.100€ daily (Formula 3).

$$377\ managers \times \frac{80.000\ euro}{230 \times 16} \cong 8.200\ euro / day \tag{3}$$

The company succeeded in very efficiently building a few hundred wikis enclosing basic information regarding employees daily duties. As a consequence, employees are able to get answers to their questions without sending e-mail messages, saving both sending and responding time. The management staff is receiving a significantly lower number of e-mail messages, now being able to answer e-mails in only ten minutes a day. The 15% decrease in the number of e-mail messages and the daily time savings of 20 minutes lead to a daily monetary saving of 2.733€ rendering a yearly saving of 628.590€. Even if the initial goal of a 25% decrease in the number of e-mail messages was not fulfilled, some significant savings have been performed, both in time and monetary resources.

In addition to the large number of e-mail messages, the employees also complained about the difficult way of retrieving information across the company network. The co-existence of a lot of outdated versions for the same document sentenced employees to a minimum of 15 minutes search in order to get the right (or the latest) version. Goodwater hopes that the existence of the wikis and the information repositories will significantly facilitate employee access to information. More than a half of the company documents were transferred to the 250 wikis, after being correctly versioned and updated. About 2.000 employees already use the wikis as a primary information source when searching for a certain document. Most of them think the average search time was reduced from 15 minutes to only eight minutes. As an employee usually performs two searches a day, taking into account the average hourly wage of 12.5€, a simple computation leads to the estimation of a yearly saving of 1.533.333€ (Formula 4).

$$2000\ employees \times \frac{16}{60} minutes \times 12.5 euro \times 230 days \cong 1.5333.333\ euro / year \tag{4}$$

A second important goal was a significant increase of the customer communication (measured weekly). The company had often and serious customer-communication issues, sometimes leading to customers' losses or some other highly unwanted results. In order to fulfill this goal, the company implemented a wiki and a social network that customers may use to report problems or interact with the employees managing their accounts. Moreover, customers are able to share information with some other customers living in the same area or facing the same issues. Since the implementation was completed, over 300 customers have created own profiles joining the social network, over 1000 employee-customer interactions being recorded. Additionally, more than 50% of the GoodWater customers started interacting with each other. By means of the wikis, over 400 product features were described as a response to customers' requests. Each request was addressed both on the wiki and directly to the customer. A poll conducted among the customers who used the wiki and the social network revealed the general opinion that their relationship with the company has improved, and the confidence level related to the company products and services has risen. The customers also appreciated the ability to interact with both customers and employees in a less formal environment, by means of the social network. The same poll discloses that 70% of the customers using the new platforms intend to renew their services requests, the usual level for this customer category being 45%. The increase in the returning customers group may lead to am increase in sales of over 650.000€. As the "keeping" of the existing customers has become less expensive, the sales department will be allowed to focus more on getting new customers.

Any streamlined company has collaboration and innovation among its main goals, and GoodWater Inc. makes no exception to the rule. The company promotes innovation, encouraging employees to work on new projects as members of the development teams. Prior to the Enterprise 2.0 implementation there were 30 running projects, and the management expected that the new platforms adoption brings an increased number of teams working on added-value generating projects. During the last six months since the implementation was completed, 500 employees have joined the social network, and 20 new teams were assembled, 16 of them being exclusively based on the social network. Based on the listed profiles, employees sharing similar interests were able to collaborate and team up by means of the network. Each team created its own wiki for the project, as a preferred collaborative work environment for the team members. Moreover, 10 of the 16 teams are assembled from employees working for different offices and departments (which was one of the initial goals). Briefly, GoodWater fulfilled the goal to increase inter-department collaboration; but did not fulfill the objective to increase intra-office employee collaboration by 25%. As 6 of the 20 new-founded teams are intra-office teams, the collaboration level definitely increased, but as opposed to the 30 pre-existent teams, the increase is only 20%. The company estimates that only 10% of the teams will produce real and applicable value-added results, and the average profit is about 250.000€ per project (industry average) [Buhse, 2006]. As a result, we can assume that only two of the 16 new teams will produce usable results, generating a total income increase of 500.000€, due to the new technologies.

As a result of the newly created social network, GoodWater Inc. intends to increase its visibility among potential employees, and, by consequence, to increase the level of interest among the young talented people. Since the social network was created or 1.00 potential employees have joined, in order to interact with existing employees and find about the GoodWater organizational culture. Since the creation of the social network, 15% more resumes were received for each job opening announced, and 60% of the candidates were directly identified as members of the company social network. Even if it is very difficult (not to say impossible) to monetarily quantify the abovementioned phenomenon, mostly on the short term, the benefit of having a wider choice of candidates is obvious, leading to a general decrease in recruiting cost levels. According to the author, this is still a "soft" benefit, and the monetary measurement is not worth the effort. Some other soft benefits were observed: the employees satisfaction increased, intra-organizational communication level also increased, the new technologies facilitated employee and customer relationships in a less formal environment. The company also has a far better exposure on the Internet, due to the CEO and management staff blogs. Some of the blogs have tens of thousands visitors and, as a result, company management members were invited as key-note speakers to a few conferences and conventions.

The following table (Table 6) is a review of the "hard" benefits being identified and also measured:

Table no. 6

Review of the "hard" benefits values (in €)

BENEFIT DESCRIPTION	VALUE
E-mail message number decrease	628.590
Increase in customer communication	650.000
Information retrieval improvement	1.533.333
Employees collaboration improvement	500.000
TOTAL VALUE	**3.311.923**

In order to accurately compute the ROI, both the costs and benefits of the Enterprise 2.0 platforms implementation were measured. According to the GoodWater Inc. organizational culture, the minimum profit margin accepted for an investment project to be considered successful is 20%, and any project whose profit margin is situated under 20% is considered to be a failure. As the total

costs of the Enterprise 2.0 technologies implementation was estimated to be 1.791.402€, the project should generate at least 2.041.682€ as benefit, in order to be considered successful. The proposed model estimated real benefits to be 3.311.923€. A simple computation leads to a value of 85% for the ROI, far superior to the minimal threshold for success. According to the author, the success of the implementation is beyond doubt, the estimated monetary value being further increased by the important aforementioned soft benefits, not to mention a far better public exposure and a whole set of competitive advantages.

Some of the technologies adopted by the company also have open-source counterparts which can be freely adopted. However, most of the open-source software packages do not provide some security and audit-related facilities which are of most importance for a large-scale, company-level implementation. When the purchase cost is replaced by the total cost of ownership (or TCO) in an evaluation, the open-source alternative may not seem the best choice any more. Even if open-source software would allow GoodWater to save 125.000€ (software purchases), ROI computation should also take into account the way open-source software would have affected the deployment, maintenance and staff training costs. In the author's opinion, the decrease in purchase costs is only justified if the company is able to face the deployment, maintenance and training requirements.

Conclusions

Measuring the results of an investment in the new Enterprise 2.0 technologies is not as hard as it seems at a first sight, but it is not an easy task either. The ROI of such an implementation project can be measured and has to be measured. Any organization implementing a large-scale project has to measure and interpret the costs and benefits. The monetary quantifiable benefits have to be carefully examined and then measured by means of a coherent computation model. The non-quantifiable benefits have to be carefully examined and then described in high detail levels, so as the impossibility to be expressed in monetary units to be balanced by a clear and objective image of their content. When implementing an Enterprise 2.0 solution, the company management has to identify the goals to be fulfilled. The management also has to find an accurate model able to measure both the costs and benefits of the Enterprise 2.0 technologies adoption and corresponding platforms implementation, a model able to take into account the opportunity costs when performing estimations and computations. After the quantifiable benefits (or the "hard benefits") are measured, and the unquantifiable benefits (or the "soft benefits") were taken into account, the company may determine, based on the ROI indicator, whether the investment was a success.

The paper relies on the classic ROI computation methods to propose a new computation model, well-adapted to measure the success of the implementations in the Enterprise 2.0 technologies, which may also be considered as a base for the valuation of the costs and benefits of building organizational memory at the economic entity level.

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