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# A Framework to Measure the Financial Performance of Virtual Communities - The Case of the Berlin Stock Exchange

### Abstract

*The usage of social software and virtual community platforms in particular promises to offer opportunities for customer integration approaches into a company's value creation activities. Therefore, ideas and innovations generated by members of a virtual community can be analyzed and used in order to enhance the quality of firm's products and services. However, evaluating economic consequences associated with the set-up, operation, and maintenance of virtual communities on a quantitative basis has widely been neglected in social network research. Thus, the objective of this paper is therefore to develop a measurement framework for the financial performance, including revenues and expenditures of a virtual community platform reflecting specific economic conditions relevant in a certain situation. The measurement framework is then applied to a real life example of the Berlin Stock Exchange, in Germany.*

## 1. Introduction

Virtual communities offer new ways to create links between companies and their respective stakeholders [1, 2, 3]. Setting up a virtual community that is based on social software promises to improve the knowledge management in organizations and to enhance customer relationship management activities. A continuous participation of members can result in an increasing customer loyalty and allows learning more about preferences and opinions of customers [4]. Additionally, ideas that are generated by community members can be further analyzed to improve company's value adding activities.

Though highly relevant, there is still a lack of efficiency approval for virtual communities. Evaluating a virtual community in terms of financial measures, a variety of aspects have to be considered, ranging from development, set up and adaptation of a web 2.0 platform to community maintenance and business model related turnovers. To measure the financial performance of a web 2.0 platform, means of finance calculations and performance measures specific to the assessment of virtual communities have to be applied. The analysis of the financial performance usually unveils the overall profitability of the community implementation with measures such as the Return on Investment (ROI) or the Net Present Value (NPV). As may often be the case only out-payments are readily quantifiable. In that case the financial performance may be reported by means of Total Costs of Ownership (TCO) analysis. In order to identify and assess relevant in- and out-payments as the drivers of the financial performance, support for deriving, structuring and consolidating payments over time is required.

In this paper design principles of an appropriate measurement system for the financial performance of a virtual community set-up initiative will be presented. In order to find these principles, a design science approach is applied [5]. Therefore, the concept of an appropriate measurement system is introduced on the basis of basic principles of decision theory and capital budgeting. The system is then applied to the case of the Berlin Stock Exchange, Germany which serves as a proof of concept. Finally, major results are summed up and the demand for further research is pointed out.

## 2. Related Work

Since the year 2000 new web-based collaboration technologies emerged and revolutionized the internet [2, 6, 1]. In 2005 the term web 2.0 was used by O'Reilly [2] to comprise these applications and trends. Web 2.0 applications are often associated with "social software". Whereas traditional software focuses on productivity and process support, web 2.0 applications focus on the linking of individuals and groups. Social software is based on different services for establishing networks and supporting the distribution of information within the network. Internet forums, wikis, web logs, instant messaging, RSS, pod casts and social bookmarking are tools of social software [2, 7].

Web 2.0-driven social software comprises a couple of innovative technological approaches, which in particular are key elements of virtual community infrastructures. Virtual communities allow members to share knowledge, experiences, opinions, and ideas with each other. Community members could even be integrated into the value creation process of a firm e.g. by generating and discussing innovations of

products [8]. Norman and Ramirez (1994) has stimulated the discussion about new organization and management concepts in the economic sciences and dynamics that aims to integrate the customer into the value creation, both from the firm and from the customer point of view [9]. These new management concepts comprise approaches such as open innovation, product self-individualization as well as customer integration [10, 11]. Customers turn into coworkers, resp. integrated customers, who fulfill more and more important tasks in specification, configuration, development, and selling of products and services.

While early concepts of customer integration, namely mass customization, stressed a better satisfaction of customers' needs, today the companies' own goals of rationalization or differentiation by better products or services also play a vital role in this form of collaboration.

Furthermore, virtual communities provide the means for enhancing the quality and efficiency of a customer relationship management (CRM). If customers can be successfully incited to participate in a virtual community, then the assumption can be made that they will increase their loyalty to the company, its products and services [4].

Research shows that members of virtual communities are usually driven by a complex portfolio of motivations. This includes motives such as enjoyment in creating content or following specific values [12] or extrinsic aspects such as gaining a positive reputation in the community. These different motivations can be stimulated by a range of incentives and rules and regulations which are to be implemented in a governance system. Such a governance system has to consider all important drivers to increase voluntary and valuable contributions from community members.

Whilst implementing a virtual community, context specific characteristics have to be considered. In social oriented communities such as communities social aspects such as identity [13], values and ideologies [14] and affiliation [13] are of importance. In rather expert oriented communities such as communities for financial markets, motivation for participation is far more driven by the need for topical information [12], the enjoyment and the desire to create and improve [14] as well as training, learning and career concerns [15, 16]. Due to the different nature of virtual communities, their implementation and their management is not an easy task.

Hagel and Armstrong (1997) developed a framework for the implementation of virtual communities [17]. They proposed four stages for the

implementation: (1) attracting community members, (2) fostering the members in the community, (3) creation of loyalty, and (4) creation of a business model. From an economic perspective efforts from the first three stages represent the investment in the community, while the last stage of implementation may yield appropriate returns. The difficulties of implement the community in the first stages are often substantial and contribute significantly to the total costs. However, no methods for measuring financial impacts are worked out, so far.

As yet, only frameworks for measuring IT value by means of qualitative analysis have been proposed, like the "Impact/Value framework" by Hammer and Mangurian (1987) [18]. Quantitative analysis is limited to detecting correlations between IT adoption initiatives and a firm's success in order to identify critical success factors. Analyses of monetary consequences are widely neglected and merely concentrate on short term measures (e. g. "IT costs/turnover"). Setting up and maintaining a virtual community usually sets a long term frame. Therefore, economic consequences should be analyzed in more detail over a planning horizon spanning multiple periods. A virtual community has its main focus on long-term paybacks, to gain strong customer relations and build up a customer relationship management. Business goals of a community set-up are increase customer loyalty, to learn more about preferences and opinions of the customers and to gain higher level of awareness. These goals are very difficult to evaluate while setting up the community – the continuous controlling is quite easy and common in practice. Focusing the out-payments gives indications to calculate potential in-payments during the process of setup. Adapting the three defined phases of setup (phase of development (1), phase of operation (2), phase of adaption (3)) to different other calculating scale alternatives in marketing and e-business could give ideas and establish possibilities how to calculate revenues [19]. In former studies the authors introduced a first approach to measure costs in virtual communities. In contrast to this contribution earlier papers did not discuss what benefits arise by providing a virtual community. Based on findings of 2007 and 2008 we developed a new holistic model which measures revenues as well as payments of operating a virtual community [4, 19].

However, in recent studies the emerging field of value-based process management is currently been elaborated. By reasoning in terms of Business-IT-Alignment these studies suggest several approaches for measuring financial implications of information system implementation and operation [20, 21, 22]. As these approaches have already been successfully

applied in practical case studies, it seems promising to employ the methodological and empirical findings for measuring the financial performance of virtual communities. Hence, a corresponding framework will be introduced in the following chapter and then be applied in order to develop a financial perspective on virtual communities.

## 3. A Framework to Measure the Financial Performance of a Virtual Community

To calculate the economic efficiency of virtual communities a general measurement framework can be applied (see Figure 1).This evaluation framework is explicitly designed for the analysis of monetary consequences and distinguishes three conceptual levels relevant for an evaluation of financial implications. On each level particular subjects of evaluation and corresponding analysis sections are suggested. Mandatory sections for executing the evaluations are marked grey.

The profitability of the virtual community design and operation has to be judged by means of financial performance measures. Measures like the Total Cost of Ownership (TCO) and the Return on Investment (ROI) help consider relevant parameters for this purpose [23, 24].
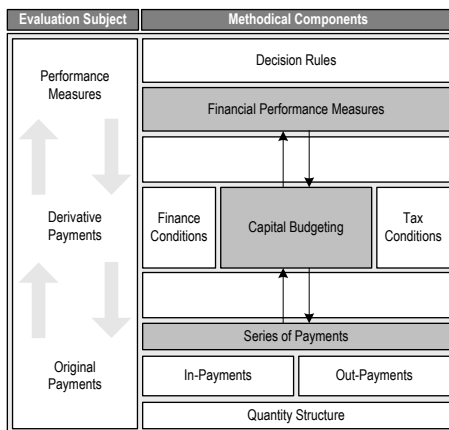


**Figure 1. Measurement Framework**

The level structure of the framework allows for separation of analysis concerns. Special interest calculations can be employed in order to analyze, how changes on individual levels affect payments or measures on particular levels.

As for the capital budgeting and performance measurement well-established methods already exist [25, 26]. Hence, the framework is designed in a way that these methods can be reused and integrated for the purpose of measuring the financial implication of virtual communities. In doing so the challenge is to find relevant in- and out-payments.

## 3.1. In- and Out-Payments

The analysis of original payments is fundamental and provides a basis for the entire evaluation of the financial performance of a virtual community. On this level, costs (out-payments) and revenues (in-payments) of the design and operation phase of a virtual community will be analyzed. Payments can be assessed on a quantitative and on a qualitative basis. In- and out-payments are summed up to a series of payments, which serves as an interface for evaluations on subsequent levels. Derivative payments are analyzed by considering additional parameters. Relevant parameters are derived from specific conditions of funding and taxes that a company has to face. That way, the series of payments can be consolidated over time by applying methods of capital budgeting in order to create a survey of financial consequences.

With regard to the specific payments that come along with the set-up of a virtual community platform, monetary consequences for development, operation, adaptation, and disintegration are to be assessed properly. A life cycle perspective helps identifying characteristic in-payments and out-payments accruing within particular stages of a virtual community adoption. Since a life cycle perspective sets a long- term frame, the assessment and calculation of relevant payments has to be conducted over a planning horizon spanning multiple successive periods.

To be compliant with methods of capital budgeting, periods should have an equal length and are usually mapped to years or fractions of a year. Possible types of payments to be assessed in the context of virtual communities are presented in Table 1. In addition to the listing of relevant payments, their distribution over the planning horizon is highlighted by marking the main emphasis of each payment over the planning horizon. The list of payment types may be used as a reference template for measuring payments and can be customized in order to capture specific payments relevant in an individual context of a virtual community implementation.

Following a life cycle approach distinct phases of a virtual community can be derived. Our research shows that specific types of payments go along with virtual community implementation, operation, adaption and disintegration.

| Estimated Series of Payments for setting up a Virtual Community Platform | | | | |
|---|---|---|---|---|
| Point in Time | Start | Year 1 | … | Year n |
| **Phase of Development (Analysis, Design, Implementa** | | | | |
| Out-Payments | | | | |
| - Definition of target group, analysis of preferences of target group | | | | |
| - Building up know-how | | | | |
| - Expertise of technical, legal, social, and economic environment | | | | |
| - For project manager, analysis and preparation activities including project controlling (external part time position) | | | | |
| - Implementation (in house) | | | | |
| - For licenses with service providers | | | | |
| **Phase of Operation** | | | | |
| Out-Payments | | | | |
| - Expertise of technical, legal, social, and economic environment | | | | |
| - Research and analysis (external part time position) | | | | |
| - For additional activities of department of public relations of Berlin Stock Exchange (in house) | | | | |
| - For additional activities of market supervision (in house) | | | | |
| - For moderation | | | | |
| - For project manager, operational activities including project controlling (external part time position) | | | | |
| - Awards and prices | | | | |
| - For online-advertisement | | | | |
| - Technical support (in house) | | | | |
| - For running licenses | | | | |
| **Phase of Adaptation (Evolution)** | | | | |
| Out-Payments | | | | |
| - Benchmarking analysis | | | | |
| - Online survey | | | | |
| - Project meetings (board, IT, PR) (in house) | | | | |
| **Phase Disintegration** | | | | |
| Out-Payments | | | | |
| - for migration to another platform | | | | |
| - for ongoing contracts | | | | |
| - replacement of technology | | | | |
| **Series of Payments According to Partial Calculation** | | | | |

**Table 1. Estimated Series of Payments**

Payments for the initial set up of a community typically relate to hard- and software provision, platform implementation efforts, build-up of know-how, administration and initial project management. In-payments will barely be occurring in this phase. During operations, costs for the maintenance work on information systems and user support usually apply [27].

As for the context of virtual communities, additional payment types have to be considered. Out-payments for moderation, for online advertisements or for service provider hosting a virtual community platform serve as examples. Over time, adaptations will have to be carried out on the virtual community design and the underlying platform. These adaptations may be necessary in order to implement new functionalities, to modify existing ones or to adapt the scope of a virtual community. Examples for drivers of such adaptations are new insights on customer behaviour or changing demands. Finally, it has to be analyzed, which payments can be foreseen in the phase of disintegration. Contractual payments like licence fees or penalty costs as well as payments for platform migration can serve as examples.

## 3.2. Measuring the Revenue Performance

A virtual community has its main focus on long-term paybacks, to gain strong customer relations and build up a customer relationship management. Business goals of a community set-up are to increase customer loyalty, to learn more about preferences and opinions of the customers and to gain higher level of awareness. These goals (respectively intangible assets) are very difficult to measure. Hence, in the following we will describe different revenue sources of virtual communities for the provider by referring to the framework of network effects in virtual communities by Hagel and Armstrong (1997).

**Development Phase**
As there are no customer activities on the platform during the initial set up phase, no in-payments can identified in the development phase.

**Operation and Adaption Phase (Evolution)**
To identify potential revenues in the operation and adaption phase we refer to the description of capturing returns in virtual communities by Hagel and Armstrong and extend this model (see figure 2). As the revenues in the operation and the adaption phase are driven by the same factors it makes sense to combine the two phases (operation and adaption/evolution) into one.

By following Hagel and Armstrong (1997) drawing new members to the virtual communities is most important to increase networks effects and therefore realize benefits for community providers [17].
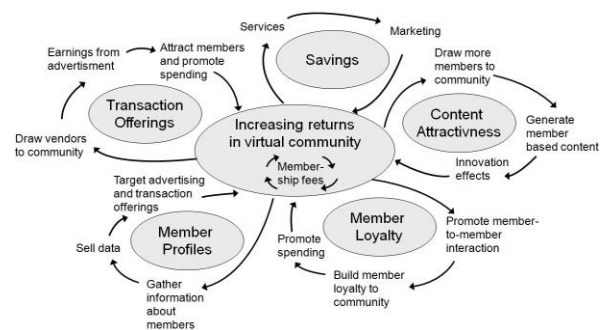


**Figure 2: Extended Model for Network Effects in Virtual Communities for Operation and Adaption Phase**

According to Hagel and Armstrong there are four main revenue sources [17]: (1) Offered transactions draw vendors to the community which affect positively the amount of advertisements on the

community platform (new element in our model) and finally attract member and promote spending. If there are member fees to be paid by the participants this leads directly to revenues [28]. (2) A high content attractiveness draw more members to the community and leads to member based content which could lead to ideas for tangible or intangible innovations for the community provider (new element in the model). This could be interpreted as a customer integration approach in the community [8]. (3) The member loyalty effect [29] promotes in the first instance a member-to-member interaction and build up a member loyalty to the community, which could lead to direct revenues if there are member fees to be paid [28]. (4) Knowing about member profiles is the basis for targeted advertising [30]. An additional revenue source from member data is to sell them (new element in the model) even if this is legally not allowed in several jurisdictions. A fifth factor (5), not covered by the model of Hagel and Armstrong, are saving effects that might lead to cost cuttings in different departments of the community provider [17]. These effects may lead e.g. to lower marketing expenses by increased word-of-mouth advertisement by the community members. Furthermore savings could be generated by customer self services and reduced customer complaints. Both may lead to a reduced work load at the help desk.

**Phase of Disintegration**

When disintegrating the community it may bring in-payments to business through selling the platform including customer data and an established brand equity. The brand equity determines the value of the brand concerning brand loyalty and awareness [31]. Table 2 introduces a framework to calculate all identified in-payments through the total life cycle of a virtual community.

| Estimated Series of Benefits for Setting up a Virtual Community Platform | | | | |
|---|---|---|---|---|
| Point in Time | Start | Year 1 | … | Year n |
| **Phase of Development (Analysis, Design, Implementation)** | | | | |
| No In-Payments | | | | |
| **Phase of Operation and Adaption (Evolution)** | | | | |
| In-Payments<br>+   Transaction offerings (1)<br>+   Content Attractiveness (2)<br>+   Member Loyalty (3)<br>+   Member Profiles (4)<br>+   Saving Effects (5) | | | | |
| **Phase Disintegration** | | | | |
| In-Payments<br>  Revenues by selling the platform and<br>+   community (brand equity & customer data) | | | | |
| **Series of Payments According to Partial Calc.** | | | | |

**Table 2. Compiling the Series of Benefits**

# 4. Framework to evaluate the revenues and costs of virtual community platforms

## 4.1. Introduction

To demonstrate the applicability of the measurement framework introduced above, a practical case of setting up a web 2.0 virtual community at the Berlin Stock Exchange will be analyzed.

The retail exchange industry shows a lack of information sharing between the retail investors and the stock exchanges in particular, because of the intermediation of investment banks. As private retail investors have only a direct link to their investment banks and not to the stock exchanges, there is no direct information flow and interaction between retail investors and stock exchanges. This causes a lack of information with respect to customer's preferences and wishes of stock exchange market micro structures. Moreover, the industry still lacks adequate trading facilities for retail investors. To overcome these shortcomings a joined project was set up by the Berlin Stock Exchange and the authors in 2006 and 2007 in order to build up an innovative web 2.0 community platform for CRM purposes and to increase information transparency.

By establishing a web 2.0 online community at a stock exchange, two sequential objectives could be achieved. Retail investors and exchange operators could be linked closer together to enhance an efficient CRM. Subsequently this could result in a customer integration approach, where the retail investor is enabled to determine the market model of the exchange trading system. The customer acts as a market engineer.

The basic aim of the project was in particular to implement a web 2.0 platform to enable retail investors to contribute ideas to define the market models of the trading system of the exchange. With this approach customers are directly involved in the specification and design market models and the stock exchange can adopt needs, desires, and wishes for private investors and thus extend their own service portfolio. Additionally, this virtual community was set up to increase customers` loyalty [6]. This is a very important aspect in the stock exchange sector since retail investors are not so loyal to exchanges, as prices and service are of major importance to retail investors when choosing a financial market for stock trading.

The project started in January 2006. The web based portal was implemented in July 2006 and featured several services such as a discussion forum, RSS-feeds, blogs, and chats with experts. To properly build up and operate an interactive web based

community model from Stieglitz (2008) was applied [32]. This approach covers the following five steps: (1) analysis, (2) design, (3) implementation and operation, (4) controlling, and (5) evolution.

The project started in January 2006 with an analysis of key issue (attracting the exchange for retail investors, increasing the basis of active traders), the definition of a target group (retail investors) and a research of existing information- and telecommunication (ICT) infrastructure at the exchange and their attributes (e.g. interfaces, competences, technology).

Market research depicted that many retail banks already operate virtual retail communities and a large variety of internet stock investment platforms exists (among others wallstreet-online.de; tradesignal.com; yahoo.com; aktienboard.com). However, all these platforms aim at sharing market information for stocks and prices among traders. Joint discussions and forums among retail investors and exchanges about market modelling do not exist.

After a four month period of analyzing the *design phase* was conducted between May to July 2006. A technological platform, community governance mechanisms [8, 33] and the design of the graphical user interface were defined. The online exchange community was opened in July 2006 (implementation and operation phase) and thereafter continuously monitored and controlled (controlling phase). Within this time frame changes and additions to offered services, functionalities, and structure of the portal were planned and realized (evolution phase).

As success criteria for generating acceptance of web 2.0 community platforms, achieving critical mass and effectively providing means for coordination and mediation between community members are of major importance [34]. A first review conducted in the beginning of 2007 evaluated the degree of user participation comprising analysis of registrations, contributions and interactions. Figure 3 shows that between January 2007 and February 2007 the total number of registrations increased significantly. As a consequence, the slope of the total number of contributions increased since January 2007 (see Figure 4). A systematic and well planned usage of governance instruments as well as the provision of appropriate means for coordination and mediation between members could be identified as one reason for the increasing activity of community members since February 2007 [4]. Moreover, the total number of members amounting to 400 in January 2007 can be regarded as the critical mass for this specific community needed to leverage the overall utility for both registered and potential participants.
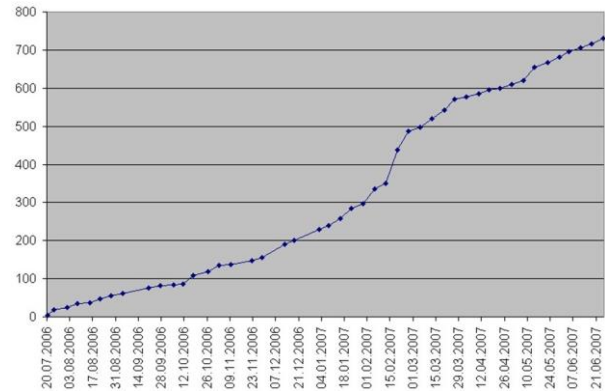


**Figure 3. Cumulated Number of Registrations between July 2006 and June 2007**
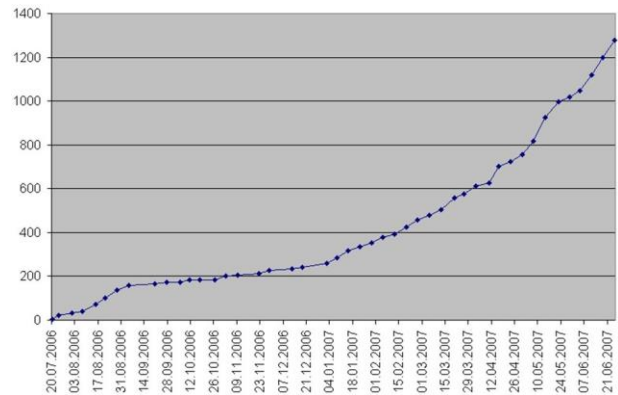


**Figure 4. Cumulated Number of Contributions between July 2006 and June 2007**

In the subsequent sections, the measurement framework presented above will be applied in order to report the overall financial performance of the web 2.0 project.

## 4.2. Measurement of Out-payments

As stated above a life cycle perspective on virtual community platforms provides an appropriate means for identifying relevant payments. With regard to the process of the virtual community set-up and operation, the relevant payments accrue from analysis, design, implementation, governance, controlling and maintenance efforts. The steps of the community-engineering framework and their respective payments can easily be mapped to a general life cycle scheme, concluding the phases of development, operation, adaptation and disintegration. Hence, payments for analysis, design and implementation are jointly assigned to the phase of development. As for the controlling step, it is suggested that payments for controlling are estimated

to occur throughout the whole life cycle of the virtual community and thus have to be considered within all phases.

The assessment of the payments on operational level led to the following initial situation for the described project (see Table 3): The set up of a virtual community in May 2006 went along with 3,400 € for building up know-how, 1,000 € for project management (preparation, resource allocation, and kick off) and 1,400 € for eliciting relevant design requirements. Costs incurred by implementing the virtual community platform at the stock exchange amounted to 1,500 €. Since the virtual community platform is hosted by a service provider 550 € have to be paid annually. The software for the platform has an open source license and therefore implies no costs.

Observations within the first month of operation show that payments for moderation efforts amount to 1,760 € per month. Continuous research analysis and project management make up another large fraction of relevant payments with 1,400 € per month. Further payments of 1,000 € per month are caused by online advertisement in the later stages of operation. Relevant in-payments didn't occur during the first phase of the project as described in the theoretical part.

**Estimated Series of Payments (Virtual Community at Berlin Stock Exchange)**

| Point in Time | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Phase of Development** | | | | | | | | | | |
| Out-Payments | | | | | | | | | | |
| definition of target group, analysis of preferences of target group | 400 | | | | | | | | | |
| building up know-how | 3400 | 3400 | | | | | | | | |
| expertise of technical, legal, social, and economic environment | 1000 | 1000 | | | | | | | | |
| for project manager, analysis and preparation activities including project controlling (external part time position) | 1400 | 1400 | | | | | | | | |
| implementation (in house) | 1500 | 1500 | | | | | | | | |
| for licenses with service providers | 550 | | | | | | | | | |
| **Phase of Operation** | | | | | | | | | | |
| Out-Payments | | | | | | | | | | |
| expertise of technical, legal, social, and economic environment | | | 200 | 200 | 200 | 200 | 200 | 200 | 2400 | 1400 |
| research and analysis (external part time position) for additional activities of department of public | | | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 13200 | 6900 |
| relations of Berlin Stock Exchange (in house) for additional activities of market supervision (in house) | | | 500 | 500 | 500 | 500 | 500 | 500 | 6000 | 4800 |
| for moderation | | 1760 | 1760 | 1760 | 1760 | 1760 | 1760 | 1760 | 18720 | 18720 |
| for project manager, operational activities including project controlling (external part time position) | | | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 10800 | 9300 |
| for online-advertisement | | | | | 1000 | 1000 | 1000 | 1000 | 600 | 600 |
| awards and prices | | 100 | | 100 | | 100 | | 100 | 0 | 0 |
| technical support (in house) | | | | 500 | 1000 | 1000 | 500 | | 6000 | 6000 |
| for running licenses | | | 150 | 150 | 150 | 150 | 150 | 150 | 550 | 550 |
| **Phase of Adaptation (Evolution)** | | | | | | | | | | |
| Out-Payments | | | | | | | | | | |
| benchmarking analysis | | | | | | | | | 600 | 600 |
| online survey | | | | | | | | | 600 | 600 |
| project meetings (board, IT, PR) (in house) | | | | | | | | | 1000 | 1000 |
| **Phase Disintegration** | | | | | | | | | | |
| Out-Payments | | | | | | | | | | |
| for migration to another platform | | | | | | | | | | |
| for ongoing contracts | | | | | | | | | | |
| replacement of technology | | | | | | | | | | |
| **Series of Payments** | -8250 | -9160 | -5410 | -6010 | -7410 | -7510 | -6910 | -6510 | -62270 | -52070 |

**Table 3. Detailed Series of Payments for the Virtual Community at Berlin Stock Exchange**

Our findings from early stages of the virtual community operation suggest that adaptations are not necessary. However, payments for benchmark analysis and project meetings occurred in the later stages. As for the disintegration phase, contractual payments are rendered possible even though no judgement on this type of payments could be given yet.

To allow for a long-term analysis, all relevant payments have to be quantified periodically within the planning horizon. The payments listed in Table 3 constitute the original monetary consequences for a planning horizon of three years. As for the year 2008, payments have been fully estimated.

The assessment of the out-payments did not employ a quantity structure.

## 4.3. Measurement of Revenues

As described for the out-payments of the case of Berlin Stock Exchange, the next step is to measure the in-payments based on the framework shown in table 4. Data is provided for one and a half year (2006 to mid of 2007).

As described in chapter 3, revenues could be identified in the phases of operation and adaption as well as in the disintegration phase. However, in the case of Berlin Stock Exchange the virtual community was not sold to a third party, therefore, only revenues of operations and adaption stage appeared (see Table 4).

**Estimated Series of Payments (Virtual Community at Berlin Stock Exchange)**

| Point in Time | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | 2007 | n |
|---|---|---|---|---|---|---|---|---|---|---|
| **Phase of Development** | | | | | | | | | | |
| no In-Payments | | | | | | | | | | |
| **Phase of Operation and Phase of Adaption** | | | | | | | | | | |
| In-Payments | | | | | | | | | | |
| + Transaction Offerings (1) | | | 200 | 460 | 630 | 790 | 1115 | 1370 | 7000 | |
| + Content Attractiveness (2) | | | 380 | 780 | 740 | 300 | 100 | 130 | 10540 | |
| + Member Loyalty (3) | | | | | | | | | | |
| + Member Profiles (4) | | | 8400 | 8400 | 9000 | 9600 | 5400 | 12600 | 168600 | |
| + Saving Effects (5) | | | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 6000 | |
| **Phase Disintegration** | | | | | | | | | | |
| not regarded caused by end of evaluation period | | | | | | | | | | |
| **Series of revenues** | | | 9980 | 10640 | 11370 | 11690 | 7615 | 15100 | 192140 | |

**Table 4. Revenues in the Case of Berlin Stock Exchange**

**Revenues in the Operation and Adaption Phase**

In the following section we calculate the in-payments according to the six positions mentioned in our extended model based on Hagel and Armstrong [17]. The calculations draw on quantity structures underlying individual positions. Data are gathered by analyses of the trading data base of the Berlin Stock Exchange and by interviews with members of the marketing department of the Berlin Stock Exchange. Numbers and figures are rounded.

*Membership fees through premium membership*
As the Berlin Stock Exchange decided to grant free access to the community there are no revenues coming from membership fees.

*(1) Transaction Offerings*
Analyses of the trading data of Berlin Stock Exchange show that an average trade at the Berlin Stock Exchange amounts to approximately € 4.000. About 20% of community members filled in a

questionnaire and stated that their value of trades increased by about 25% after accessing the community because they get more information from other community members. The Berlin Stock Exchange receives 0.5% of each contract note. Hence, the additional in-payment for each additional community member per month sums up to 5 Euro per member per month (€ 4,000 * 25% * 0.5% = € 5).

*(2) Content Attractiveness*

According to the head of the marketing department of the Berlin Stock Exchange each contribution on the platform can be valued with 10 Euro in respect to their potential innovation impact. As the members of the community generated about 1300 contributions by June 2007 we calculate 13,000 Euro as a non-real income-accounting position.

*(3) Member Loyalty*

As the member loyalty effect leads only to direct revenues if the community provider charges member fees, this position generates no additional in-payments for the stock exchange.

*(4) Member Profiles*

According to head of the marketing department of the Berlin Stock Exchange each member profile equals to about 300 Euro. By June 2007 740 members were registered in the community. This sums up to 222,000 Euro. This is a non-real accounted income over the whole period of the existence of the platform.

*(5) Saving Effects*

Interviews with employees from the functional help-desk depicted that the work load at the help desks were significantly reduced by about one third overall due to the effect that customers mutually helped each other by using the offered forums. Additionally customer complaints were significantly reduced, too.

The help desk was staffed 10 hours a day on five days a week (200 hours a month) by students with hourly earnings of 15 Euro. Hence, the monthly cost to run the help desk amounts to 3,000 Euro. Even if these costs could be interpreted as fixed step costs, we calculate 1,000 Euro as savings as these students could do other work such as data analysis or work for marketing campaigns.

Cost savings in respect to word-of-mouth advertisings are not calculated as these effects should be shown in the increased number of member which leads to feedback loops in the other position mentioned earlier.

**Disintegration Phase**

As the platform was still up and running until the end of the analyzed period (June 2007) no incomes were incurred in cause of selling the platform.

## 4.4. Measurement of the Financial Performance

The assessment of original payments sets the basis for analyzing derivative payments. In order to calculated derivative payments of the project the series of payments was processed with means of VOFI (*Visualization of Financial Implications*, [25]). The calculation is displayed in Table 5.

In order to consolidate the series of payments by means of VOFI, a periodic update of the capital stock has to be calculated. Starting in period zero, each period has to be calculated in a way that there is a balance between in- and out-payments. The following example may illustrate the essential procedure. In the first period, usually an out-payment has to be financed. If the internal funds available are insufficient, a loan has to be taken out. As usual, various conditions for loans can be agreed upon, and also a combination of various loans can be calculated in the VOFI. Correspondingly, multiple forms of funding can be included. As for the calculation above, interest rates for bullet loan (which can only be raised at t=0), loan in current account and financial investment accounts for 4 per cent, 5 per cent and 3 per cent respectively.

In each period, the periodical in- and out-payments have to be balanced. As a check-up, the net funding value, which is defined as the accounting balance of all in- and out-payments, should be zero. On the basis of these flow figures, the capital stock can be updated periodically. The accounting balance for loans and funds finally results in the net balance of the total investment. Within the spreadsheet, the value of an investment in a virtual community can be monitored for each period during the life-cycle simply by observing the net balance in each relevant period.

On the basis of the detailed assessment of both original and derivative payments, performance measures can be calculated in order to allow for an economic evaluation of the virtual community initiative. The actual financial performance of the virtual community adoption is indicated by the terminal value at the planning horizon, which for the profitability ends in t=2007 and can be directly read out of the VOFI spreadsheet. In the present case the terminal value accounts for 75,606 € (see table 4).

However it has to be taken into consideration that most of the revenues are not cash capital but intangible values such as brand equity or knowledge about member`s profiles.

| Visualization of Financial Implications (VOFI) | | | |
|---|---|---|---|
| Point in time | 0 | 2006 | 2007 |
| **Series of payments** | -8250 | 17475 | 129870 |
| **Internal funds** | | | |
| + initial balance | 10000 | | |
| - withdrawal | | | |
| + deposit | | | |
| **Bullet loan** | | | |
| + credit intake | | | |
| - redemption | | | |
| - debit interest (6 %) | | | |
| ( incl. disagio 5% ) | | | |
| **Loan in current account** | | | |
| + credit intake | | | |
| - redemption | | | |
| - debit interest (8%) | | | |
| **Financial investment** | | | |
| - re-investment | 1750 | 8764 | 65093 |
| + disinvestment | | | |
| + credit interest (6%) | | 53 | 315 |
| **Tax payments** | | | |
| - tax due | | 8764 | 65093 |
| + drawback | | | |
| Net funding balance | 0 | 0 | 0 |
| **Balances** | | | |
| on bullet loan | | | |
| on loan in current account | | | |
| on financial investment | 1750 | 10514 | 75606 |
| **Net Balance** | **1750** | **10514** | **75606** |
| | | | |
| **Calculation of tax due** | | | |
| Point in time | | 1 | 2 |
| cash flow | | 17475 | 129870 |
| - interest expenses | | | |
| + interest yield | | 53 | 315 |
| - depreciation | | | |
| - depreciation on disagio | | | |
| Tax base | | 17528 | 130185 |
| drawback | | | |
| tax due | | 8764 | 65093 |

**Table 5. Aggregation of the Series of Payments within a modified VOFI**

## 5. Conclusion

Given the economic potential of social software and web 2.0 technologies to enhance a company's value adding activities, the challenge of evaluating the financial performance of respective technology adoptions arises. In particular, different types of payments specific to a virtual community adoption have to be considered appropriately. However, no framework for evaluating the overall economic efficiency of virtual community platforms with their in- and out-payments has been established until now.

Aiming at a measurement system for assessing the financial performance and benefit outputs of a virtual community platform, findings on the financial implications on three levels of evaluation were presented in this paper. (1) Due to the long-term economic consequences of virtual community projects, means of capital budgeting have to be employed in order to assess the economic consequences properly. (2) From a methodological perspective the findings were summarized in a general framework and (3) then applied by means of a practical example of the Berlin Stock Exchange.

Although the calculation of in-payments accountable directly to the usage of a web 2.0 platform is a difficult undertaking, the profitability was analyzed in a first step by drawing on an extended model of network effects. Therefore, we depicted a procedure to operationalize and calculate revenues by interviewing employees and customers and by analyzing data bases of the platform provider. The first results proved the applicability of our proposed measurement system. As virtual communities do not generate necessarily direct profits (as in the presented case, where no member fees are exhibited), non-financial aspects have to take into considered, too. If financial measures like the terminal value and subjective qualitative assessments of the economic benefits are put into relation, each decision maker could balance an individual ratio. That way, monetary as well as non-monetary consequences can be considered and judged according to individual preferences of the person in charge of virtual community adoption decision.

As the economic success of the implementation of a virtual community has to be proved throughout its life-cycle, the measurement system already constitutes a good tool for controlling and management of a virtual community.

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