Critical Assumptions in Superdistribution based Business Models – Empirical Evidence from the User Perspective

Sophie Ahrens, Thomas Hess
Institute for Information Systems and New Media, University of Munich, Germany
{ahrens|thess}@bwl.lmu.de

Tanja Pfister
Institute for Communication Science and Media Research, University of Munich, Germany
tanja.pfister@ifkw.lmu.de

Behrend Freese
Deutsche Telekom Laboratories, Deutsche Telekom AG, Germany
behrend.freese@telekom.de

Abstract

Superdistribution is not new to the content industries. Quite a few suppliers of digital content have started to implement this concept already. Be it to share bandwidth and storage as it is mainly the case for movies or to spread content faster by stimulating the user to engage in direct marketing actions to promote content as it is true for the music industry.
Still, (illegal) peer-to-peer file sharing is by far more popular than the manifold legal offers.
We created a prototype equipped with Superdistribution and Domain Sharing implementations as well as a revenue sharing incentive scheme. Applying the triangulation method we tested and evaluated these concepts. Results indicate that Superdistribution by itself is not likely the remedy for legal content dissemination. Farther revenue sharing does not work well as an incentive within social networks consisting of close friends.

1. Introduction

The ease of duplication of digital content supersedes the abundant supply of pre-fabricated information goods. But the difficulty to monitor the copying of content jeopardizes traditional business models. With ubiquitous broadband internet access and peer-to-peer file sharing systems this problem has gained momentum. A myriad of new services and business models, especially for music and video content, are currently explored. Most of them seem to lack critical mass so far. As content usage, unlike copying, is trivial to monitor the potential of the concept of Superdistribution is to leverage these new possibilities of electronic markets in order to create innovative content centered business models.

In this paper, our research objective is threefold. First we want to examine business models based on Superdistribution of digital music and revenue sharing as an incentive to forward. Second we want to explore if Superdistribution is a superior concept against Domain Sharing for content dissemination. Third we want to glean if revenue sharing incentive structures effect Superdistribution among small social networks made up of close friends (private social networks).

The remaining paper is made up of 3 chapters. In chapter 2 related work concerning the concept of superdistribution and domain sharing as well as monetary incentive schemes and business models is resumed. Drawing on these results the research question is written out. Chapter 3 comprises the prototype, the design and execution of the study, as well as the discussion of results. The conclusion pointing out limitations and further research opportunities is drawn in chapter 4.

2. Related Work

The concept of Superdistribution as originally defined by Mori and Kawahara allows for decentral exchange of content combined with a usage based charge mechanism and a defense mechanism against interference to assure proper operation. [Mori and Kawahara 1990] The basic idea is to take advantage of the Internet's infrastructure to distribute content decentrally and additionally create the possibility to monitor usage and charge the user accordingly.

Alongside with the technical implementation possibilities of the Superdistribution concept research was conducted in the field of revenue sharing business models in peer-to-peer file sharing systems. [Gehrke and Anding 2002] The revenue sharing component leads to the extension of the technical Peer-to-Peer model by an economic Peer-to-Peer concept. The commission-based distribution remunerates users who redistribute the protected content to spread it like a viral infection. The

1530-1605/08 $25.00 © 2008 IEEE

authors argue that such business models supersede illegal free file sharing systems as the owners of music are compensated for their expenditures. Further the possibility to attain revenues constitutes a gambling factor according to the authors with the security not to act illegally as they would do using traditional file sharing systems.

One of the first to apply these two concepts to music was the potato system. [Nützel and Grimm, 2003] The system remunerates users with a defined commission who actively redistribute content within the system. The potato system monitors usage and secures the controlled distribution through a link system where the links forwarded to other users include the identity of the last buyer respectively.

Further empirical research was conducted to investigate the effects of splitting ratios when splitting revenues among the members of a supply chain. [Quiring et al. 2007] In order to test different splitting ratio scenarios Superdistribution enabling software was developed for the experimental setting. Results indicate that users' download behavior does not strictly relate to increasing revenue share. It is concluded that users foremost seem to acknowledge the possibility to participate actively in this business model and do not act as profit maximizing actors.

Currently many different implementation scenarios of Superdistribution are pursued. The music industry alone counts a dozen of implementations of the Superdistribution concept to create innovative online music offerings for artists, labels and consumers. They all count on the desire of customers to share content and the technological superiority of Superdistribution. Most of them offer some kind of revenue sharing incentive to their participants as well.

Building on these outlined findings, we identified two underlying assumptions. First, all business models emanate from the belief that people do want to share content by forwarding. Alternative concepts such as Domain Sharing where the legitimate owner of a music file grants selected people access to his proprietary content repository are not taken into account. With regard to the most successful business model, Apple's iTunes music store, who implemented this feature, Domain Sharing should not be ignored in this context. Second, all business models offering revenue sharing assume that incentives are equally successful for all kinds of networks. In this paper we try to validate and substantiate these two underlying assumptions, namely

- the predominance of Superdistribution over Domain Sharing as a means of content distribution within social networks and
- the positive impact of revenue splitting as an incentive to redistribution of content among close groups of friends (private social networks) in an experimental setting.

Consequently we built a prototype that integrated both, the revenue sharing concept and the concept of Superdistribution. Additionally a Domain Sharing mechanism is implemented in order to observe if there is a preference for one of the two technical solutions. The research questions were tested among private social networks.

3. Methodology

To receive meaningful results for our exploratory research questions, we settled for a qualitative research strategy applying triangulation. This greatly reduces uncertainty of qualitative results by confirming one proposition by two or more independent measurement processes [Webb et al. 1981:35]. In our context we supplemented the observational data from our exploratory experiment with data gathered by other means (here focus group interviews).

First, chapter 3.1 gives an overview of the technical aspects of the prototype. Then the design of the test is described. And finally the results are presented.

3.1 Prototype

The study focuses upon getting information about Superdistribution with revenue sharing and Domain Sharing as means to redistribute music in private social networks.

The use cases include downloading files from a test platform by mobile phones or laptops, sharing files with friends and their devices or sharing files with one's own devices. The prototype built for and evaluated in this experiment consists of a central server hosting both 400 music files and the accounting mechanisms to track the chosen way of distribution and register the Domain Sharing partnerships. Users can access the service via mobile phones or laptops, which are provided for the duration of the experiment. For the experiment we used 12 laptops running on Windows NT and 12 Nokia N91 mobile phones.

The revenue splitting concept is implemented with the help of bonus points a user can collect if Superdistribution is used to distribute files. The participants could recommend songs to other participants within their own group during the experiment. By doing so, the receiver of a recommendation has the possibility to 'preview' the recommended song for about 30 seconds. As soon as this person buys the song from the platform, the other person, the so called "sender" receives 25 bonus points in exchange on his or her account.

The Superdistribution implementation consists of the 400 protected songs and a license server. Whereas the songs can be forwarded decentrally, contact to the server

is required to get the license to play the song. Once a license is acquired no further online connection is necessary to play the songs.

In order to see if Superdistribution finds higher acceptance with the participants than other means of legal content sharing, a second principal was implemented: Domain Sharing. Domain Sharing was limited only to one person at a time during the experiment because of limits of the prototype and its' connected server. At the beginning of the test week each participant could choose one Domain Partner. "Domain Partners" could share songs without any additional costs.

To share a domain the owner of the domain sends an invitation to the invitee. The invitation is registered on the server to grant access to the licenses of the license owner. License accounts are stored on the end device of the rights holder and on the central server to grant access to the invitees.

Participants were initially equipped with a credit of EUR 80 to buy songs for the experiment. The songs in the prototype had fixed prices of EUR 1.99 per track. Downloads via mobile phone were free of additional connection fees. Each participant received EUR 50 for participation.

3.2 Design

We selected network analysis as the best level to analyze the diffusion of the songs. As defined by Mitchell a network is "a specific set of linkages among a defined set of persons" [Mitchell, 1969]. In our case the networks were partial and uniplex also caused by the prototype [Schnell, Hill & Esser 1999]. It was partial, because we observed just one or only some relationships and not the whole network. And it was uniplex, because we examined only one type of relationship, namely the use of the prototype in the context of the concepts of Superdistribution and Domain Sharing. According to Schnell, Hill, and Esser a network analysis is a research strategy whose concern lies in the description and illustration of social relationships and its' resulting acts [Schnell, Hill & Esser 1999]. In this study the social relationships among close groups of friends result in acts like sharing and recommending music.

In order to analyze private social networks we recruited persons and their natural groups. Thereof we expected a natural and non-complicated attitude of sharing music songs. Therefore we looked especially for music and technically knowledgeable persons. Recruiting was accomplished with notices that had been posted at different places at the Ludwig-Maximilians-Universität, Munich. All participants were recruited the same way

Due to limitations of the prototype, qualitative research strategy and the explorative character of this study we recruited 33 participants and tested the prototype within 6 groups in three rounds because we could not provide the equipment for all groups simultaneously. The testing period took place from December 2006 to March 2007, the experiment itself took place during February and March 2007.

Within group randomization in this case was not applicable as we wanted to test file sharing behavior within natural groups of friends ("private social networks" see above). The groups selected for treatment were randomly selected.

In order to analyze the assumptions outlined in chapter 2, we applied a research design summarized in figure 1.

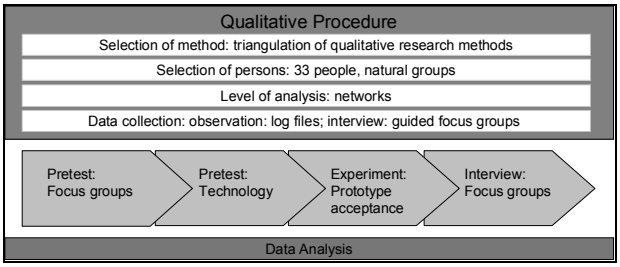

Figure 1. Overall Research Design

The collection of data was split in four phases: two pre-tests, the first to cast the participants and the second to conduct a usability test of our technical infrastructure. Both pre-tests were prerequisites for the experiment in the third phase. In the fourth phase focus group interviews were held to get further insights into the participants' behavior during the experiment.

Whereas data collection was only anonymous in the pre-test, all data analysis was done anonymously.

First, the pre-test questionnaire served to get a picture of the actual consumption of music of the participants. The pre-test was to asess whether the participants were the music and technically experienced type of persons we had been looking for. Based on the pre-test the participants were casted. After the pre-test we chose six groups pictured in figure 2.

The formations of the groups were different. There were more students and accordingly three student groups, because of the university area where we recruited the participants. But there was as well a group of pupils and two groups containing employed people. As this study has an explorative character containing qualitative focus group interviews, the different formations were not a disadvantage but rather an advantage to get more and a variety of information from different points of view.

The average age of participants was 22.2 years. The young age secured that the money provided for Superdistribution would be considerable in relation to the monthly income of the participants. Furthermore the age average secured that participants grew up with and were

familiar with different forms of peer-to-peer file sharing networks.

First Round: 27.02. – 06.03.2007	
Group 1	4 female, 2 male students
Group 2	5 female students
Second Round: 08.03. – 15./20.03.2007[1]	
Group 3	2 female, 2 male students
Group 4	4 female, 4 male pupils
First Round: 22.03. – 30.03.2007	
Group 5	5 male students and employed people
Group 6	5 female students and employed people

Figure 2. Constitution of Groups

Secondly, an additonal pre-test was done to test the usability of the prototype and to write a comprehensive instruction manual for the actual test. To make sure that the participants mastered the two concepts we gave them simple working definitions, so that they could easily distinguish one concept from the other. Therefore "Domain Sharing" was unmodified called "Domain Sharing", but "Superdistribution" was renamed as "Forwarding and collecting bonus points". Additionally we practiced both ways of content diffusion. For the ensuing experiment we required each individual to execute each possibility at least once. This was important to make sure that the participants understood the superdistribution and Domain Sharing concepts, and the revenue sharing principle. Furthermore it helped to make the participants familiar with the technical surrounding We didn't want to "lose" participants during the experiment as a result of handling or comprehension problems.

Thirdly was the actual experiment. It addressed the expatiated assumptions as described in chapter 2 through the two different possibilities to diffuse content and the implementation of a bonus point collection scheme. Experiments examine causal connections by manipulating an experimental variable in a repeatable manner and measuring the effect of the manipulation [Campbell et al. (2001)]. Experiments are an especially suited method to analyze causal connections if the stimulus (experimental variable) can be manipulated and resulting actions can be monitored. Experiments can take place in a laboratory setup or in natural surrounding (field experiment). The latter gives less room to control the experiments' environment but increases external validity.

Users in our case were thereby able to use the service for a one week test in their natural surroundings to give room to extensive trials and to approximate better to the participants' music consumption habits. The experiment, though set up like a field experiment, had a laboratory quality to it, since an extensive IT infrastructure was essential to the usage experience. This infrastructure was modified to meet the requirements of the prototype and to monitor all user actions.

In order to test the incentive of revenue sharing in the experimental design we selected randomly among the student-only groups the first two groups (see figure 2, the grey shaded groups 1-3 are student-only). We created a non matched (regarding gender) 1x2 factorial design with an additional incentive for Superdistribution as experimental variable (see figure 3).

The students of the two experimental groups (group 1 and 2), were especially motivated to do Superdistribution with a monetary incentive. Before the experiment we told these instructed groups that the participant of the group who gained most bonus points in the end would receive an additional amount of money. (We did not tell them exactly how much this would be in advance drawing on the results of the study about splitting ratios [Quiring et al., 2007] outlined in chapter 2. In the end it was EUR 5.)

	Additional Incentive for Superdistribution
Experimental groups	✓
Control group	-

Figure 3. 1x2 Experimental Design

At this point we anticipated that groups with additional incentive would use preferably Superdistribution and thus would gain more bonus points that the control group.

Finally, the focus group interview – in phase four – was conducted individually with each focus group to gain further insights of the expectations in the prototype. An assessment of the two distribution concepts was demanded from the participants during the follow up interviews in order to validate our first assumptions based on the data of the experiment. It also helped to identify the motives for the individual behaviors during the experiment.

The focus group interview followed a qualitative research strategy which contains a couple of advantages in this stage of research. At first place stands the so called inter-subjective understanding: socio-scientific statements are made with the help of empirical methods which are unfolded and commonly understandable. That means the empirical analysis takes place independently of the researchers person and his or her personal preferences [Flick et al. 2004]. The second advantage concerns the integration of the participant's perspective. An additional advantage of qualitative research at this point is the process orientation which includes that participant's behavior and statements are seen as process-like parts of the reproduction and construction of social

[1] Because of the difficulties finding an appointment for the focus group interview of group 4, it took place 5 days later.

reality. In other words, there is no static representation of a fixed effect correlation [Punch 2005]. And last but not least, qualitative research is explorative: The object area is investigated and explored with the object to gain meaningful hypothesis and measurement instruments [Flick et al. 2004] for the data collected during the experiment.

The analysis of the focus group interviews was conducted within a code system based on the research considerations. This system was developed on the basis of the questions and adjusted with the help of the feedback loops with the data material; thereby we followed Mayring [Mayring, 2003].

3.3 Results

The results show, that the concept of Superdistribution was not judged very positively by the participants. Being used to the possibility to satisfy the demand for music via illegal file sharing systems the participants didn't ascribe the fact that Superdistribution enables legal file sharing high weights. The analysis of statements of the recorded focus group interviews showed the following results (all quotations in the footnotes are taken from the focus group interviews).

Both Superdistribution and Domain Sharing were perceived as restricting by the participants.[2] The attitude towards Domain Sharing was more positive than towards Superdistribution in the focus group interviews across all groups. Domain Sharing turned out to be the preferred technology in our experiment.[3] Our results suggest that Superdistribution by itself is not regarded to be a superior technology by users.

Altogether 1.500 bonus points were collected during the experiment whereas the bonus points per forward amounted to 25 per song. The amount of bonus points collected varied considerably between groups. Against the assumption groups 1 and 2 who were instructed to collect bonus points for a higher revenue share did not perform well at all as figure 4 brings out. Revenue splitting as an incentive did not enforce the utilization of Superdistribution but seemed to have had the opposite effect among these groups of friends.

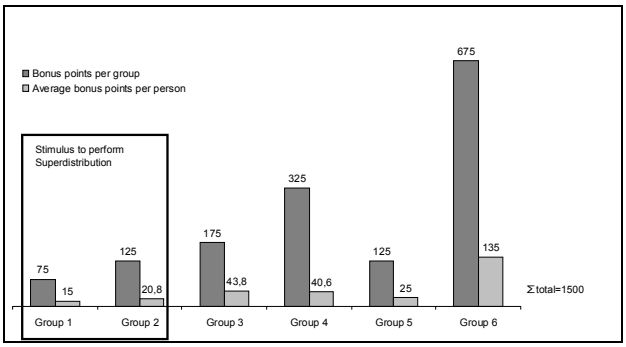

Figure 4. Collection of bonus points across groups

In the follow-up focus group discussions all participants expressed moral concerns[4] as to the idea to earn money with the recommendation of content to their own friends. In their notion the concept of friendship implies that information and goods are handed on voluntarily without any expectations for direct remuneration.[5]

It can be concluded that the idea to earn money for redistribution paired with the information exchange with friends results in conflicting thoughts of the participants. Cognitive dissonance emerges because the action is contradictory to existing beliefs and causes discomfort and if persisting, the motivation to change this state by using other means of information sharing. [Festinger 1957].

Similar effects have long been discussed in economics to explain the effects of monetary compensation on performing civic duty and the siting of unwanted projects (also discussed under the label "not in my backyard" or NIMBY problem) [Frey and Oberholzer-Gee, 1997].

Titmuss was among the first to claim that monetary compensation destroys altruistic values [Titmuss, 1970]. Today, building on Deci and Ryan's theory of intrinsic and extrinsic motivation [Deci and Ryan, 1985], the most dominant theory to explain suchlike phenomena is the crowding-out hypothesis. As intrinsic motivation is depleted by extrinsic motivation such as monetary compensation people may want to do certain actions for free, but not for little monetary compensation, as the compensation does not outweigh the loss of intrinsic motivation. Only significant amounts of money will again turn around the person's willingness to do that very action. [Searbright, 2002]

[2] „Well I don't know. It should actually go without saying that, if I buy a song, I then can play it wherever I want to. So I would, to be honest, find it pretty bad if I can only use it on the laptop for example."

[3] „If it's like that, I wouldn't buy the song. A song which can't be played on other devices. And then I would have to buy it again? I wouldn't want that."

[4] „.. if you palm such a song off on your friends." "You just don't do that!" "It's so selfish if you only think of your bonus points, isn't it?"

[5] „No, I wouldn't want to profit, if someone else had to pay just because I promoted it on to him." „Well, however I prefer giving friends something for free than saying 'Buy something, that gets me a bonus point!'"

A second well-established hypothesis is the discontinuity hypothesis which claims that there is a discontinuity of values across the population. The hypothesis claims that the distribution is bimodal or even discontinuous, since people either have enough intrinsic motivation to perform an action for free or ask for high monetary compensation to fulfil the action.

The results of our experiment can partially be explained by these hypotheses: Whereas everyone has a natural desire to forward interesting music to their friends, this desire is lowered considerably by monetary incentives. Even though we didn't tell the participants in advance exactly how much money they would get for forwarding the most, it was probably not enough to cross the discontinuity-gap.

Attribution theory serves to explain the discontinuity from a psychological point of view. This theory suggests that people interprete their own actions from a third person's perspective [Festinger, 1957; Heider, 1958]. Therefore they see themselves as altruistic if no compensation is paid, if money comes into play, no matter how much, the perception of themselves changes: they act in return for money. Indeed this could be the reason why monetary incentives for forwarding music cause cognitive dissonance among the participants of our experiment. The change in self perception causes the infringement of a fundamental principle of friendship: reciprocity. The monetary reward changes the reason for the engagement according to the attribution theory, from an act of real friendship to an economic relationship.

Gneezy and Rustichini put a more economic reasoning to discussion, incomplete contracts [Gneezy and Rustichini, 2000]. The explanation is based on the following arguments. Contracts, whether social or private, regulate situations of incomplete information. Therefore they are by nature incomplete themselves. An introduction of new incentives can effect the terms of the contract. In our case this explains why the participants had no problem to accept the EUR 50. In their mindset the money was to pay for the incurred expenditures for participation which weren't defined exactly. Only when we told them that they would get extra payment for forwarding the payoff structure probably changed. The EUR 50 was interpreted as the money the participant gets for showing up, as the effort to forward music was paid additionally.

It can be put on record that both assumptions underlying most Superdistribution concepts could not be reinforced in our experiment. Neither was Superdistribution without doubt the preferred way of content dissemination nor did the bonus point stimulus work as an incentive to forward content to friends within the groups. Whether or not Superdistribution works in networks of unrelated or anonymous people still has to be shown, in a network of befriended people, however, that does not seem to be the case.

4. Conclusion

Apparently Superdistribution by itself does not naturally outplay other file-sharing concepts such as Domain Sharing. Empirical evidence also shows that business models allowing for Superdistribution of music have not entered the mass market yet. Proper areas of application that go along well with the Superdistribution concept seem yet to be identified. This finding makes research directed at suitable fields of application and implementation of Superdistribution potentially interesting.

As shown in our experiment there are constellations where revenue splitting concepts as incentives do not promote Superdistribution. Superdistribution inherently builds on networks for the redistribution of content. In order to forward content a possibility to make contact is a prerequisite. Our case shows that revenue splitting in a network composed of close friends could also rather impede Superdistribution. The experiment indicates that unidirectional revenue splitting is a concept that does seem to work well among convenience relationships but not for close friendships as it was the case in our experimental setting.

Our explorational research aim, to find out if there is a causal relation between monetary incentives and forwarding in social networks, was met.

Previous research did not take the nature of social networks into account when developing incentives. In our opinion this is an important parameter in order to assess the applicability of Superdistribution combined with incentives based on revenue splitting.

This finding raises the question whether there are other incentive schemes that are more fruitful in this context. Our exploratory focus group interviews suggest that the possibilities to obtain reputation and to provide opportunity for self presentation are more stimulating to engage in redistribution within social networks.

In order to capitalize on Superdistribution technology within social networks new incentive concepts should be taken into consideration.

As of now the results cannot be generalized because of the exploratory nature of our research setting. Nevertheless they provide interesting results and offer manifold opportunities for scientific investigations. Further research is necessary do validate the findings of this qualitative study and to understand more thoroughly the cause and effects of incentives to share content in these technological environments.

References

[1] Campbell, D. T.,Cook, T. D. and Shadish, W. R., "Experimental and Quasi-Experimental Designs for Generalized Causal Inference", Houghton Mifflin, Boston, 2001.

[2] Deci, E. L. and Ryan, R. M., "Intrinsic motivation and self-determination in human behavior", Plenum, New York, 1985.

[3] Festinger, L., "A Theory of Cognitive Dissonance", Stanford University Press, Stanford, 1957.

[4] Flick, U., Kardoff, E. v. and Steinke, I., "A Companion to Qualitative Research", Sage Publications, London and New Delhi, 2004.

[5] Frey, B. and Oberholzer-Gee, F., "The Cost of Price Incentives: an Empirical Analysis of Motivation Crowding-Out", American Economic Review, 87, 4, 1997, p. 746-755.

[6] Gehrke, N. and Anding, M., "A Peer-to-Peer Business Model for the Music Industry", in: Monteiro, J. L., Swatman, P. M. and Tavares, L. V. (ed.), "Towards the knowledge society – eCommerce, eBusiness and eGovernment", Kluwer Academic Publishers, Boston, 2002, p. 243-257.

[7] Gneezy, U. and Rustichini, A., "Pay Enough or Don't Pay At All", Quarterly Journal of Economics, 115, 2, 2000, p. 791-810.

[8] Heider, F., "The Psychology of Interpersonal Relations", Wiley, New York, 1958.

[9] Lang, K. R. and Vragov, R., "A Pricing Mechanism for Digital Content Distribution Over Peer-to-Peer Networks", Proceedings of the 38th Hawaii International Conference on System Sciences, Big Island, HI, 2005.

[10] Mayring, P., "Qualitative Inhaltsanalyse", 8th edition, Beltz Verlag, Weinheim, 2003.

[11] Mitchell, J. C., "Social Networks in Urban Situations",University Press, Manchester, 1969.

[12] Mori, R. and Kawahara, M., "Superdistribution – The Concept and the Architecture", the transactions of the IEICE E 73, 7, 2000.

[13] Nützel, J. and Grimm, R., "Potato System and signed Media Formats – an Alternative Approach to Online Music Business", Wedelmusic 2003 conference, Leeds, United Kingdom, 2003.

[14] Punch, K., "Introduction to Social Research: Quantitative and Qualitative Approaches", Sage Publications, London, 2005.

[15] Quiring, O., von Walter, B. and Atterer, R., "Money from Peer to Peer - an Experiment on File Sharing Behavior under Different Economic Conditions", Paper accepted for presentation at the 57th Annual Conference of the International Communication Association, San Francisco, USA, 2007.

[16] Schnell, R., Hill P.B. and Esser E., "Methoden der empirischen Sozialforschung", 6th edition, Oldenbourg, Munich and Vienna, 1999.

[17] Seabright, P. "Blood, Bribes and the Crowding-Out of Altruism by Financial Incentives", working paper, IDEI, Université de Toulouse-1 & CEPR1, 2002.

[18] Stöckl, R., von Walter, B., Kosyak, A. and Hess, T., "Success Factors of Communities for User Driven Content: the Case of Ciao.com", Proceedings of the Twelfth Americas Conference on Information Systems, Acapulco, Mexico, 2006, p. 4444 – 4452.

[19] Titmuss, R. M., "The gift relationship", Allen and Unwin, London, 1970.

[20] Webb, E.J., Campbell, D.T., Schwartz, R.D., Sechrest, L. and Grove, J.B., "Nonreactive measures in the social sciences", 2nd edition, Houghton Mifflin, Boston, 1981.