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Can filesharers be triggered by economic incentives? Results of an experiment

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Abstract

Illegal filesharing on the internet leads to considerable financial losses for artists and copyright owners as well as producers and sellers of music. Thus far, measures to contain this phenomenon have been rather restrictive. However, there are still a considerable number of illegal systems, and users are able to decide quite freely between legal and illegal downloads because the latter are still difficult to sanction. Recent economic approaches account for the improved bargaining position of users. They are based on the idea of revenue-splitting between professional sellers and peers. In order to test such an innovative business model, the study reported in this article carried out an experiment with 100 undergraduate students, forming five small peer-to-peer networks. The networks were confronted with different economic conditions. The results indicate that even experienced filesharers hold favourable attitudes towards revenue-splitting. They seem to be willing to adjust their behaviour to different economic conditions.

Key words

filesharing • interactivity • internet • music • online • peer-to-peer

INTRODUCTION

The digitalization of music content has caused dramatic changes in the music business because music content that used to be limited to physical media can now be copied quite simply and – in the majority of cases – without any loss of quality (with one exception: compressing compact discs (CDs) into mp3, Advanced Audio Coding (AAC), etc. leads to a considerable reduction in quality). Therefore it can be distributed far more easily.

Accompanied by an increasing diffusion of internet access, this new possibility led to the phenomenon of massive illegal music sharing via the internet.

Although the extent of the losses for the music industry is still a matter of discussion, a number of measures have been taken to prevent the illegal exchange of data. Not all of these measures have proven equally successful, although new legal payment models on the internet, such as Musicload and Apple's iTunes Music Store, have become increasingly popular (see, for example, von Walter and Hess, 2004). However, considering the duration of the dispute over illegal filesharing on the internet, these new online services were introduced rather late and only reached a limited number of consumers.

In addition, illegal filesharing systems are still flourishing and their users can hardly be restrained by harsh legal penalties; thus these users exploit their improved bargaining position in the music market. A number of current online services (such as PotatoSystem: www.potatosystem.com; and Weedshare: www.weedshare.com) and theoretical business models (e.g. the distribution revenue model; Gehrke and Anding, 2003) account for this improved bargaining position and essentially are based on the idea of revenue-splitting between professional suppliers and peer-to-peer communities. From a technical viewpoint, this means that central professional suppliers take on tasks such as identification, invoicing, paying the copyright owner, supplying new music files, etc., but the music files are still exchanged in decentralized peer-to-peer networks. In these models, parts of the revenues remain with the peers since they provide the technical infrastructure.

Although the idea of legal revenue-splitting could free the users of peer-to-peer systems from the blemish of illegality and impending punishment, the question remains whether economic incentives actually appeal and have an effect on their behaviour.

The aim of the following article is to give an insight into a first empirical exploration of the potential effects of economic incentives on user behaviour. The results indicate that even experienced filesharers react positively towards the idea of revenue-splitting and adjust their behaviour under corresponding conditions, including different economic incentives.

PEER-TO-PEER: ATTACK ON THE TRADITIONAL MUSIC INDUSTRY AND REACTIONS

Although the introduction of the internet opened up a number of new business possibilities for media enterprises (Bailey, 1998; Hummel and Lechner, 2001), in both the scientific literature and public discussion growing attention is being paid repeatedly to one special type of interactive¹ services called 'filesharing' systems which subvert traditional business models on the media sector. Based on peer-to-peer technology (Fattah, 2002; Oram, 2001), so-called 'filesharing' systems offer the possibility to exchange any sort of digital data for free and without restriction. The network built up around Shawn Fanning's software Napster was known for a long time as the prototype of such gratuitous and illegal exchange systems. Although Napster itself has experienced several changes of ownership (at present it is owned by Roxio) and was transformed into a legal system, there is still a great number of alternative filesharing systems that allow the gratuitous exchange of media data (such as BitTorrent, eMule, Gnutella, etc.).

According to the music industry, it misses out on considerable revenues each year due to the illegal exchange of music data (for an overview, see for example, Dietl et al., 2005). In 2005 the Recording Industry Association of America (RIAA, 2006) declared that its losses resulting from acts of piracy amounted to 8 percent of total revenue. Although, for understandable reasons, the music industry mainly identifies the use of filesharing systems as an economic threat (see, for example, Denegri-Knott, 2004), it has not yet been clarified whether and to what extent the use of these systems has actual negative effects on sales and revenue. In this context, two different effects can be distinguished (see, for example, Bounie et al., 2005; Gopal et al., 2004; Liebowitz, 2005). The 'sampling effect' describes the fact that users download illegal music files from the internet and look upon these files simply as 'sample copies'. If they like a song, they will buy it later. In this case, the use of filesharing systems actually boosts legal music purchasing. In contrast, the 'competition effect' means that users obtain illegal songs from the internet, which in turn become part of their final music collection. Thus, the music industry loses money, but it is still not clear whether all illegally acquired music data would have been bought legally.

Scientific insights into these two effects are contradictory. Most studies on the effects of filesharing on the sale of legal music offers are based on aggregated data (usually aggregated data on the use of filesharing systems is related to the number of CD copies sold). There are studies which confirm the fears of the music industry and, on balance, show losses (Hui and Png, 2003; Liebowitz, 2005), as well as studies which consider the effects to be insignificant (Oberholzer and Strumpf, 2004; Peitz and Waelbroek, 2004). Studies on the individual level indicate that the use of peer-to-peer

systems could have a negative influence on the purchasing of legal offers (Bounie et al., 2005; Rob and Waldfoegel, 2004; Zentner, 2004).

Although the exact consequences of filesharing are not sufficiently clear yet, the music industry has reacted mainly restrictively towards its potential economic threat. Here, one can differentiate between legal, technological and economic measures. Legal measures basically consist of filing lawsuits against the providers of filesharing software and individual users in order to restrict some filesharing systems, at least for a certain amount of time, in terms of their functional efficiency. High individual fines were supposed to frighten off potential users. Technological measures were employed to try to tackle the problem through the elimination of entire systems, the concerted 'spamming' of filesharing systems with the help of extremely large and dysfunctional files, or by imposing digital rights management systems (Picot and Fiedler, 2003; Ünlü, 2005). Economic measures basically rely on the attempt to offer legal download systems as competition to illegal offers. Apple Computers, Inc. was the first enterprise to build up a successful commercial platform for digital music distribution. Since its launch in April 2003, more than 1 billion legal music files have been sold on Apple's iTunes Music Store according to official company data. This example demonstrated for the first time that at least some users were ready to pay for music that they download from the internet (von Walter and Hess, 2004). Recent studies show a predominantly growing willingness to pay for online services, including music downloads (Krüger et al., 2006). However, it still cannot be assumed that users are prepared to pay for the better part of files downloaded from the internet.

Considering the measures taken so far, most of them seem to tackle only parts of the problem. Moreover, on the part of the music industry, they do not always lead to desirable effects. Legal steps require enormous efforts because the legal situation in each country can be surveyed only with difficulty (see, for example, Frey, 2001; Richardson, 2002; Zhang, 2004). Furthermore, it has to be assumed that 'punishment actions' against individual filesharers, which are viewed as excessive by users, will contribute to a more negative public image of the music industry (for an extensive discussion on the various positions of the music industry and online pirates, see, for example, Denegri-Knott, 2004). Additionally, technological efforts to restrain online filesharing may provoke undesired side-effects. For example, a common problem is that some legally acquired music files are incompatible with some endpoint devices because (technical) copy protection has been handled too restrictively. Nevertheless, there is a strong drive to keep investing in technical solutions (for an overview, see for example, Schechter et al., 2003). Economic measures encompass, among others, attempts to make legal music download pages more attractive through additional offers – a strategy which at least seems to be partially successful (see, for example, Baumann and

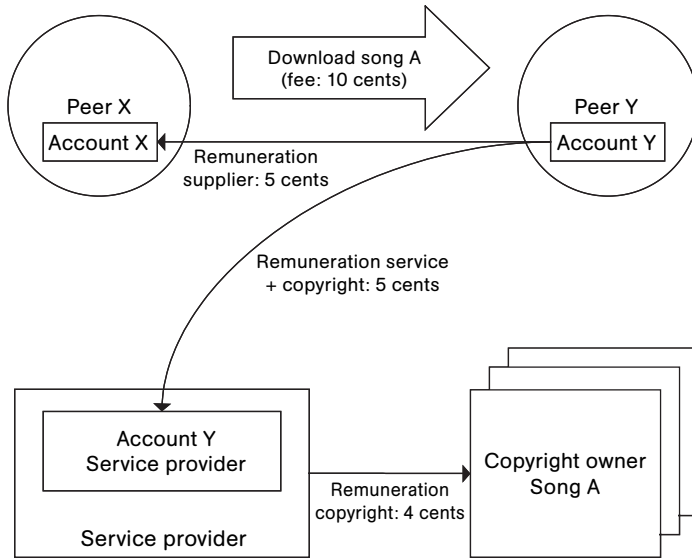
Hummel, 2003). Despite costly measures taken by the music industry, illegal offers on the internet are still thriving. Experienced users of peer-to-peer systems in particular hardly seem to be deterred from exchanging illegal files (LaRose et al., 2005) and inexperienced users are, to some extent, unaware of providing their files by logging into filesharing systems which then gain access to their computers.

A less restrictive possibility to handle the problem of filesharing is to employ economic incentives. The possibility to write previously purchased digital music to CD and forward it to other computers has been realized already within the Apple iTunes Music Store. After its market introduction, concessions such as these caught on increasingly with other digital music providers. For example, PotatoSystem gives discounts to its users and allows the circulation of music files to a certain degree. Weedshare allows for revenue-splitting between licensees, copyright owners and users. However, both systems are based on a comparatively small range of music files and, if anything, tend to offer a distribution platform for relatively unknown artists and labels. Data on the usage of either system is not at hand.

SUPERDISTRIBUTION AND THE DISTRIBUTION REVENUE MODEL

The approach of 'superdistribution' presents an alternative economic concept for the distribution of digital products into which users' improved bargaining position can be integrated, at least to a certain extent. Originally the approach aimed to distribute software on the internet in a safe and decentralized manner and waive fees at the same time (Mori and Kawahara, 1990). Later on this idea was transferred to the distribution of media content (see, for example, Buhse, 2002) and corresponding business models were developed. One of these theoretical models is the distribution revenue model by Gehrke and Anding (2003; see Figure 1), which was developed especially for the distribution of music files.

This model is based on a combination of server-based services (administration of user accounts, accounting and identification of music files) provided by a commercial provider and decentralized music distribution via peer-to-peer networks. The theoretical model (Figure 1) assumes that music files are sold over the internet at 10 cents per file. If user Y acquires a music file from the hard drive of user X, the system will charge him 10 cents. These 10 cents, in turn, will be shared between user X who provides the file (5 cents) and the service provider (5 cents). Subsequently, the service provider pays the copyright owner (4 cents). Finally, user X may spend the profit within the system on other files (Gehrke and Anding, 2003). Although users would receive a share of the total price, the commercial providers of such systems could still earn a considerable sum of money by using an external



• Figure 1 The distribution revenue model

Source: Gehrke and Anding, 2003 (with kind permission of Springer Science and Business Media)

infrastructure (peer-to-peer networks), supplying newly-published music files, and collecting fees for invoicing or additional services such as album covers. It can be argued that user Y receives no direct remuneration, since the full amount of money has to be paid for each file. However, we expect that users of filesharing systems are willing to grant other users a leap of faith which, until now, has expressed itself through the provision of illegal music files for free (for explanations of this phenomenon by game theory and action theory see, for example, Dixit and Nalebuff, 1997; Haug and Weber, 2003). It seems at least plausible that new users will assume that other users will download from them in the future and thus they themselves will make a profit (a phenomenon that can be interpreted as a form of social trust; on the concept of 'social trust', see, for example, Putnam, 1994). In addition, participation in such a system could be attributed to users' economic considerations, especially when users not only download music files according to their own taste but also with the purpose of resale. From the perspective of media economics the crucial question seems to be whether the economic incentives described above (revenue-splitting) are sufficient to influence users' behaviour. In order to gain information on the real potential of the model it is not sufficient to examine one single ratio of

revenue-splitting (as described in the theoretical case). Conclusions on the behavioural efficiency of economic incentives can be achieved only by comparing various ratios of revenue-splitting. The corresponding research questions are:

R1: Do economic incentives affect the amount of care with which users select files to download?²

R2: Do stronger economic incentives (measured by a higher share of revenues given to the uploading user) lead to an increasing share of downloads from other users (who are refunded) and to a decreasing share of downloads from a professional provider (who would not share revenues)?

METHOD

Design

In order to measure the influence of different ratios of revenue-splitting (independent variable) on the degree of care that users employ to select files to download (dependent variable 1), and on the download splitting between a professional provider and other users (dependent variable 2), a laboratory experiment was conducted. The independent variable (ratio of revenue-splitting) was graded in a five-fold manner. The condition 0:0 simulated a classic illegal filesharing system (0% of the purchase price goes to the commercial provider; 0% to the user). 100:0 was the pendant for a classical legal download page (comparable to iTunes or Musicload, where all the proceeds go to the commercial provider, not to the users). In between, the ratios 75:25, 50:50 and 25:75 were established (commercial provider: user). A treatment check confirmed successful manipulation of the experimental conditions. The following question was used as a treatment check: 'Which statements on the system would you agree with? ... allows for making one's own profit'. Answers on a five-step Likert scale ranged from 1 = 'totally agree' to 5 = 'do not agree at all'. For group 0:0 ($N = 20$), there was a mean value of 2.9 ($SD = 0.8$); for the 100:0 group ($N = 20$), a mean value of 3.0 ($SD = 1.1$). The other corresponding values are: 75:25 group ($N = 20$): 2.2 (mean; $SD = 1.1$); 50:50 group ($N = 20$): 2.2 (mean; $SD = 1.1$); 25:75 group ($N = 20$): 1.9 (mean; $SD = 1.0$). As expected, each single experimental group perceived the financial incentives in a different way. A one-way ANOVA was run to test for group differences. The groups without financial compensation (100:0 and 0:0) differed significantly ($F = 4.387$; $p < 0.01$) from the groups with economic incentives (75:25, 50:50, 25:75) according to the post-hoc test (Duncan).

The whole design consisted of a pre-experimental questionnaire, a filesharing software package and system that was especially programmed for the experiment (which was used during 30-minute filesharing sessions by each of our five groups) and a post-experimental questionnaire. All

three instruments were integrated into a single web-based design. The pre-experimental questionnaire asked for the following:

- general media equipment;
- media use;
- history and duration of the use of different media;
- special aspects of music use (music-related activities, situations of use);
- preferred music styles (music purchases and budget spent on music);
- special aspects of peer-to-peer usage (frequency of usage of various legal download pages and illegal filesharing systems);
- number of files downloaded from the internet per week;
- ratio of legal to illegal and price rating for legal offers; and
- the participants' sociodemographics.

The data allow for the control of various influences regarding the download behaviour shown during the test phase.

The filesharing software and system³ especially programmed for the study were suited to simulate the five different economic conditions. Compared to the theoretical model outlined earlier, we provided a more common price of €1 (approximately \$1.50) per song. The system contained typical attributes of existing filesharing systems (Figure 2).

For example, account balance indices informed the user of their remaining credit. In addition, a search engine allowed for requests for songs, artists, titles and the various suppliers of files. Moreover, the file stock of other users was always co-equally indicated with the file stock of the virtual provider in an alphabetical list. Consequently, the participants always knew the supplier from whom they were downloading. All the participants started the simulation phase without any files of their own and had to download from a virtual provider (commercial 'provider' in Figure 2) first in order to subsequently exchange songs between each other (for example 'fred', Figure 2). To enable them to do so, we arranged for an initial virtual deposit of €112 (approximately \$85.50) for each user.⁴ Files which had become the property of the participants were offered automatically to other users and could be sold on to them.

An initial pool of 4500 songs (offered by a commercial supplier called 'Provider', Figure 2) served as a stimulus for file exchange. The music pool was generated using an evaluation of 12 current international chart lists of various genres (pop, rock, hip-hop, etc.). With the help of these charts, first the most popular 300 artists at the time of research were identified. Second, the 15 most popular songs of these artists were included in a song list (300 artists × 15 songs = 4500 files). Due to legal reasons, it was not possible to use real music files, therefore only dummy files were introduced, which appeared in the system under the names of the 4500 eligible titles. However, in order to create a download situation that was as realistic as possible, the participants were told



• Figure 2 Screenshots of the file sharing software and system – search and download window

that all the files that they were downloading during the experiment could be taken home at the end. For this purpose the participants were given blank CDs, in order to suggest that the stimulus material contained real music files. After the experiment the participants were asked whether they had entertained any suspicion, but they all maintained they had been unaware. All of the participants were debriefed after the experiment and compensated. During the simulation phase the following actions were logged: login/logout, search actions, downloads and abandoned downloads. Each log entry contained an individual user identification and a time stamp. The logs show in detail the songs that were downloaded by each user from each source (other users or commercial provider) at a given point of time. Furthermore, all account movements were recorded. Third, the participants were asked to give information on the usability of the system, the basic idea of revenue-sharing and the optimal ratio of revenue-splitting in a post-experimental questionnaire.⁵

All data were recorded on a server and subsequently read into the Statistical Package for the Social Sciences (SPSS).

Sample

To reproduce the five different revenue-sharing conditions (100:0, 75:25, 50:50, 25:75, 0:0), the sample of 100 undergraduate students⁶ was divided into five groups of 20 participants. Each group simulated a small peer-to-peer network. Participants were recruited via a web form where they filled in their address, age, gender and download affinity. The five experimental groups were matched according to these three criteria (age, gender, download affinity).⁷ The results of an analysis of variance (ANOVA) show that the groups did not differ significantly according to their age ($F = 0.758, p = 0.555$) or download affinity ($F = 1.064, p = 0.378$; Table 1). Moreover, each group consisted of six female and 14 male participants.

Although the sample is by no means representative of peer-to-peer users, the study at least opted for a relevant target group: students – above all, male ones – are well-known for their affinity for peer-to-peer communities (see, for example, Billboard-Blogs, 2006). More essential conclusions on the composition of the sample result from the introductory questionnaire data. The participants claimed to download files from the internet about once a week on average. Moreover, they only procured the equivalent of one CD (13.6 songs) per week. However, even more crucially, they admitted that 76 percent of all downloads were performed illegally. Consequently, the participants can be looked upon as experienced peer-to-peer users. The experimental groups do not differ significantly in this respect.

• Table 1 Group differences – age and download affinity^a

	TOTAL (N=100) MEAN (SD)	GROUP 0:0 (N=20) MEAN (SD)	GROUP 25:75 (N=20) MEAN (SD)	GROUP 50:50 (N=20) MEAN (SD)	GROUP 75:25 (N=20) MEAN (SD)	GROUP 100:0 (N=20) MEAN (SD)	F VALUE (P VALUE)
Age	24.0 (2.4)	24.8 (2.3)	23.7 (2.4)	23.7 (2.4)	24.1 (2.4)	23.6 (2.7)	0.758 (0.555)
Download affinity ^a	3.6 (1.1)	3.4 (1.0)	3.7 (1.0)	3.5 (1.0)	3.8 (1.1)	3.7 (1.3)	1.064 (0.378)

^aQuestion: “How often do you download music from the internet?”: scale: 1 = (almost) daily, 2 = two to three times/week, 3 = once/week, 4 = very rarely, 5 = never.

Basis: 100 participants. Means do not differ significantly between the groups according to post-hoc tests (Duncan; $p < 0.05$).

RESULTS

Since this study is interested primarily in the effects of economic incentive conditions on users' behaviour, it examines group differences concerning two behavioural patterns: the degree of care that users exercise when choosing files to download; and sources of downloads (commercial provider versus other users).

Economic incentives and degree of care

As mentioned previously, it is still not clear whether illegal downloads from the internet can be interpreted directly as losses for the music industry. There is still a possibility that some of the songs obtained illegally from the internet would not find any buyers otherwise. Looking at the ratio of search actions to download actions at least provides some clues to the question of whether it comes to indiscriminate activities and 'hoarding' when file supply is for free. Of course, the data from this study does not allow for any quantitative inferences on the ratio of potentially saleable to 'haphazardly downloaded' files under real conditions. However, it becomes clear that users who do not have to pay anything for their downloads (0:0) do ultimately download more than users in all the other groups (Figure 3).

First, in the 0:0 group, the absolute number of actions and resultant downloads is much higher than in all other groups (basis in Figure 3). Second, the absolute number of actions reveals that with decreasing economic incentives, the number of total actions also decreases; this means that users take more time for each action. However, in this respect the difference in the absolute numbers between groups 75:25 and 100:0 is exceptional. In the first

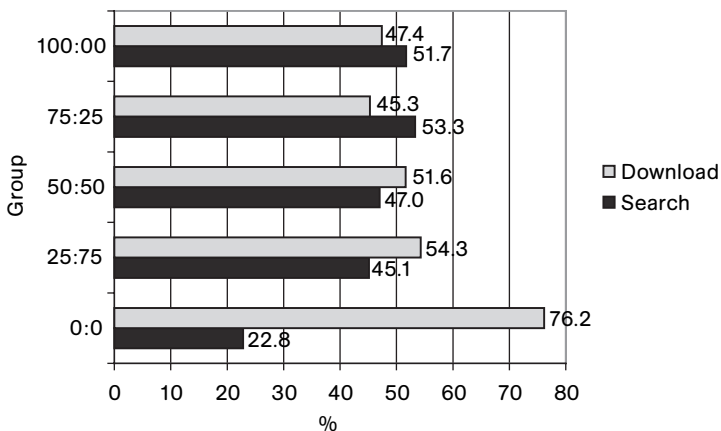


Figure 3 Search and download actions per group

Basis: 5.080 actions in group 0:0; 3.501 actions in group 25:75; 3.218 actions in group 50:50; 3.035 actions in group 75:25 and 3.114 actions in group 100:0.

(economically more favoured) group, fewer actions took place than under full payment conditions. This result may well have been provoked by the test design. While users in the full payment group (100:0) knew from the beginning that they could only download 75 songs within 30 minutes, users in the 75:25 group were looking for cooperation partners until the very last minute and thus missed the end of the simulation phase.

Differences in degree of care can be demonstrated, for example, by the ratio of search to download actions. While in all groups in which (virtual) money had to be paid to download files, the relationship between download and search actions is more or less balanced, more than three-quarters of all the actions of the 0:0 group (simulation of an illegal/free of charge system) consist of downloads. Unlike all the other groups' logs, this group's logs show that in many cases the complete song lists of favourite artists were downloaded, so to speak, 'in a package'. On average, one single search action corresponds to almost four download actions (for the exact means of the ratio of download to search actions per group, see Table 2, line 1). By and large, a differentiated search for particular songs could not be observed in group 0:0.

On the other hand, the participants in all the other groups proceeded much more carefully. In these cases, one download approximately corresponds to one search action (Table 2, line 1). The result of an ANOVA shows that the 0:0 group differs significantly from all the other groups in its choice of particular songs. However, there are no significant differences between those groups which have to invest money in some form.

As a partial result, it can be noted that distinct differences exist in the care invested in choosing download material between those users who have no costs whatsoever for a download, and those who have to pay. This result indicates that under real conditions, not all files which are downloaded illegally from the internet would be saleable. Therefore, on no account can the number of illegally-acquired files be treated as commensurate with music industry

• Table 2 Group differences – ratio download/search and download provider

	TOTAL (N = 100)	GROUP 0:0 (N = 20)	GROUP 25:75 (N = 20)	GROUP 50:50 (N = 20)	GROUP 75:25 (N = 20)	GROUP 100:0 (N = 20)	F VALUE (p VALUE)
	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)	MEAN (SD)	
Ratio							
Download/ search	1.6 (1.4)	3.8 ^a (2.0)	1.3 ^b (0.4)	1.2 ^b (0.3)	0.9 ^b (0.4)	1.0 ^b (0.3)	32.55 (0.000)
Download provider	70.4 (17.6)	72.6 ^{ab} (22.0)	63.1 (16.1)	65.1 ^b (13.0)	71.9 ^{ab} (17.2)	78.9 ^a (15.0)	2.85 (0.028)

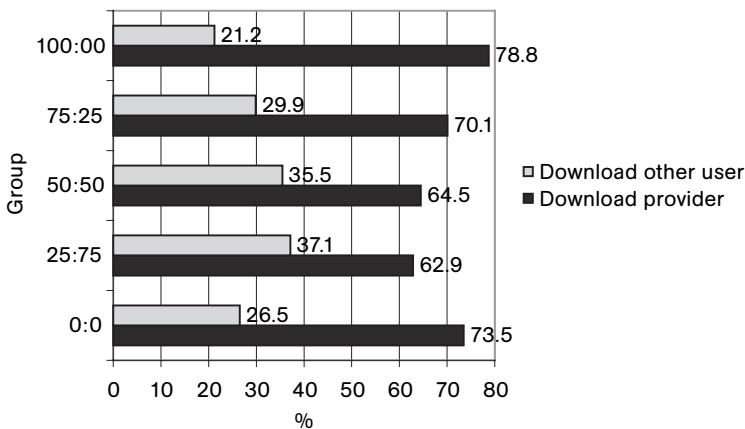
Basis: 100 participants. Means with different superscripts differ significantly according to post-hoc tests for group differences (Duncan; $p < 0.05$).

losses. The reason why there are no significant differences between those groups with different payment conditions lies, among other things, in the experimental design, which had to allow for restrictions to the duration of the simulation period and the consistent budget of €75. Certainly, studies over a longer period of time with variable budgets would yield more vivid results.

Economic incentives and the source of downloads

The source of downloads is even more crucial to the basic idea of this study, therefore the study examines the share of downloads from the commercial provider and other users. Differences between the groups can provide clues as to the effect of economic incentives on users' willingness to cooperate in an anticipatory manner. While downloads from the commercial provider do not lead to financial gains for any participating user, the users in groups 25:75, 50:50 and 75:25 profited from downloads by other users. Therefore, the tests on group differences can be looked upon as rough partial tests of the distribution revenue model. Figure 4 shows that each group does indeed differ in this respect.

All of the groups primarily acquired files from the commercial provider. This is partly due to the design of the study. Since all participants started off with no files of their own,⁸ first they had to build up their own file collection. However, subsequent download behaviour differs from group to group. On the one hand, those users who downloaded for free (0:0) mainly purchased files from the commercial provider simply because its repertory was more ample and they were not charged any fee. On the other hand, the share of files downloaded from other users changed considerably under conditions



• Figure 4 Downloads from other users and the commercial provider

Basis: 3.909 downloads in group 0:0; 1.912 downloads in group 25:75; 1.684 downloads in group 50:50; 1.394 downloads in group 75:25 and 1.412 downloads in group 100:0.

where economic incentives were employed. The more other users profited financially, the more exchange happened independently of the commercial provider (see Figure 4).

However, the results of an ANOVA show that not all groups differ significantly from each other (Table 2, line 2).⁹ Only the two groups with relatively favourable incentive conditions (25:75 and 50:50) differ significantly from the group positioned worst (100:0). The 75:25 group takes up an intermediate position. Here it seems plausible that the amount of money that users could earn was too small to significantly change their behaviour compared to the full payment condition.¹⁰ The behaviour of the 0:0 group can be put down to the fact that users did not really differentiate between the potential download sources. They neither had to pay nor provide an advantage to another user, nor were they able to earn any money. However, on the whole the results indicate that revenue-sharing between users and commercial providers may be a fruitful economic idea. The higher the economic incentive, the higher the users' willingness to cooperate with each other (i.e. to download from a peer, not from a commercial provider).

There is still the possibility that other variables could be responsible for the results, because only three variables were applied in the matching procedure (as outlined previously). For example, disposable income or download motives are considered to be key to downloader behaviour (Holm, 2003). The pre- and post-experimental questionnaires contained various variables (blocks) that may serve as controls:

- 1 sociodemographics (age and gender);
- 2 music-related behaviour (music consumption per week, frequency of use of six different digital devices, frequency of use of four different music-related activities, such as concerts, etc.);
- 3 previous download behaviour (frequency per week, number of illegal songs per week);
- 4 motives of illegal downloads (nine items); and
- 5 financial situation (estimation of the price of legal downloads, expenditure on music per month, monthly income).

As a result of a series of ANOVAs it can be stated that the groups did not differ significantly from each other in any aspect at all.¹¹ Finally, the potential effects of the five variable blocks (1–5, independent variables) on the ratio of search to download actions (dependent variable 1) and the share of downloads from the commercial provider (dependent variable 2) were tested with the help of hierarchical regressions. The variable blocks were entered into the regression according to the sequence mentioned previously. The results show not a single significant beta-value and, besides, the insignificant (and almost non-existent) R^2 does not improve with the entering of new variable blocks.

Thus, it can be assumed that the behaviour shown during the filesharing sessions can be traced back to the varied variable (revenues-splitting).

DISCUSSION AND CONCLUSION

This study indicates that economic incentives seem to be a suitable instrument to remind users to take care when choosing files to download, instead of downloading whole packages of songs from the internet which will rarely be listened to; and to influence behaviour in filesharing systems to the point of cooperation of commercial suppliers and peers.

From a media economics perspective, the question of whether users are willing to leave profits to other users initially when they have the prospect of later proceeds seemed decisive. This study confirms that users – at least under experimental conditions – show a willingness to cooperate and take future profits of their own into account. The strategy observed in the experiment more or less resembles the cooperation part of the ‘tit for tat’ strategy well known from game theory (Axelrod, 1990). In the long run, all users benefit from a cooperative strategy, as they would miss out on financial benefits if they did not cooperate. Therefore, a cooperative strategy can be regarded as the most effective choice economically. Moreover, these systems could be interesting for users who want to make a profit by building up an extensive database in order to resell their files. However, one could ask why the music industry should be interested in legal filesharing systems which allow for revenue-splitting. This question can be answered easily against the background of flourishing illegal filesharing systems. Users have improved their bargaining position in the music market, be it on legal or illegal grounds. Accounting for users by applying corresponding digital rights management systems could solve this problem to a certain degree. Moreover, providers’ expenses would be reduced significantly by using an external technical infrastructure (peer-to-peer networks), thus part of the lost profits in the field of physical music distribution could be balanced out.

Nonetheless, a rigid economic interpretation of the results tells only part of the whole story. If the participants had tried to maximize their own profits with no regard for other users, the ANOVA described above (provider share, Table 2, line 2) should separate significantly *all* experimental groups from each other. From a sociological perspective, one could argue that the participants’ behaviour also shows very obvious signs of social co-orientation (towards the commercial provider as well as towards other users) despite the relative anonymity of our experiment. First, potential users felt themselves to be taken seriously by the idea of revenue-sharing. The data from the post-experimental questionnaire reveal that the participants claimed to find the basic idea both attractive and fair.¹² Therefore, the provider of a revenue-sharing system might well be regarded as more socially-oriented than full

payment providers, which may result in more positive attitudes towards such a provider. In addition, the peer-to-peer structure enables the individual user to feel part of an online community, rather than simply an anonymous consumer. Looking at the users' interactions, there are several indications that social norms are at work: a closer inspection of the log file data reveals that almost all users in the revenue-sharing conditions began the simulation period by immediately buying songs from the commercial provider, i.e. they spent (virtual) money in order to establish a common basis for further exchange. After a very short period of time (about three minutes in each condition) they began to download songs from other participants without being addressed by them first. It can be assumed that they did so because they believed that other users would download from their account in the future. This behaviour can be interpreted as the result of social trust (Putnam, 1994). Moreover, it was observed that the users in the revenue-sharing conditions, in turn, tried to reward exactly the same people who had granted them a benefit previously in a relatively short period of time; a behaviour that fulfils the social norm of reciprocity (Gouldner, 1960). Theoretically, ongoing interactions that are based on norms of reciprocity and social trust result in the accumulation of social capital (Haug and Weber, 2003). According to Bourdieu (1986), social capital is transferable into economic capital and vice versa. In the long run, such a revenue-sharing system might result in the accumulation of not only economic but also social capital. The results of this study indicate such interdependencies, but do not offer final answers.

Admittedly, this explorative study has severe limitations and only parts of the theoretical ideas discussed above are covered by the data. It was unable to investigate a number of factors that also might have a decisive impact on user behaviour. Further experimental research might consider factors such as unlimited time, a larger number of participants, the integration of chatrooms, new ways of distribution (including cellphones and personal digital assistants (PDAs)), real budgets and real songs. While the participants more or less behaved according to the theoretical idea in a 30-minute simulation period, long-term online experiments might clarify whether or not some users drop out of the system because they are never addressed, while other users emerge as new big players within the system. In this context it would be interesting to see how other users' attitudes towards new big players develop. Are they still regarded as peers or will they be sanctioned negatively? Moreover, experiments with a greater number of participants might offer clues as to the diversification of the basic network. It can be assumed at least that sub-networks will emerge which support their own members while ignoring others. Other experiments might shed some light on the impact of chat features inside revenue-sharing systems. It seems plausible that strategies might change when all participants of such

an experiment are enabled to communicate with each other in real time. Furthermore, other ways of distribution should be integrated into an experimental design. As a first step it could be interesting to see whether or not the inclusion of mobile media (for example, cellphones) accelerates the rate of file exchange. To get a more realistic picture of users' behaviour, it seems necessary to investigate the effects of real money and real songs. Long-term experiments simply cannot be conducted with dummy files because participants will only behave realistically if they have the chance to own and listen to the music that they download. This would certainly require cooperation between the music industry and academic research institutions.

Finally, little is known about the cultural diversity of filesharers and the impact of current legal actions. Although online surveys are not representative of the whole population of filesharers, they might complete the picture by identifying different types of filesharers. From the cyberculture perspective, some might stick to the idea of hacker ethics (Himanen, 2001), while others might feel frightened by current legal actions and submit to commercial and legal alternatives. Moreover, real-world cultural differences might result in different attitudes towards the norm of reciprocity (as observed by, for example, Cook and Hardin, 2001).

Notes

- 1 On the phenomenon of interactivity and its effects on users, see, for example, Jensen (1998), McMillan (2002).
- 2 As mentioned previously, the number of illegal downloads was directly interpreted repeatedly as deficits of the media industry. Should more favourable economic conditions lead to a less careful selection of files, it can be assumed that at least part of these relatively carelessly selected songs would find no customers under full payment conditions. This would imply that one cannot simply convert the number of illegal downloads one-by-one into losses.
- 3 This prototype underwent several technology and usability tests.
- 4 The deposit of €75 certainly increases the degree of artificiality of the experiment, but it could not have been expected that users would invest their own money. Moreover, due to the very limited budget of the study, it was not possible to grant users a payout of the unspent money. However, reimbursements through resales to other users could be immediately reinvested during the 30-minute simulation phase. Thus, participants in all groups – except for the 100:0 group – could download more than 75 files, depending on the reimbursement received.
- 5 These data were obtained before the debriefing and before the users could find out that they had loaded dummy files.
- 6 Subjects the students studied were business economics, library science, computer linguistics, ethnology, computer sciences, law, communication science, mathematics and media informatics.
- 7 Although the random assignment to each experimental group appears to be the procedure of choice, we had to rely on a matching procedure since we had to make appointments with the participants, and the investigation had to be carried out over a single day in order to prevent as much mutual interference as possible.

- 8 The reason why all users started off without any files of their own originates from our interest in finding out when exactly users would begin to acquire files from peers in such a system. The results are not particularly spectacular. After only approximately three minutes, users began to download from other users.
- 9 The share of downloads from the commercial provider served as the dependent variable 2. As the user share and the provider share add up to 100 percent, it does not really make sense to calculate the ratio of downloads from the provider to those from other users.
- 10 The scope of these users was rather restricted due to the time limit and fixed budget of €75.
- 11 Motives (nine items), the frequency of use of various devices (six items) and music-related activities (four items) were entered as indices (means).
- 12 Question: 'Which statements on the system would you agree with? The system ... is advantageous to all users ... provides a fair idea'. Answer categories: 1 = perfectly true to 5 = not true at all (mean (advantage) = 2.0; *SD* = 0.9; mean (fair): 1.9; *SD* = 0.9).

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