Consumers in the virtual world: what do they share, download and stream?

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Abstract: The aim of this paper is to get a better understanding of what file-sharers actually search for on P2P-networks in terms musical works, particularly audio files; New, old, mainstream or obscure? Extensive data from two P2P-networks was processed and compared to (1) data on music video downloads from a Swedish 3G-operator primarily focusing on content services as an tool to get new and faithful customers, (2) music requested on a successful Nordic web radio channel and (3) legal downloads in Sweden. The study concludes above all that diversity, level of control and price are common denominators for all types of successful on-line services, no matter if they are considered legal or not.

1. Introduction

Concentration of ownership and declining cultural diversity in broadcast media has been observed in many countries. One comprehensive empirical study[1] of Swedish national broadcasters covering eleven years has proved both static and declining length of play-lists (68 and 84% respectively) and increasing similarity of play-lists between broadcasters (47%).

In 2003 three major commercial networks controlled 70% of the available commercial radio licences in Sweden (1993 30%). In July 2004 MTG Radio acquired no less than 20 licences from the French rival NRJ making it even more dominant in the market. One consequence is fewer gatekeepers (those who decide which songs to be played) making it increasingly difficult for artists to get exposure, probable one factor contributing to the growing number of often artist-owned record companies which make material available over the Internet.

Diversity has been mentioned as one of the main success factors of Peer-to-peer networks (P2P). At virtually no cost apart from ISP fees, users have been able to customize the use of their downloaded material on PCs, cell-phones or other portable players. In other words diversity, control and price. The early response from the music industry, apart from trying to kill these networks, was to launch their own services with limited diversity (only label-related), limited level of control (e.g. one physical computer and files automatically deleted upon end of subscription) and a limiting price model (unable to compete with obvious advantages of CDs and P2P-networks).

Since the introduction of iTunes Music Store in April 2003 over 1 billion tunes have been purchased through this service. Today, in August 2006, iTunes, with 2 million available titles, still is the dominating downloading service despite many major competitors. Distinguishing features are: reasonable diversity, an acceptable level of control and a price considered more or less reasonable by consumers.

Legal digital sales are indeed becoming more and more important revenue sources for record companies. For example digital sales accounted for 5,5% of EMI Music's revenues for 2005, a growth by 150% since 2004[2].

Encouraged by a maturing market for legal downloads, Universal plan to offer downloads of hundreds of thousands of out-of-print releases[3]. Some of these have previously only been released on vinyl. This will probably entail a larger business opportunity than the major CD sales of the 90's when music lovers replaced their LPs with digitally re-mastered recordings on CD resulting in the all-time-high sales peak in 1999. More recently Universal[4] has gone one step further, announcing a major advertising supported service offering free downloads of all Universal-controlled recordings.

Even though legal digital downloads are booming, the artists' share of this new revenue stream does not seem to go the same way. In France legal downloads costs 99 eurocents, the artists get 3 on average, composers/publishers get 7 and producers (read: record companies) get 65. The rest is royalties to DRM-companies, ISPs and credit card operators such as VISA[5]. These figures coincide with analyses made by the US Trade paper Billboard and reprinted in Music and Copyright in 2003. Artists, producers and composers/publishers get 7, 3 and 8 cents (USD) respectively per sold audio file (0,99 USD). However this is not entirely true since some record companies have introduced a deduction for "establishing a new distribution channel" which means that artists end up with far less than 7 cents. Composers can end up getting less than the credit card company.

Parallel with the legal on-line success, the war against file-sharers continues as before. In parallel with suing software companies and individuals, P2P-networks are flooded with false links, so called "decoys" and false files, so called, "spoofs" in order to annoy users and slow down the service[6]. This has probably encouraged file sharers to move to less infected and/or more closed networks[7].
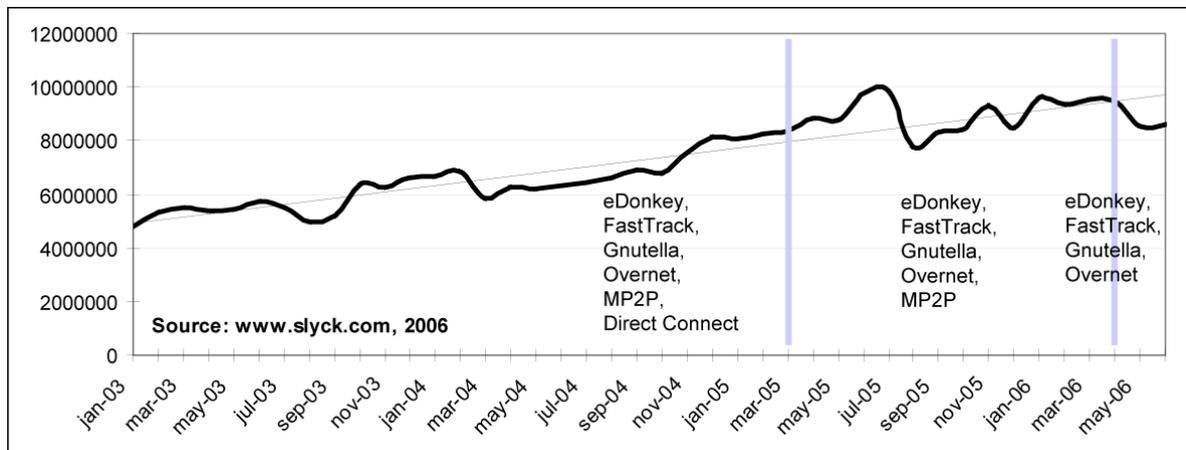

Figure 1. The total number of members on file sharing networks from January 2003 to June 2006.
Note: The popular BitTorrent network is not included.

According to IFPI the number of illegal files present on P2P networks is flat despite an overall increase of broadband penetration[8]. Of course illegal files the Internet can be a suitable parameter in measuring file sharing activities, but the total number of files sharers is increasing according to aggregate statistics from the P2P-news website slyck.com.

The site has been monitoring the number of file sharers on five major P2P-networks since 2003. Some single networks like FastTrack (e.g. KaZaA) are decreasing in terms of active users, but the tendency is that the total number of members on file sharing networks is increasing.

According to figures from the P2P-monitoring service BigChampagne in 2005, there were 8,8 million file-sharers worldwide, a number that fairly coincides well with data from slyck.com. Figure 1, with data from the latter source, indicates a constantly increasing total number of file-sharers on several major file-sharing networks from 2003 to 2006. Most surprisingly, these figures don't include the massively popular BitTorrent network.

Furthermore the nature of these networks makes them difficult to measure. For example all file-sharers are not logged in simultaneously around the globe, the use of P2P-networks with a different architecture (e.g. Bit Torrent), encryption, dynamic IP-addresses (common when using DSL-connections), multiple users on computers and finally portable computers using multiple IP-addresses (home, at friends house, hot-spots, hotel, school or at work).

The ever-growing popularity of P2P-networks and the parallel success of legal downloading rises questions about the content in both worlds. Some studies have namely concluded that avid file-sharers are also frequent CD-buyers, on-line shoppers and concert lovers[9, 10].

2. Objectives

The main objective of this paper is to analyse the types of musical works that are shared and downloaded among file-sharers. Were they newly released acts, old, obscure or perhaps unknown music? Is the focus on a limited number of titles or rather an even spread over a large numbers of titles?

A second objective is to compare file-sharing firstly to legal downloads, and secondly to 3G and web-radio in order to discover coinciding patterns. The comparisons can give valuable information about probable future success strategies.

3. Methodology

The main data for this paper has been derived from two empirical case studies of P2P-downloads. The first focused on files requested on numerous significant Direct Connect hubs during May 2005. The second involved similar sniffing data from a major Gnutella node in March 2003, involving considerable P2P-traffic foremost from American university campuses. These studies can of course be criticized of being insufficient in terms of their extent. However it is difficult to do anything but spot tests in the oceans of file-sharing networks.

A third study focused on data on legally downloaded material via the Swedish branch of iTunes and its competitors in Scandinavia. As a complement empirical data of recent music video downloads (streaming) from the Swedish branch of the 3G-operator "3" have been used to widen the perspective to mobile downloads. Songs requested on a Swedish web-radio channel, Jan thru May 2005, have also been used to broaden the picture even more.

4. Empirical studies

4.1 – Musical works searched on Direct Connect

The data of this empirical study was gathered in May 2005 using a computer connected to several major so-called hubs on the Direct Connect file-sharing network. The study was performed on a computer in Sweden running on Apples OS X with tailored "sniffing" software connected to Internet via a 6 Mbit ADSL connection. Direct Connect version 1.1.0 for OS X from Neo Modus was used as file sharing client. The computer was connected to

as many hubs at possible, preferably the bigger (read: more users) the better. Neither the nationality of the hubs nor the nationality, identity/nicknames or IP-addresses of the connected peers was recorded, but the presence of Swedish and other Scandinavian peers was obvious.

Both the names of hubs and peers often used unofficial name conventions describing the nationality, connection speed, ISP and – in case of hubs – the expected connection speed of candidates applying to be accepted by the administrators, their minimum amount of sharing (often tens of Gigabytes) and what type of material peers were expected to share.

The "sniffing" computer shared some 5 Gigabytes of material, pictures and music with the rights holders' permission and gathered during May 2005 some 200,000 questions, nearly 13,000 containing any of the abbreviations "mp3" or "wma". The latter one is Windows Media Audio, the native audio format used by Microsoft in Windows Media Player. Numerous portable mp3-players are compatible with the wma file format, which also supports DRM and is a de-facto standard in legal downloading sites outside iTunes.

Despite the dominance of Windows among personal computers, the mp3 file format proved to be far more popular (97%) than wma (3%). Search strings containing the abbreviation "mp3" proved to be more than twice as popular than "avi" (a movie file format) and nearly four times more popular than "mpg"/"mpeg" and "dvd" respectively.
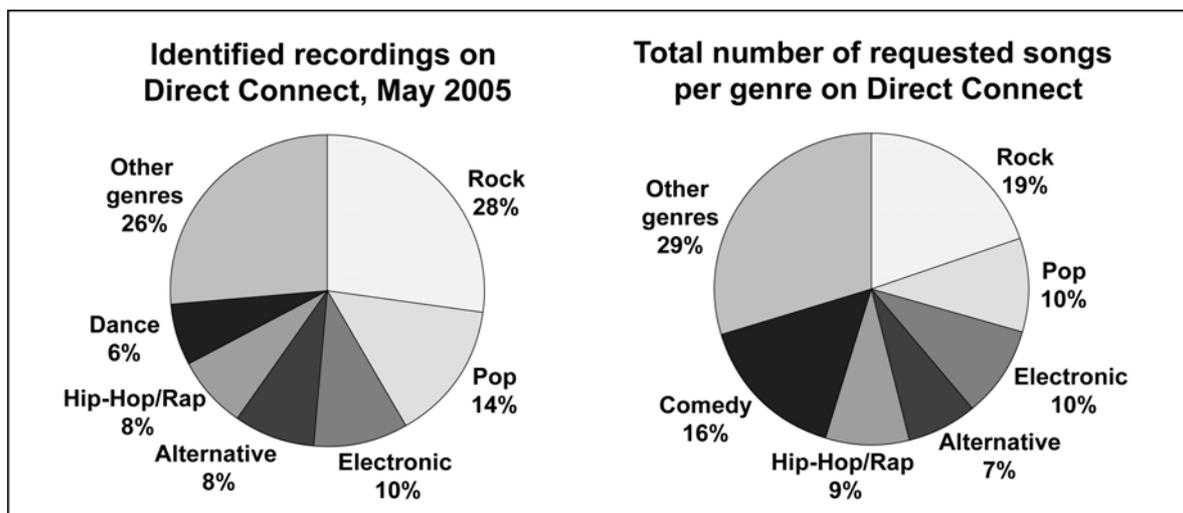

Figure 2 (left): The division of identified recordings searched on Direct Connect, May 2005.
Figure 3 (right): The division of the total number of requests per genre on Direct Connect, May 2005.

Thousands of search strings were randomly selected for classification and this data was manually entered into the search engine of the iTunes music store. Matches to existing recordings were filed – with title, artist/group, genre and earliest year of release. This procedure continued until at least 1,000 recordings had been identified.

Search strings such as "Track 11 mp3" (irrelevant) or "jealously mp3" (matches with too many different works) were ignored. When a recording wasn't available in iTunes Music Store (e.g. "obscure"/"narrow" genres or many Swedish artists/groups) Google and Wikipedia were used in order to discern a possible earliest year of release and genre.

Of course some recordings were searched many times via similar questions. All similar questions for a certain recording (title + artist/group) were merged into one and the number of searches was thereby summarized. In other words two recordings of one work but with different artists/groups was counted as two individual recordings.

In the list of about 1,000 identified recordings three genres were dominating; rock (28%), pop (14%) and electronic (10%), see Figure 1. The biggest individual slice of Figure 2, "other genres", consisted of no less than 18 genres, for example R&B, reggae, new age, jazz, inspirational, French pop, folk and classical.

But some specific recordings, as one would expect, were requested many times. Figure 3 illustrates total number of questions per genre. Again rock got most of the "votes" (19%), pop (10%), electronic (10%), hip-hop/rap (9%) and alternative (7%). Surprisingly the genre comedy got (16%), probably due to that one peer happened to share a limited number of very popular files during that time period.

Figure 4 shows the age-spread of the requested songs. In the list of over 1,000 identified recordings on Direct Connect the average age of a recording proved to be as old as 7,23 years (median age 3). The year of 2005 was considered as year zero. Recent releases proved to be popular, but the centre of gravity is dislocated towards somewhat older works as seen in Figure 4.

Of course some works got more requests than others. The most and least requested songs got 357 and 2 "votes" respectively. When plotted, the numbers form an exponential graph similar in shape to Figure 3 but far more steep. A closer analysis shows clearly that a vast number of songs got a very limited number of requests. The median proved to be only four requests and the average song was requested about 10 times.

4.2 – Musical works requested on the Gnutella network

The data for this empirical studying the Gnutella network was originally gathered by the security company Palisade Systems in February 2003. During three weeks a computer acted as a node on a Gnutella network in U.S. recording 22 million searches in order to categorize the type of material shared and downloaded on a typical P2P-network[11].

Input to this paper was primarily more than 200,000 random searches focusing on audio files derived from Palisades database. The searches showed that much data originated from edu-networks in the USA, most likely giving a good indication of what adolescent music consumers are interested in.
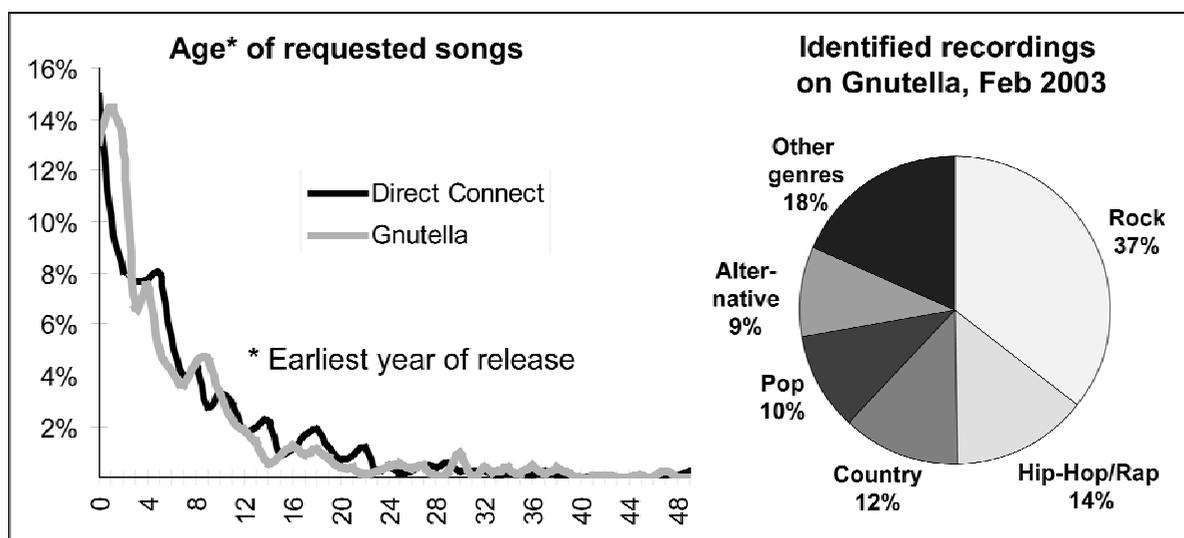

Figure 4 (left): The age of identified recordings on Gnutella (grey) and Direct Connect (black).
Figure 5 (right): The division of identified recordings on Gnutella, February 2003.

The data was processed in a similar way as described in the Direct Connect study. In this data the mp3 file format proved to be even more dominant (98.2%) compared to wma (1.8%). A little bit more than 1,000 titles were identified, and in the list of songs the average age of the recordings turned out to be 6,90 years (median age 4).

The year of 2003 was considered as year zero. Again figure 4 illustrates an obvious interest for recent released music but also somewhat older releases.

Figure 5 shows that the genre rock proved to be dominant (37%) followed by hip-hop/rap (14%), country (12%), pop (10%) and alternative (9%). The slice named "other genres" consists of thirteen genres from R&B and Latin to world music.

4.3 – Musical works downloaded from legal downloading sites in Sweden

At time of writing, real and reliable statistics from legal downloading services on the market are hard to access due to legal and competition issues in the market. Besides iTunes there are a number of distributors of digital downloads in Sweden, among others, InProdicon – providing solutions for many online shops in the Nordic region – and 24-7, technical supplier for CDON and Elgiganten.

However according to staff at the Swedish Performing Rights Society (STIM, a limited number of titles receive about 1,000 or more downloads each. Surprisingly, among hundreds of thousands of downloads, tens of thousands of titles are "active", i.e. get at least one download. In other words the download frequency distribution equates to the shape of the graph in Figure 3.

According to staff at STIM, two patterns are noticeable: Firstly, many customers buy complete digital collections of their favourite groups. Secondly, many customers buy individual tunes, i.e. "cherry picking", but the emphasis is not on top-list music. Thus, the legal digital market can be characterized by a) absence of heavy downloads of a limited number of popular works and b) a huge interest for non-top-list music.

 When it comes to mobile ring-tones the most popular songs (10-50) are more heavily downloaded (about three times more) compared to iTunes, InProdicon, CDON and others. In other words the graph decreases more rapidly. The emphasis on top-list music can likely be explained by the limited diversity offered by resellers and the age of the customer base. In fact the total number of unique titles purchased as mobile ring tones is only one third compared to legal downloads via Internet.

4.4 – Musical works requested on a Swedish web radio channel

The web radio channel and music community Spraydio (www.spraydio.com) started as a hobby project in 1998, by two young Swedish programmers[12]. In early 2001, Nordic Web Radio (NWR) acquired Spraydio and from April 2001 to April 2006 the number of unique listeners have almost doubled to 100,000 per month. At the same time the overall interest for web radio has boomed among all in Sweden.

By the end of August 2006 Spraydio's' community had over 182,000 registered music enthusiasts. Anyone can listen to the web radio but only members can vote for songs to be played in any of the twelve so-called "rooms" reflecting different genres. Hundreds of thousands of recordings are available and new songs are constantly being added upon request.

During January to May 2005 over 60,000 songs (titles) were requested on Spraydio (average 12,7 requests/song and median only 4 requests). The total number of "votes" amounted to 765,503.
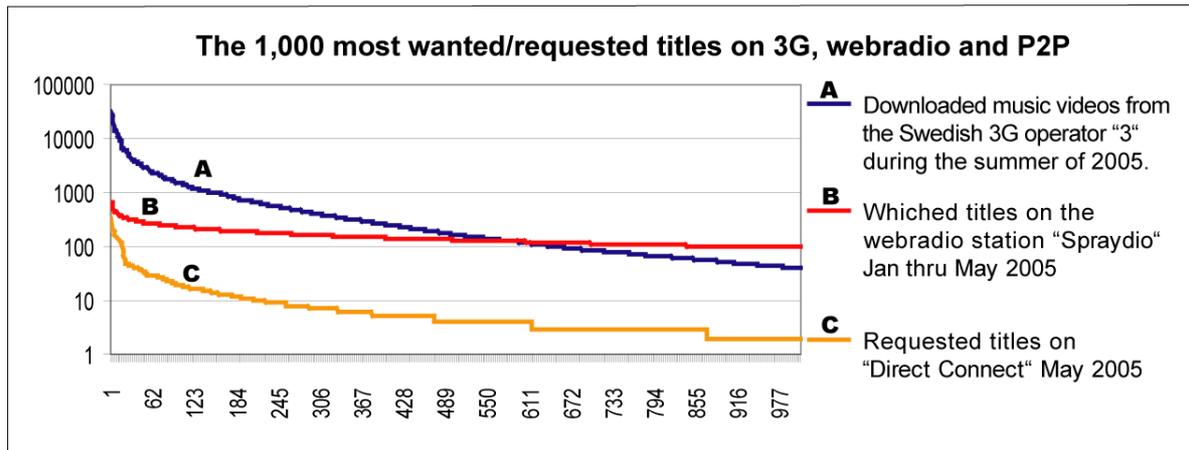
Figure 6: The 1,000 most downloaded/requested titles on the 3G operator "3"(summer 2005) the Nordic web radio channel "Spraydio"(Jan-May 2005) and requested titles on several Direct Connect nodes (May 2005). Note: logarithmic scale on the Y-axis.

Figure 6 illustrates the division of the 1,000 most popular songs requested by Spraydio's members. Figure 6 reflects both a big interest for a limited number of titles, but more apparent is diversity in terms of number of requested titles. The interest for local acts (Swedish) is much higher than in the data from Direct Connect and Gnutella. It is obvious that more than 50,000 recordings only get a handful of requests.

4.5 – Music videos downloaded from the 3G-operator 3 in Sweden

When the Swedish operator "3" launched its first 3G-service in May 2003 all competitors were already established on the GSM market. In order to quickly gain a reasonable market share 3 had to offer more than just lower rates for speech and services like SMS and MMS.

The operator offered different types of content services, e.g. video telephony and music, in order to attract customers. During the summer of 2005 new customers could download unlimited numbers of music videos to their 3G-terminals. Today the operators' 500,000 Swedish customers can choose among many music services for a fixed price. In fact content packages like music, news, sports entertainment and (since summer 2006) chat via MSN Messenger are becoming more and more important sources of income for 3 and an important marketing tool [13].

Exclusively for this paper, 3 provided a complete list of music video downloads from the campaign in 2005. The data from end of September 2005 consisted of about 1,900 music videos; artist, title and total numbers of downloads. The span of downloads (from 1 to 31,283) made it necessary to use a logarithmic scale when plotting the data, see Figure 6.

The extreme emphasis on a very limited number of songs was probably a result of the TV-ads during that period of time, the presentation of songs in the java based player used in the subscribers' 3G-phones and the limited number of titles in the beginning. Nevertheless figure 5 shows an interest for many recordings, and follows the pattern of record sales in Sweden, namely many Swedish acts.

5. Conclusions and Summary Recommendation

Collecting data for studies such as this is very difficult. Firstly reliable information about legal downloads is hard to get due to legal issues and competition fears. Secondly the very act of "sniffing" (listening to data traffic) raises serious questions about privacy. However this type of data mining is often used by the entertainment industry in order to get information about trends, habits and sue file-shares for copyright infringements.

Many results confirmed previous assumptions regarding activities on P2P-networks. One conclusion that can be drawn is that searches on these networks truly reflect a broad diversity in terms of requests rather than massive requests for certain works. In fact the common denominator of the investigated P2P-networks, legal downloads from iTunes in Sweden, Spraydio and video downloads from the operator 3 is simply _diversity_.

A surprising observation was the high average age of songs requested on the investigated P2P-networks - Gnutella 6,90 and DC 7,23 (median 4 and 3 respectively). The most remarkable observation was the interest in works older than twenty years. When considering a worldwide P2P-community of definitely 10 million (but probable many times more) active file sharers, "older" music represents millions of music files.

P2P-networks are indeed used in order to seek out songs that definitely cannot be found on legal download services. In many cases the music is only available in vinyl; titles that nowadays only can be found in second-hand shops, eBay or similar services.

The earlier mentioned strategy of releasing downloads of older recordings, some previously only released on vinyl, seems to be a promising way forward. Firstly in order to compete with the diversity found in file-sharing networks. Secondly in order to catch up with decreasing CD-sales partly due to so-called cherry picking – an obvious pattern of the modern music consumer at legal downloading sites. According to IFPI's 2006 digital music report[14], both legal down loaders and illegal ditto are namely cutting back on their CD purchases (25 and 35% respectively).

Once legal alternatives prove to be faster, delivering a high and consistent level of quality to a decent price, record companies can live up to the original vision of Steven Jobs' iTunes: To outperform illegal file-sharing. In other words the maturing digital market is opening doors to an unlimited global market without the disadvantages of the physical world, such as reproduction costs, distribution and packaging. In fact some major labels already have created sub-labels for acts that will only be released for digital downloads.

We have seen the beginning of a shift from highly controlled marketing via record companies towards consumer led marketing, where consumers demand to decide when and what songs to buy. In earlier days record companies tried – to a much greater extent – to control the exact order of single releases prior to album releases.

However the present incompatibility of legal download services, i.e. iTunes vs. all others, is limiting true competition and is therefore hindering a real boost in on-line sales.

A second major obstacle is problems regarding moving songs with DRM-protection to and from devices such as PCs and portable players. However all major downloading services allows users to burn real CD-tracks. As the use of digital downloads mature, users will probably use this opportunity to make DRM-free files such as mp3 in order to maximize portability between devices and secure future access to their purchased digital assets. This raises questions about of the real benefit of complicated DRM-systems in the long run.

A recent pan-European study[15] concluded that the biggest sources of digital music in mp3-players, computers and other similar devices were firstly "own CDs"(77%), secondly "CDs of family/friends" (71%) and thirdly "from file sharing networks" (51%). In other words "off-line networks" seem to be a bigger source of piracy than file-sharing networks. After the major debacle with intrusive CD copy protection by Sony BMG in 2005 it will

probably be harder for record companies to prevent consumers from making DRM-free files of CDs they buy.

Digital downloads via the 3G-net has perhaps the biggest potential for growth. Firstly 2G- and 3G-customers are already used to pay for all kinds of services (voice, video-telephony, SMS, MMS, e-mail etcetera). Secondly, instant access to a reasonably fast ubiquitous Internet connection opens opportunities for impulse purchases, for example music that you happen to hear on radio. However the present limitations of 3G-terminals in terms of forward-lock inhibit the moving of purchased material to new terminals. As DRM standards for 3G-terminals mature we'll se a real boost in these kinds of legal downloads. Until then we'll probably see operators offer dual-downloads (PC and cell phone), as with the operator 3 in Sweden, or maybe Universal's announcement of "free" advertising-supported services will turn all existing business models upside down.

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