

# **White Knight or Trojan Horse? The Consequences of Digital Rights Management for Consumers, Firms and Society (\*)**

**Thierry RAYNA**  
Imperial College London

**Ludmila STRIUKOVA**  
University College London

**Abstract:** Due to its ability to solve all main problems associated with digital goods, Digital Rights Management is the favourite option used by companies to tackle piracy. The aim of this article is to discuss the consequences of DRM for consumers, firms and society. The rationales of DRM are discussed and the expected benefits for firms are presented.. In contrast, consumers are shown to be likely to see few benefits in DRM. This article demonstrates that even a standard DRM system is unlikely to improve social welfare. The article concludes with some public policy recommendations.

**Key words:** Digital Rights Management, Digital Goods, Piracy, Excludability, Durability, Sampling.

**T**he content industry is, especially since the appearance of the digital goods, one of the fast growing and innovative industries. However, the growth and viability of the companies in this industry are seriously undermined by the extent of consumer piracy, which seems to be, in addition to innovation, the main characteristic of this sector. One of the most common solutions to fight against piracy and enforce intellectual property rights is the introduction of Digital Rights Management (DRM) technologies.

The purpose of Digital Rights Management is to help content creators protect the content from uncontrolled use and distribution. DRM systems work in such a way that any action of the consumer that is not explicitly

---

(\*) We would like to thank the participants of the EuroCPR 2007 Conference for their useful comments and suggestions. We are in particular thankful to Richard Hawkins, Edward Steinmueller and Lorenzo Pupillo.

authorised by the producer is, by default, prevented. As such, these systems allow to prevent the copying, sharing, as well as the simultaneous use of digital goods. Furthermore, DRM systems make the anonymity of consumption impossible since they require a formal identification before protected digital goods can be consumed. Supporters of DRM believe that DRM can provide a secure distribution of digital content. As a side effect, DRM can allow the firms to gain some additional strategic advantages (switching costs, consumers lock-in, barriers to entry, absence of second-hand market, collection of information on the consumers' behaviour) and can also help the firms appropriate extra revenues (DRM allows the firms to charge the consumers several times for the usage of the same digital goods at different locations e.g. home, work, car).

The opponents argue that DRM is not very effective in preventing piracy, but can prevent the legitimate users taking full advantage of the digital media. The Foundation for a Free Information Infrastructure notes that DRM can act as a trade barrier. There is also a view that DRM can prevent future historians from recovering the necessary data due to the variety of technology required to read the data. Finally, the DRM opponents state that DRM infringes private property rights and very often restricts user's activities. The other problem associated with the DRM is that, since there is no standard for DRM and no compatibility between the existing systems, it causes additional problems for the consumers, the firms and eventually for the society.

The aim of this article is to discuss the consequences of DRM for consumers, firms and society. First, the rationales of DRM are detailed. This is followed by an analysis of the strategic advantages created by DRM and the possible limitations. The issue of the impact of DRM on consumers is then assessed. Finally, this article conducts an in-depth study of the consequences of DRM on social welfare and recommends some policy changes as well as some improvements of the DRM strategies of firms.

## ■ The rationales of Digital Right Management

Digital goods are goods that are distributed in digital format (i.e. encoded in binary form, as a succession of 0s and 1s). Nowadays, most entertainment goods (such as music, movies, computer games and books)

and also a large number of professional tools (software, documentation, stock pictures) are digital goods.

Due to their digital nature, all these goods have a common characteristic: they are replicable. Indeed, digital goods can be copied without loss of quality or information. Therefore, a copy of a digital good is a perfect replica (a clone) of the original. As a consequence, digital goods are independent of the medium used to distribute and store them. More precisely, the binary form used for encoding them ensures that these goods can be transferred from one medium to another without loss of quality or information.

The digital nature of digital goods has important consequences in regard to the economic characteristics of these goods. First of all, their replicability makes digital goods both public and durable. Secondly, the economic value of digital goods lies in the content embedded in these goods. As this content is either information, culture or entertainment, digital goods are experience goods.

These three economic characteristics are expected to lead to important challenges for the firms that produce digital goods. First of all, the public nature of digital goods is likely to lead to a free-riding behaviour of consumers (RAMELLO, 2005). The inability of firms to exclude consumers leads to a wide piracy phenomenon and, thus, undermines their ability to make profits and recover the initial fixed cost of production. Moreover, digital goods have common characteristics with ideas, information and innovation. All these types of good are also known in the literature as leading to market failure because of their nature. The usual argument (ARROW, 1962; NORDHAUS, 1969; AGHION & HOWITT, 1992) is that, in the absence of a proper protection system, the market fails to produce a sufficient quantity of these goods. This is due to the fact that, since the replication cost for these goods is negligible, the marginal cost of such goods is equal to zero. Therefore, in a competitive environment, the price of these goods is expected to equal zero.

Secondly, the potentially infinite durability of digital goods deprives firms from the large amount of revenues they used to enjoy because of the renewed purchase of consumers. Its important to note that sales are further decreased by the universality of digital technology and the perfect replicability: consumers are now able to use the same unit of digital good with various devices: Hi-Fi, computers, MP3 players, etc., whereas before the advent of digital technology, several purchase could be required in order

to obtain an optimal quality (e.g. consumers could have to purchase both a vinyl and an audio tape of the same album).

Finally, the fact that digital goods are experience goods makes consumers reluctant to purchase these goods before they are able to experience them and determine their value. As a consequence, firms have to supply consumers with samples of the digital goods. If they do not do so, consumers may be encouraged to conduct their own sampling activity by pirating. In this case, they are very unlikely to be willing to pay for a legitimate version of the digital goods once the good has been experienced. However, providing consumers with samples is not always an easy option. Indeed, firms need to ensure that the consumers are only able to consume the sample a small number of times, as otherwise consumers will probably decide to not purchase the product. For some digital goods, it may be possible to offer, as a sample, a truncated/stripped down version of the digital good (as it is often the case with electronic books, films and software). Nevertheless, such a strategy may cause consumers to underestimate the value of the digital good, thereby reducing their willingness to pay. In addition, the value of some digital goods, such as music, is unlikely to be revealed by partial sampling, and may even require repeated experience.

These three economic characteristics of digital goods raise a serious challenge for government and policy makers: without public intervention, the number of market failures and the resulting loss of social welfare are likely to be very high. The usual solution to this type of problems is the use of intellectual property rights, which can help to safeguard creator's award (MERGERS & NELSON, 1990). However, although IPRs may act as an efficient deterrent in the case of inventions, they do not have much effect in the case of digital goods, because of the massive scale of piracy phenomenon (RAYNA, 2006a).

## ■ Digital Right Management systems

The purpose of Digital Rights Management is to help content creators protect their products from uncontrolled use and distribution. As opposed to enforcement of IPR, which occurs after the infringement (and is thus punitive) has occurred, DRM aims at preventing the infringement from initially taking place (and is thus preventive). The DRM protection is embedded into the digital good itself and consists of encrypting the digital

good, which can therefore not be consumed without being decoded first. The DRM tags embedded in the file contain precise information about the owner of the file and the rights of usage this owner has. For example, in order to be played on a computer or on a media player, a music file protected by DRM has to be activated. The activation is made by contacting a central server on the internet. The consumer is then asked to identify herself, and this information is compared with the owner's information included in the file. If the authentication is confirmed, the computer receives a key allowing to decode, and play, the music file. In addition to the decoding key, data containing instructions about potential restrictions may be transmitted to the computer. Indeed, DRM systems allow to restrict the number of times the music file is activated, so that consumers cannot consume the same music file on more than one computer at the same time, it can also prevent the file from being copied/transferred, or exported, more than a certain number of times.

The most popular (in terms of usage) DRM technology, at the time of this writing, is FairPlay which was created by Apple and is used by its products and services, such as iPod, iTunes and iTunes Store. The files protected by FairPlay can only be played on authorised computers and at most five computers may be authorised at the same time. Consumers can, however, burn their music files on CDs which will have legal, but not physical restrictions. Yet, a particular playlist can only be burnt up to seven times, though the overall number of burns is not limited. The main issue related to FairPlay is that, because of Apple's refusal to licence its technology, songs purchased from iTunes Store can only be played on Apple's iPod media player (although they play on any Windows or Mac computer) and the only DRM protected songs compatible with iPod are the ones purchased from the iTunes Store. Despite these limitations, this technology is the most used one, certainly owing to iPod's 80% market share in the market for portable media players. Since the introductions of films, video clips and TV programmes on the iTunes Store, FairPlay technology is also available to protect video content.

Other DRM technologies are much less popular and are (by order of popularity): Microsoft's PlayForSure, RealNetworks' Helix, Sony's ATRAC. These three DRM systems are able to protect both audio and video files. These technologies allow to establish similar restriction as Apple's FairPlay.

Both Microsoft and RealNetworks licence out their technologies. There are still, however, some restrictions. Microsoft PlayForSure only functions on Windows and RealNetworks Helix has to be used in conjunction with their

Real's content distribution server. Like Apple, Sony has refused to licence out its ATTRAC technology and is, to this day, the sole user of this system. Microsoft recently adopted a similar approach, since they developed a new DRM technology (used by the new portable media player Microsoft Zune) that they have decided not to licence out.

## ■ Digital Right Management as universal solution?

Although Digital Rights Management systems were primarily developed as a solution to piracy (and thus addressed the problem caused by the publicness of digital goods), these systems also provide a solution to the problems caused by durability and uncertain ex-ante value of digital goods.

With regard to the publicness of digital goods, DRM enables to increase the excludability of digital goods, and thus to reduce (or eliminate) piracy. Since DRM protection requires an authentication for the digital good to be consumed, a consumer able to obtain a pirated copy of the good is unable to consume this digital good unless it is activated. Since the activation is granted by firms only, this means that DRM restores the excluding capability of firms. To this respect, BOMSEL & GEFFROY (2006) note that "[...] DRMs are intellectual property institutions [and] transpose the empirical principle of copyrights [...] into the digital era". In fact, although DRM and IPR defend the same rights, DRM is superior to IPR laws, since it prevents copyright infringement and does not bear additional costs (such as litigation costs) (RAYNA, 2006a). IPR laws, on the contrary, can only be used after the infringement has occurred.

In terms of durability, DRM allows the firms to control the life span of digital files. It is indeed possible to restrict the consumption to a fixed amount of time. Although firms do not usually sell "short-lived" digital goods, DRM also created the possibility to rent digital goods instead of selling them. Without DRM, renting digital goods online is obviously not a feasible option, since the consumer would still be able to enjoy the digital good (or a copy of this good) even without paying the rent. DRM enables firms to set up a time period after which the good will not be playable anymore unless the authorisation is, once again, granted. This ability to rent is extremely important for firms. Indeed, the main consequence of durability is that it reduces the market power of the firms and leads them eventually to sell at

the price equal to marginal cost (COASE, 1972; STOKEY, 1981; BULOW, 1982, 1986).

With regard to durability, DRM also allows to make digital goods, which are potentially infinitely durable, as obsolete as the hardware which is used to play/execute them. Indeed, DRM systems are such that the consumption of a protected digital good is authorised on a particular piece of hardware (a computer, a portable media player, etc.) that is identified by a unique number. If this hardware is replaced by a new one and the digital goods stored on the old hardware are transferred by consumers onto the new hardware, these a new authorisation will be required in order for the goods to be played. Firms are thus able to charge consumers each time they change their hardware. As such, DRM prevents digital good from having a higher durability than hardware. Since most electronic devices have a life expectancy of, at most, three years, DRM systems ensure a constant and sustained demand for digital goods instead of a constantly decreasing one, as it is the case with durable goods.

Finally, DRM makes it possible for the firm to use sampling for digital goods. First of all, sampling is made possible since firms can set-up a free trial period of the digital goods, enough for the consumers to assess the value of the goods, after which the consumption is made impossible without authorisation (and payment). In addition, DRM enables firms to design fine-tuned sampling: since DRM requires a formal identification of consumers, a per-user sampling system can be designed. This ensures that the trial period, the length of which is based on the tastes of each consumer, is long enough for the consumer to fully assess the value of the product, but short enough to keep the incentive to purchase the product.

All economic characteristics of digital goods tend to lead to a decrease in the demand for legitimate digital goods. Because of its ability to enforce excludability and to make renting and sampling practical, DRM allows to restore the demand for legitimate digital goods. In addition, since DRM enables fine-tuned sampling and expands the marketing options; it is even likely that it will *in fine* lead to an increase of the demand for legitimate digital products.

It is important to note that, although DRM provides firms with important advantages, it also has some important limitations. First of all, only a minority of digital goods is nowadays protected by DRM, and for any digital good protected by DRM, it is still possible to purchase the same digital good in an unprotected format.

The second important limitation, which is linked to the previous one, is that all existing DRM systems have been cracked, and patches allowing to remove the protection can be downloaded on the internet. Even if that were not the case, as long as protected digital goods can be transformed into an unprotected format (it is the case with most DRM systems since they allow to burn the downloaded protected digital goods on CDs or DVDs) piracy is made possible. Ultimately, the rule of thumb is that as long as it is possible to see or to hear a digital good, it is possible to copy it (for example, many computer programmes are nowadays able to intercept the video and/or audio signal sent by the computer to the monitor and/or to the speakers when a protected digital good is played, and to create an unprotected file from this signal).

A third shortcoming of DRM is the absence of standard and the incompatibilities between DRM systems. This is indeed likely to slow the adoption of DRM protected digital goods by consumers, since they are aware of the switching costs created by DRM.

## ■ Digital Right Management and consumers

From the consumers' point of view, DRM decreases consumer welfare, because it enables firms to charge a price above marginal cost. Although consumers may anticipate that this short-run loss of welfare may be later compensated by an increase of welfare caused by an increase in the quality and variety of the goods supplied, the restrictions usually imposed on the consumers by the DRM systems make it likely that consumers will avoid, as much as possible, consuming protected digital goods.

First of all, DRM can remove some of the characteristics that are normally associated with digital goods. DRM makes protected digital products inferior to the non-protected ones, for instance e-books or protected audio files cannot be lent and it might be not possible to make a backup copy. In addition, as discussed above, DRM systems remove the ability to resell digital goods and reduce their universality and durability.

This is likely to have important consequences, since consumers still have a possibility to access digital goods, legally or illegally, that are not protected by DRM. For example, Audio-CDs are not protected by DRM. In contrast to a protected audio file, the content of a CD can be freely transferred to many devices (computers, portable media players, etc.). The consumer is able to



lend the CD, to make backup copies of the CD. The good is thus infinitely durable and fully universal. Regardless of the new standards and new devices being created in the future, the owner of a CD is certain to be always able to consume the music recorded on this CD. When the consumer is not willing anymore to consume this particular CD, it can be sold on the second hand market.

Likewise, there are important differences between the films protected by DRM and the films distributed on DVD-Video. Although DVD-Video cannot, theoretically, be copied (widely available software still allows to easily bypass the copy protection), they can be lent and resold. Their durability is also high, and they can be used on any compatible device. Similar examples can be found for most digital goods.

This lack of features, in comparison to unprotected digital goods, means that consumers are unlikely to be willing to pay as much for protected digital goods as for unprotected ones. As a matter of fact, protected digital goods are often sold at a cheaper price than unprotected ones or than their physical equivalents. Nevertheless, in addition to the loss of value created by the presence of DRM, digital goods sold online often have additional differences to the other digital goods. For example, music and movies sold online are heavily compressed, which causes a sharp decrease in quality, as opposed to the same good being distributed on a CD or DVD. This means that, for consumers, digital goods protected by DRM may have much lower value (since they have fewer features and a lower quality) than the equivalent unprotected ones. Yet, the difference in price between these two types of digital goods is often rather small.

It could still be argued that protected digital goods bring extra value to the consumers because of their fast online access and their low transaction cost. Although this is undeniable, consumers also have access to unprotected digital goods that have similar features: pirated digital goods. These digital goods are also available online for a low transaction cost. In addition, they are available for free. Moreover, their determinant feature from the consumers' point of view is that they do not have any of the restrictions created by DRM.

Thus, consumers are facing a dilemma. If they want to access digital goods online, they can either choose DRM protected files, which are legal, but have a low value due to the restrictions of DRM, and a comparatively high price or they can download pirated digital goods, which are illegal, but have no restrictions, and are available at no cost. It can even be argued that

law-abiding consumers are, in a way, "punished": although they do pay for their digital goods, the digital goods they obtain have fewer features and involve tedious authorisation process. In contrast, consumers who decide to pirate obtain full-featured digital goods, for free.

Another important consequence of the presence of DRM for consumers is the absence of secondary market. Indeed, digital goods are, for most of them, experience goods: their value is, for consumers, uncertain and only becomes known after at least one episode of consumption and, sometimes, only after many episodes. The durability of digital goods usually makes up for this uncertainty. Since the digital good is durable and can be sold on the second-hand market, the consumer is able to recover at least part of his initial spending if the good is revealed to be unsatisfactory or not to her taste. However, the absence of second hand market removes this possibility and increases the potential loss of consumers who are thus expected to be even more reluctant to spend money on digital goods that they did not experience. Thus, by preventing the existence of secondary market, DRM makes the existence of sampling even more critical.

Unfortunately, in spite of the great potential improvements brought by DRM as regards sampling, little has been done, so far, by firms to take advantage of this feature. Regardless of the type of digital good, the samples offered by the firms are very much like what existed before the introduction of DRM. For example, the iTunes Store offers 30 seconds sample for music; films samples still rely on trailers/teasers of 30 seconds to one minute; software samples are still either limited in time or in terms of features. Despite the fact that DRM makes it possible to personalise and tailor sampling for each consumer and each type of digital good, the same sampling strategy is used for all consumers and all digital goods.

Since one of the main motivations of consumers for downloading pirated digital goods is sampling, chances are that, unless a proper sampling strategy is used, consumers will be even more incited to pirate.

Overall, it is important to note that DRM is expected to increase consumer piracy, because of the lack of features of protected files, the increased risk brought by the absence of second hand market and the insufficient sampling. This is indeed a paradox, since the very goal of DRM is to reduce piracy.

## ■ Digital Right Management and society

With regard to social welfare, although DRM may lead to an improvement, it does not completely solve the economic problems caused by the nature of digital goods. Indeed, because the marginal cost of digital goods is close to zero, so should be their market price in order to achieve static efficiency. However, dynamic efficiency requires the price to be above marginal cost, as otherwise the initial fixed/sunk costs could not be recovered and few, if any, digital goods would be produced. Thus, due to the nature of digital goods, it is not possible to actually achieve a total efficiency. There is always a trade-off between static and dynamic efficiency.

From society's point of view, the challenge raised by DRM is thus quite similar to the usual trade-off between static cost and dynamic efficiency that applies to any good protected by intellectual property rights. The three particular characteristics of digital goods (they are public, durable and experience goods) cause the competitive market price for digital goods to be extremely low, thereby leading to underprovision of digital goods. By allowing firms to fully exclude consumers, reduce the durability of digital goods, and enable adequate sampling, DRM permits firms to charge a price significantly higher than the marginal cost of producing digital goods. Although the positive economic profits are expected to provide firms with sufficient incentives to produce digital goods, hence solving the underprovision problem, the high price tag of digital goods excludes consumers, who would have otherwise found worthwhile purchasing the goods, from the consumption of digital goods. Thus DRM may solve the problem of underprovision of digital goods, but this comes at a cost: underutilisation will appear, and the role of governments is to ensure that the level of protection of digital goods is such that the right trade-off between these two issues takes place.

An important problem for governments is the multiplicity and incompatibility of DRM systems. DRM has a very low (or non-existent) level of interoperability as digital goods protected by a particular DRM system can only be decrypted by hardware or software compatible with this DRM system. As DRM only allows compatible files to be played by a certain technology, it might lead to anti-competitive and even monopolistic behaviour. Furthermore, as there is no interoperability between DRM technologies, the switching costs are high and consumers are often locked in one particular DRM technology. The current situation is quite different

from other industries, where special bodies ensure that established standards are not only based on self-interest.

The issues associated with interoperability, in general, have been of vital importance over decades now. Companies constantly release new technologies and thus create a need for standards; if not for the common protocols and data, it would have been impossible to exchange data, and therefore information, using new technologies. One way to achieve interoperability is through standards. Standards make coordination and cooperation easier as they create similarities between otherwise different organisations (BRUNSSON & JACOBSSON, 2002). They can be used as "external points of reference" when there is a need to assess the performance or quality of a product or a service (LEISS, 1995). Moreover, ZHU *et al.* (2006) discuss the "excess inertia" phenomenon when older standards prevent the shift to new standards through creating switching costs. The issue of the switching costs introduced by incompatible DRM technologies is even more crucial, since switching costs are considered to be even more important in networked environments (ARTHUR, 1996; SHAPIRO & VARIAN, 1999; HAX & WILDE II, 1999). Furthermore, switching costs are higher when there is no interoperability and consumers need to switch between different standards, and lower when consumers switch within one standard, therefore consumers are more locked in the same product or service when there are several competing standards.

Interoperability can be increased, and switching costs decreased, if the same DRM technology is adopted by several market players. Unfortunately, none of the major DRM systems is universal enough to lead to a large adoption. There is thus a strong need for a universal DRM technology.

Several attempts have been made to develop universal DRM systems that would make the exchange of content between different DRM platforms possible. However, none of these universal systems managed to reach a significant market share.

Thus, besides the question of whether the concept of DRM can improve social welfare, it is clear that a minimum requirement for DRM to be socially desirable is the existence of a standard and open DRM system. Open and universal standards such as the ones developed by the W3C (World Wide Web Consortium, organisation in charge of the standardisation of the technologies used on the Web), played a determinant role in the development, growth, and adoption of the internet. The absence of standards makes the market environment less competitive and therefore

---

customers are offered fewer choices in terms of products compatible with a certain standard and in terms of payment packages.

However, even assuming that a universal DRM system existed, the positive effects of DRM on society are quite arguable. Indeed, the assumed positive effect of DRM lies in its ability to prevent piracy. Nevertheless, piracy is always possible as long as non-protected digital goods are available. Not only is it still the case nowadays, but it is even likely that it always will be. So far, all DRM and anti-copy systems have been cracked and consumers have been able to remove the protection from protected digital goods. In addition, it takes only one leaked unprotected copy of digital good to start a whole stream of piracy. DRM is expected to hinder piracy by preventing consumers who purchased digital goods from sharing these goods with other consumers. However, as long as other unprotected sources are available, it is quite arguable that DRM has any effects on piracy at all. In fact, there is currently no empirical proof that the introduction of DRM, a few years ago, had any effect on consumer piracy. Quite on the contrary, piracy rate has kept increasing.

The fact that DRM has not made the access to pirated digital goods more difficult, means that the pirated digital goods still have, from the consumers' point of view, the same value as before the introduction of DRM. In contrast, as discussed in the previous section, the restrictions introduced by DRM are likely to have reduced the value of legal digital goods. If only these two types of digital goods (unprotected/pirated and protected/legal) were available, the introduction of DRM would undeniably have decreased social welfare, since the situation of pirating consumers would be unchanged, while that of law-abiding consumers would worsen due to the lower value of digital goods. In addition, resources would be used to develop and maintain the DRM system.

However, at the moment, non-DRM-protected digital goods, such as Audio-CDs, are still available to consumers. As mentioned above, these goods have a greater value than protected digital goods, since they are full-featured, but are also expected to be sold at a higher price. In this case the introduction of DRM is nothing more than a hidden form of versioning. By offering DRM-protected digital goods at a lower price than unprotected digital goods, firms attempt to capture additional consumer surplus through second-degree price discrimination. The goal is to lure the consumers with a medium reservation price for digital goods (e.g. consumers who were either pirating or not consuming, but, in any case, were not buying legal unprotected digital goods), into purchasing digital goods. However, such a

strategy is successful in increasing the demand for digital product only if consumers with high reservation price (e.g. consumers that were beforehand paying for legal unprotected digital goods) are put-off from consuming DRM-protected digital goods. Hence the restrictions and lower quality introduced. DRM protected digital goods are, in fact, "value-subtracted versions" (SHAPIRO & VARIAN, 1999). Although second-degree price discrimination is not, per se, expected to decrease social welfare, the small number of versions offered (three) makes it unlikely to allow for a social welfare improvement. Furthermore, the introduction of lower quality digital goods is, in the case of DRM, not neutral, since (as it is often the case with information technologies) introducing value-subtracted versions is actually costly. Indeed, the cheaper option for firms would be to distribute full-featured legal digital goods. DRM systems are costly to develop and to maintain, especially once taken into account the actions of hackers that force DRM systems developers to upgrade their systems on a continuous basis. Although value-subtracted versions may allow firms to obtain higher profits, the cost of development and maintenance of DRM systems and the fact that DRM leads, at best, to a gross second-degree price discrimination, makes DRM systems (at least in the way they are developed and used nowadays) wasteful and socially undesirable.

A final source of concern is that DRM creates privacy issues that have to be dealt with. Not only is DRM technology used to collect personal information, but also, very often, does it without the knowledge of the parties concerned. This characteristic of DRM undermines ethical values and expectations of the public.

## ■ Conclusion

This article showed that Digital Rights Management is, a priori a very interesting concept, since it is supposed to solve at once the three main problems associated with digital goods. Indeed, DRM enables firms to fully recover their excluding power (thereby making digital goods private), to reduce the durability of digital goods and to use sampling (thereby making the true value of the good known to consumers). Although DRM theoretically provides firms with important advantages, it has, in practice, serious limitations. Among them, the fact that many non-protected digital goods are available to consumers is certainly a crucial one. This article also emphasises that all DRM systems have so far been eventually "cracked"

and that consumers are able to remove the DRM protection. In this respect, consumers are shown to have very little incentives to favour DRM protected digital goods over non-protected ones. In fact, the restrictions introduced by DRM strongly decrease the value of digital goods, making protected digital goods very poor competitors in comparison to unprotected digital goods (both legal and illegal).

From a social point of view, it is shown that, although DRM may, in theory, permit an efficient provision of digital goods, the absence of standards among DRM systems and their incompatibilities are likely to decrease social welfare even further. In addition, as long as unprotected digital goods are still available, DRM is unlikely to prevent, or even diminish piracy. In fact, it is demonstrated that the introduction of DRM is not expected to increase social welfare, even in the case when one standard system exists. The main effect of the advent of DRM is that it provides firms with the ability to price discriminate consumers. However, since this price discrimination requires a costly reduction of the quality of digital goods, it is obvious that it is expected that DRM systems are wasteful and socially undesirable.

Overall DRM helps companies to strengthen their market position. DRM can be a useful tool to create corporate value, however, as any tool it may have a destructive power as well. The problematic issues associated with DRM, such as anti-competitiveness, privacy, etc. make it very challenging for companies and governments to balance corporate and public interests.

In terms of public policy, it is clear that the establishment of a standard and universal DRM system is a minimal requirement. Other social (and corporate) improvements could be brought by rethinking Digital Rights Management. It is thought that DRM more often stands for Digital Restrictions rather than for Digital Rights Management. "R" should stand for rights, not for restrictions. Instead of stripping digital goods of their distinctive positive features, firms using DRM should instead increase the value of protected digital goods. So far, law-abiding consumers are punished for their honesty: the digital goods they pay for have fewer features than pirated digital goods. Such consumers should, on the contrary be rewarded. It is clear when examining the current DRM policies used by the firms that they do not use DRM to its full potential, but merely as a way to capture additional surplus from honest consumers, who end up paying for pirating consumers. DRM is a very powerful tool, and it could enable firms to achieve near-first degree price discrimination. But this would certainly require a complete rethinking of firms marketing and pricing strategies.

---

### References

- AGHION P. & HOWITT P. (1992): "A model of growth through creative destruction", *Econometrica*, 60(2):323-351.
- ANDERSEN B. & STRIUKOVA L. (2004): "Intangible assets and intellectual capital: Where value resides in the modern enterprise", Management Working Papers 04/02, Birkbeck College University of London, School of Management and Organizational Psychology.
- ARROW K.J. (1962): "Economic welfare and the allocation of resources for inventions", in Nelson, R.R. (Ed.): *The Rate and Direction of Inventive Activity*, pp. 609-625, Princeton University Press.
- ARTHUR W. (1996): "Increasing returns and the new world of business", *Harvard Business Review*, 74(4):100-108.
- BOMSEL O. & GEFFROY A.-G. (2006): "DRMs, innovation and creation", *COMMUNICATIONS & STRATEGIES*, 62:35-47.
- BRUNSSON N. & JACOBSSON B. (2002): *A World of Standards*, Oxford University Press.
- BULOW J.I.:  
- (1982): "Durable-goods monopolists", *Journal of Political Economy*, 90(2):314-332.  
- (1986): "An economic theory of planned obsolescence", *Quarterly Journal of Economics*, 101(4):729-750.
- COASE R.H. (1972): "Durability and monopoly", *Journal of Law and Economics*, 15(1):143-149.
- HAX A. & WILDE II D. (1999): "The delta model: Adaptive management for a changing world", *Sloan Management Review*, 40(2):11-28.
- LEISS W. (1995): "Stakeholder involvement in the administration of environmental standards", in Hawkins R., Mansell R. & Skea J. (Eds): *Standards, Innovation and Competitiveness: The Politics and Economics of Standards in Natural and Technical Environments*, Edward Elgar.
- MERGERS R. & NELSON R. (1990): "On the complex economics of patent scope", *Columbia Law Review*, 90(1):839-961.
- NORDHAUS W.D. (1969): *Invention, Growth and Welfare: A Theoretical Treatment of Technological Change*, MIT Press.
- RAMELLO G.B. (2005): "Property rights, firm boundaries, and the republic of science – a note on Ashish Arora and Robert Merges", *Industrial and Corporate Change*, 14(6):1195-1204.



---

RAYNA T.:

- (2006a): *Digital goods as public durable goods*, Ph.D. thesis, University of Aix-Marseille, France.
- (2006b): "The economics of digital goods: Selling vs. renting music online", DIME Working Papers on Intellectual Property Rights 13, DIME.

SHAPIRO C. & Varian H.R. (1999): *Information Rules: A Strategic Guide to the Network Economy*, Harvard Business School Press.

STOKEY N.L. (1981): "Rational expectations and durable goods pricing", *Bell Journal of Economics*, 12(1):112-128.

ZHU K., GURBAXANI V., XU S. & KRAEMER K.L. (2006): "Migration to open-standard interorganizational systems: Network effects, switching costs, and path dependency", *MIS Quarterly*, 30 (special issue on standards): 515-539.