Markets in the Information Age

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1 Competition Policy in the Information Age

The changing environment that comes along with the information age is something that affects all industries one way or the other. The major difference, it appears, is the way markets work, not the main purposes they serve. At the Swedish Competition Authority, arguments that relate directly or indirectly to concepts, conditions and features of the new economy do come up in basically all cases under scrutiny by the Authority, irrespective of whether they concern food retail, financial markets, house construction or transport. In recent years, traditional antitrust analysis has been criticised and accused of not being able to appropriately deal with these markets. These developments are naturally of interest to the Authority and to other parties involved in competition law enforcement.

The characteristics of markets exposed to dynamic competition in which control and possession of information play a key role have been defined slightly differently by different scholars. The following three features are, however, frequently proposed (Evans and Schmalensee, 2001; OECD, 2002; Office of Fair Trading (OFT), 2002):

- *Substantial investments in R&D.* Intellectual property is a key competitive tool strenuously protected from infringement by other firms through patent or copyright measures, or is simply hidden. In addition, successful innovation hinges upon hiring innovative people. Labour costs are thus often higher in these industries reflecting the higher human capital represented by their staff in terms of education and skill.

- *Strong network effects*. These can be direct, where the value to the consumer increases as more users choose to connect to the network. Classic examples include telephone and fax services. Indirect network effects arise when the supply of complementary products increase with the number of people who adopt the underlying product. An example is a computer operating system: the more widespread a particular platform becomes, the greater the number of

applications developed to run on the system, which benefits all users.

- *High fixed costs.* Development of computer software may involve substantial investment. Duplication and distribution of the final product cost considerably less. Production in most dynamic markets such as that for software thus exhibits large economies of scale. Often this has the effect of "tipping" markets towards a single supplier who becomes the market leader. As a consequence, these markets are more concentrated. The race between firms to induce the market to "tip" to their advantage leads them to pursue aggressive marketing and pricing strategies. Investments of a sunk costs nature, i.e. investments that have no alternative value, are also important in this respect and can serve as a strategic commitment instrument, thereby discouraging potential entrants to the market.

The OFT and OECD have two more features in common in their description of these markets:

- *Compatibility and standards play a key role in competition.* For products with strong network characteristics, standards are essential for firms in order to supply the market with products that are compatible with those of other firms. Before a common standard is adopted, markets can be highly sensitive since consumers run the risk of picking a product that represents a losing technology. At this stage, competition is more for the entire market than for market shares. Once a standard is agreed and open, the market matures and demand can be expected to increase as consumers face a lower technology risk. Competition then evolves mainly around content and product characteristics that are encapsulated within the technical boundaries of the standard.

- *Technical complexity and rapid change.* Information intensive products are often very complex for outsiders, such as competition authorities, to understand. In addition, markets and products constantly change, making predictions about future outcomes very uncertain. Defining relevant product markets or, even more difficult, designing

adequate remedies to mitigate anticompetitive effects of mergers, thus becomes a highly complex task.

Evans and Schmalensee add two characteristics of the industries in the new economy that resemble some of the points made above, but with some complementary insights:

- *Innovation as a series of winner-takes-all races*. Since competition in these industries often contains a number of races to be the dominant player in the market as a result of high fixed costs and network effects, competition can be expected to be significant in the initial phase, with low profitability, substantial marketing and low prices. The central competitive parameter is innovation. When consumers have picked an industry winner, the winning firm will supply the bulk of the market and competitors will exit or become small fringe players.

- *Highly profitable industry leaders.* The winner of the race can enjoy high profits for a period of time that is substantially higher than the initial investments. However, for the losers in the winner-takes-all race, investments made represent losses. Most importantly, what appears to constitute "excessive" profits might only reflect the expected return, given the probability of failure of the investment. In essence, this is the old Schumpeterian argument (Schumpeter 1939), where monopoly profits are the main drivers of innovation and investment in R&D.

Even though the picture is somewhat different depending on who you ask, these attributes are fairly uncontroversial in most camps. What is more often debated, however, is what challenges these characteristics pose for competition law enforcement. Critics who argue for a "hands-off" approach believe that high-technologically dynamic markets have an inherent capacity to cure their own problems. Abnormal profits will always spur new entrants and new innovation, constantly forcing technological progress in the industry. Should authorities intervene and take measures against profitable dominant players, the incentives to innovate and invest would be drastically reduced, curbing growth and advancement. Another argument against intervention is a general distrust of the ability of competition authorities to make informed decisions within a reasonable time frame.

More moderate commentators accept anti-trust intervention, but call for caution and a flexible approach, where the standard tools for competition analysis may not work, or need to be carefully adapted to the specific facts of the case. An example to illustrate the point is predatory behaviour. Since marginal costs are low, sometimes even zero, whereas fixed costs and investments in R&D are very high, standard price tests do not apply. Low or even zero-level pricing may also be the only feasible strategy for a company involved in a winner-takes-all race. Cases involving predatory pricing can thus be hard to identify. Similarly, profitability of an industry is in all probability a poor measure of how fierce competition is if the winner of a winner-takes-all race is examined. The evaluation of whether specific tying and bundling arrangements are anti-competitive or not should also possibly consider legitimate reasons for that practise such as recovering fixed costs, maintaining reputation through support services, rational product integration, and so on.

With these qualifications in mind, both the OECD Roundtable discussion in June 2002 and the OFT (2002), citing numerous prominent scholars and lawyers, conclude that competition policy and antitrust enforcement do have an important role to play in high technology markets. Both the experiences of OECD members and theoretical studies point to the fact that firms in such industries still have strong incentives to act anti-competitively, for instance by various forms of exclusionary practices, and that these enterprises are often successful. Acts such as these, it is argued, are in general captured by conventional anti-trust legislation. Hence, the rules themselves do not constitute a problem. The main challenge, instead, is to apply them to highly complex industries undergoing rapid technological development. This, in turn, exerts great pressure on the institutions, enforcement agencies and courts, to grasp and comprehend the nature of competition in high-tech industries.

The Swedish Competition Authority is convinced that markets in the information age need strong anti-trust monitoring. The current rules are relevant, but the application of them must acknowledge the changing environment of the markets. Hence it is vital to continue to follow the development, to fund research on how to analyse competition, and to stimulate an open and serious public discussion on these issues.

This book is an effort to live up to these goals. The Swedish Competition Authority has previously released two related studies on internet trade and other aspects of the new economy (Swedish Competition Authority 2001, 2002, in Swedish). In this volume, researchers of various disciplines have been invited to contribute papers based on their own research applied to some of the issues raised above. The purpose of the project has been twofold: to stimulate research in the field and to encourage a public discussion of the topic. In contrast to the earlier reports, this volume is written in English in order to facilitate communication and enable the contributors to continue to develop their work for publication in academic journals and books. The project has been managed by Karl Lundvall during the period May, 2002 to June, 2003. Draft versions of the papers were presented at a workshop on October 15, 2002, in which professor Stephen Davies, University of East Anglia, and Adrian Majumdar, Office of Fair Trading, participated as discussion partners. Their input is much appreciated. The conclusions made in the various chapters represent the views of the authors alone, and do not necessarily correspond to those of the Swedish Competition Authority.

1.1 The contributions

In chapter 2, Linda Wårell and Mats Nilsson contribute to the debate on market definition in high-tech industries. Traditional methods for defining markets, based on prices and/or quantities, they argue, may not give correct answers in markets where companies compete on the basis of rapid changes in different product attributes, product design, and technical solutions. A case study is conducted, based on a hypothetical anti-trust case in the Nordic market for mobile phones which is scrutinised both through the lenses of traditional analytical tools and a proposed price-performance measure. The authors conclude that the price-performance measure, complementary to traditional merger analysis tools, provides a clue to the path for future product development. Various product characteristics are key competitive parameters in the mobile phone market in the Nordic countries, suggesting that rivalry between producers has had a positive impact on innovation. A non-interventionist approach by a competition authority may thus, it is concluded, be as harmful as preventing a merger in an industry characterized by rapid innovation.

The chapter draws on the ideas advocated by Pleatsikas and Teece (2001) who argue that traditional anti-trust analysis typically ends up with market definitions that are too narrow since these methods cannot appropriately acknowledge the dynamism of the high-tech markets. However, the paper also demonstrates that such alternatives are inherently difficult to implement in practice. The problem lies in the potentially erroneous assumption that past experiences of highly innovative activity will tell us what innovation will be like tomorrow. With reference to the case study presented, it is indeed a challenging judgement to determine whether progress will be as fast tomorrow as it has been in recent years, although there is some evidence pointing in that direction. The key issue is how to evaluate the welfare effects of potential mergers between two large players in a market such as that for mobile telephones. Will the pooling of the resources of two R&D departments result in innovations to the benefit to consumers that would not have materialised in the absence of the merger? Or, will the pooling lead to less innovation because fewer products and services are tested on the market? The authors seem to lean towards the latter interpretation, in contrast with the opinion of Pleatsikas and Teece.

In chapter 3, Henrik Glimstedt examines a related issue, namely the potentially harmful and beneficial effects of close collaboration between competitors in terms of standardisation and patent-sharing. Since most of these industries depend closely on each other's interfaces and inputs, and common standards have often become a prerequisite for operating in the market, the conditions under which such cooperation can exist are of decisive significance for long term progress in the particular industry. An increasingly common form is open standards which are promoted and developed by private standardisation consortia. As Glimstedt points out, this raises concern as to whether such structures contain, either intentionally or unintentionally, anti-competitive elements which harm long-term progress for the benefit of consumers.

The chapter argues that the essential facilities doctrine is a more fruitful approach to understanding these markets than the theories of tipping and lock-in effects. Central to this approach is the conceptual distinction between architectural and modular innovation. Architectural innovation refers to a system containing several modular sub-units or modules. A car is an example of an architectural innovation containing discrete sub-systems, such as

different engines and gear boxes. Modular innovation may then occur which leads to improvement in functionality without replacing the original architecture. A biogas engine designed for cars would thus be an example of modular innovation.

The distinction is of value in the analysis of computer systems and communication network systems. The chapter contains a case study of essential patents in the development of the GSM standard. The empirical analysis shows that Europeans were far behind their US competitors in digital mobile technology as the standards were set for the European market. Glimstedt interprets this finding as a strong indication that the existence of an architectural dominant design (the GSM system) did not result in lack of innovation at the modular level. Hence, standardisation did not curb further development. Instead, the number of essential GSM patents increased after the standard was set in the early 1990s. Under the European "New Approach", the UMTS system seems even more open to innovation at the modular level.

In conclusion, the paper argues that we are witnessing a tendency to move away from competition between standards to intra-system competition. Contributing to this development are the policies adopted at the EU level which can be regarded as successful in the sense of allowing a dominant standard and yet maintaining competition at the modular level.

In chapter 4, Fredrik Andersson analyses various aspects of business-to-business e-commerce. His study focuses on how supplier markets work, how the organization of these complex markets may change, and likely consequences for competition policy. Many of these markets have exhibited tremendous growth in recent years and can also be expected to grow in the future. Considerable savings for the companies involved emerge as a result of improvements in inter-firm administration of planning, scheduling and production.

In some cases, e-commerce makes markets more competitive, especially for auction markets with relatively simple and standardized goods and services. In other cases, in which supplier relationships and products become more complex and, consequently, require more collaboration, it is difficult to measure whether competition has improved. There is no clear indication of

whether the e-commerce tools alter the trade-off between competition and co-operation.

A major concern for competition authorities is whether e-market places facilitate collusion, tacit or explicit, in comparison to earlier forms of supplier relationships. Collusion would be facilitated due to the improved scope for information exchange, and information hiding, that such markets provide. Andersson underlines that this may be especially important when one side in the market is highly concentrated. The appropriate competition policy response lies in enabling public institutions to access information from within companies and e-market places. Enforcement should also include restrictions, where justified, on the exchange of information that is not central for the function of the business-to-business e-commerce network, and thus limit the risks of collusion.

Another concern is that of exclusionary behaviour by participants in a business-to-business e-market place. This could amount to imposing restrictions on members in a network which would be difficult for potential firms to fulfil and thus constitute a barrier to entry with anti-competitive effects. In this way, control over an e-market place amounts to control over essential facilities. Andersson concludes that these effects are a source of concern, but not particularly common to date.

In chapter 5, Stefan Hellmer investigates the special case of a market in the information age, namely the distribution of music. With the advent of new technology such as the MP3-format and free p2p networking, the marginal cost of an additional song or entire album is almost zero. As a consequence, there is no rivalry in consumption because the listening of one music lover does not stop others from enjoying the same piece. These attributes, i.e. non-rivalry and non-exclusion in consumption, make music distributed over the Internet, in a theoretical sense, a strictly public good, whose consumption cannot be controlled. Hence, no market would exist as no private actor would produce a good for free. Is then the music industry subject to imminent collapse?

Hellmer’s answer is negative. First, a total collapse would require that all consumers of music switch to the use of p2p-software and MP3-technology, which is unlikely. Second, consumers’ taste for pre-recorded CD-albums would have to vanish. Neither of these conditions are likely in the near future. Downloading will then,

arguably, serve as a complement rather than a substitute for commercial distribution channels. This dual nature of distribution will guarantee a future commercial market for pre-recorded music.

Nevertheless, the market for pre-recorded music will certainly change. Although CD sales have decreased in recent years in both volume and value terms, there is no correlation with MP3 and p2p use. Longer time series would be needed in order to investigate whether this conclusion is valid in the long run. In one way or another, however, the music industry will undoubtedly be affected. A survey conducted by Hellmer on his university students confirms the findings of other studies that the use of MP3 is widespread. More than 60 per cent of the students download a significant amount of music. As this behaviour spreads across age groups its importance will grow in coming years. Most respondents also buy fewer CDs as an effect of using these technologies. An interesting additional finding is that a relatively high proportion of the respondents expresses a willingness to wait a certain time and/or to pay a certain amount for each download in order to make it legal.

In terms of efficiency, MP3 and p2p are more efficient than ordinary distribution channels. Hellmer therefore concludes that the optimal strategy for the music industry is to adopt and make use of the new technology. The appropriate competition policy is an intriguing issue. For example, is protection against digital copying of CDs pro- or anti-competitive? To answer this, the potential losses for the intellectual property holder must be weighted against the potential harm that can be caused to the innovation process in the technology of distributing music.

In the final chapter 6, Maria Frostling-Henningsson and Anna Jakobsson explore the attitudes and preferences of Swedish consumers towards downloading music over the Internet. The study is conducted on 16 in-depth interviews of people‘s perceptions of downloading. Complementary interviews of music distributors were also conducted.

The theoretical starting point is the theory of diffusion. Successful innovations are diffused through the population and become widely used. Downloading is understood as an innovation. Success depends on the relative advantage of the innovation and on its compatibility, complexity, trialability and observability.

A number of findings arose from the consumer interviews:

- *Time is a scarce resource*. Downloading requires time, not only depending on connection speed, but also to learn the functionality and uses of the activity. This is a restraining factor for consumers, which is paradoxical since downloading has the potential to save shopping time.

- *Music consumption involves different types of experiences.* Consumers still consider that downloading is not a perfect substitute for purchasing the pre-recorded CD because of small quality differences, and the additional physical "widgets" that accompany a CD, such as the original cover and lyrics.

- *Shopping is fun.* The shopping experience has a value in itself which is missing in the consumption of downloaded music.

- *Fear of cyberspace*. There is still a significant step for many before actually trying to download because of a general distrust of the technology itself.

- *Anonymity when consuming music*. Downloading and subsequent playing of music is a solitary activity, hence the scope for diffusion is somewhat restricted.

These results together with the views from the industry provide an input for Frostling-Henningsson and Jakobsson to create a hypothetical competitive scenario in the music distribution industry. In their judgement, the problems listed above associated with downloading will erode over time as consumers become more knowledgeable and the technology more user-friendly and efficient. Over a longer period, such as 10-15 years, the authors believe that diffusion will have reached the majority of Swedish consumers. Nevertheless, consumers will in the future still demand a physical manifestation of purchased music in many situations, for instance when recordings are bought as gifts. A complete shift from physical to virtual distribution of music is thus not likely. Music distributors, given that diffusion does not move too fast, may react by emphasising emotional bonds to traditional music consumption, including covers, lyrics and store atmosphere.

In sum, these contributions present different perspectives on markets in the information age. The task for competition authorities is to incorporate the key features of these markets into their analyses and to enforce the competition laws in a truly pro-competitive manner. It is evident that many markets in the information age have great growth potential – but also provide big opportunities for actors to earn high profits by acting anti-competitively. The challenge for competition authorities is to act so as to preserve the incentives for productive innovations in the market, and to discourage in the strongest way possible all kinds of anti-competitive behaviour.

The discussion on how to deal with this challenge will certainly continue. It is our hope that this volume can serve as an input to that discussion.

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2 Antitrust Analysis in Markets Characterized by Rapid Innovation: The Market for Mobile Phones

Linda Wårell and Mats Nilsson

2.1 Introduction

Antitrust analysis have historically been focusing on static competition, based on the well-known ideal of perfect competition. However, perfectly competitive markets, i.e., markets with homogenous products, no economic profits, identical production technologies, and price competition only, is increasingly being challenged as the ideal when analyzing markets characterized by rapid innovation. Pleatsikas and Teece (2001) propose that markets characterized by rapid changes, and industries with a strong emphasis on innovation, should be measured against some other benchmark. A report from the Swedish employers trade also stresses this point and concludes: (Andersson, 2001, p. 36) "Internet and other new cross border media, offer a new competitive environment. In this environment classic tools are not enough. A static analysis is doomed to lead in the wrong direction and may be disastrous for the firms, and for necessary structural changes. The use of existing competition laws in dynamic markets requires no legal changes. It does require that a new way of thinking penetrates the application of the law".[1]

When approaching an antitrust case competition authorities have traditionally focused on the analysis of static competition, which implies an investigation of market shares and market integration under the assumption that companies compete using quantities or prices. However, in a market characterized by rapid innovation it becomes more important for firms to compete on the basis of other factors than price. Undoubtedly prices are still a critical factor for

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[1] Our translation from Swedish. For a literature review of these issues, see Pleatsikas and Teece (2001), Audretsch et al (2001), and Nilsson (2002).

consumer choices, but equally important are consumer preferences towards different features and designs of the products. The mobile phone market illustrates this situation, since new models have entered the market almost every week during the last year. The firms in this market evidently compete using new characteristics such as design, GPRS[2], MMS[3], colored display, camera, and so on. Clearly technical innovations form the basis of these new products and services. This situation necessitates an investigation of how applicable the traditional tools for antitrust analysis are in such a high technology industry.

However, before analyzing dynamic markets it is important to introduce and define some of the main differences between static and dynamic markets. S*tatic* markets are characterized by a relatively slow pace of innovation, as well as infrequent entries and exits of firms. This is mainly caused by the large capital investments in the form of plant and machinery often required in traditional industries such as natural resource-based industries. Conversely, *dynamic* markets are characterized by a rapid pace of innovation, as well as frequent entries and exits. The life length of the product is shorter than that in traditional industries, mainly because of the continuous attempts to find new solutions or products. This strategy (product differentiation through technical innovation) is often used by companies, e.g., mobile phone suppliers, where research costs are high and the marginal cost of developing a new model is insignificant compared to the overall cost of research (Posner, 2001).

However, even though theoretical differences between a static market and a dynamic market are relatively easy to establish, it is a more complex issue to decide *whether* and *when* a market is dynamic in an antitrust situation. Is it reasonable to assume that what is considered to be a dynamic market today will stay so also in the future? Perhaps a market that is considered dynamic today is close to being saturated, and thus, even if new technological solutions are introduced, there will be no demand for these solutions. When this is the case, is it reasonable to believe that the

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[2] GPRS (General Packet Radio Service) permits the use of high-speed Internet and other communication services, given that the information is sent as a package solution (Meurling and Jeans, 2000).

[3] MMS (Multimedia Messaging Service) is a development of short message system (SMS) in which you can send photos and pictures.

actors in the market will focus on traditional competition based on prices? These issues are important for competition authorities when approaching an antitrust case in a dynamic market situation.

The literature that emphasizes the importance for antitrust authorities to adjust existing tools for market definition is extensive (e.g., Teece and Coleman, 1998; Shapiro and Varian, 1999; Pleatsikas and Teece, 2001; Audretsch et al., 2001). There exists also an increased pressure on the European competition authorities concerning how to approach antitrust cases (e.g., Padilla, 2002; Andersson, 2001). The purposes of this paper are to: (a) review the relevant literature in this area; (b) compare the European Commission's guidelines in the *Official Journal of the European Communities* (European Commission, 2002) with what we can learn from the above literature; and (c) analyze a hypothetical merger in the mobile phone market. The primary contribution of the paper thus lies in its discussion of how the different theoretical implications are to be implemented in practice. In order to investigate the relevance of performance, as opposed to only prices, we also develop a price-performance measure and apply this on the mobile phone market. This measure shows the importance of different characteristics for the market structure and thus for possible market power.

The paper proceeds as follows. In section 2.2 we present a brief overview of relevant theories focusing on technological change and its impact on market structure. This section also discusses previous analyses of dynamic markets and implications for antitrust analyses. Section 2.3 presents the European Commission's guidelines for analyzing markets characterized by rapid technological change, such as the communications industry. Section 2.4 presents a case study of the Nordic mobile phone market, and illustrates some of the implications for antitrust authorities when analyzing market concentration in high technology industries. The paper ends with some concluding remarks in section 2.5.

2.2 Theoretical framework and practical implications

This section presents the relevant literature that discusses implications of innovation and competition in different market situations. The first part (subsection 2.2.1) covers a selection of theories focusing on the importance of market structure for

inducing a rapid pace of innovation. These theories illustrate the lack of consensus in the literature on whether innovation is stimulated by a highly competitive market or by a market structure that is protected from intensive competition. This is primarily portrayed by the different views of Schumpeter (1943) and Arrow (1962). The following subsection 2.2.2 focuses more explicitly on antitrust policy in dynamic markets, and the different arguments for why antitrust analysis of these markets requires different analytical methods are presented.

2.2.1 Market structure and the level of innovation

Theories focusing on the importance of technological change, and thus innovation, for a steady and continuous economic growth are well established. Presented here is a selection of theories in the field of industrial organization that focus on innovation, starting with Schumpeter's thoughts on market structure and its impact on economic growth. Joseph Schumpeter (1934; 1939; 1943) is often recognized as the founder of innovation theories, even though it was not until the late 1970s that his ideas achieved considerable attention. Schumpeter (1943) argued that market structure has a profound impact on the level of technical change in a society. He concluded that it is not perfect competition that encourages innovation in a society, but rather a situation characterized by a few large companies.[4] According to Schumpeter, it is these large companies that facilitate the diffusion of important technological changes that are vital to continuous economic growth. This conclusion stems from Schumpeter's argument that: "perfect competition is not only impossible but inferior, and has no title to being set up as a model of ideal efficiency," (Schumpeter, 1943, p. 106).

Numerous authors have been inspired by Schumpeter's work, and different hypotheses have emerged from his original thoughts. Many later studies stress that it is the very existence of monopoly power that encourages innovation in high technology industries. The Austrian school of economics, which has its roots in

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[4] This conclusion comes from Schumpeter's later work. In his earlier research he emphasized the role of the entrepreneur, and the importance of small, new firms to achieve a high level of economic development in a society.

Schumpeter's work, builds on these thoughts when arguing that static models, focusing primarily on price competition, do not cope with reality very well (e.g., Kirzner, 1973; Schackle, 1971). This argument stems from the notion that the very existence of rapid innovation implies that companies will not be able to exercise market power in a static sense. Monopoly profits are in their view seen as only temporary, yet vital for the instigation of R&D undertakings. This is however under the assumption of easy entry and exit in a market, i.e., the presence of monopoly profits will induce new firms to enter the market. The basic recommendation of the Austrian school, regarding competition policy, is thus not to intervene in markets characterized by rapid innovation and ease of entry (Audretsch et al., 2001).

Arrow (1962), on the other hand, argues that innovation is more likely to occur in a highly competitive industry than in a more monopolistic one. Arrow illustrates that an innovation in a perfectly competitive situation will yield greater profit than the same innovation in a monopolistic industry. Given this he argues that a market structure that is closer to perfect competition is more likely to stimulate a high pace of innovative activities in a society.

Scherer and Ross (1990) emphasize, also in contrast with the Schumpeterian hypothesis, that large companies are not the most likely initiator of innovative efforts unless their market position is challenged by new entrants, or existing rivals on the market.[5] They argue that when a market becomes too concentrated it will in many cases reduce the innovation pace in the market. This since the number of independent R&D departments will decrease, and those left on the market subsist in larger corporations that often are over-organized with many management levels. Scherer and Ross argue that this situation will reduce the odds for the really imaginative innovations. They conclude: "[t]echnical progress thrives best in an environment that nurtures a diversity of sizes and that keeps barriers to entry by technologically innovative newcomers low," (Scherer and Ross, 1990, p. 654). This illustrates the importance of securing that it is relatively easy for new firms to enter the market in a highly innovative industry.

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[5] For an overview of this argument, see Scherer and Ross (1990, p. 635).

In sum, perfect competition is not the structural arrangement that is most prominent to encourage innovation and economic growth. Temporary market power to reap rents enough to cover R&D, should be seen as a natural element of innovative industries. The step from this notion to the conclusion that monopolies are needed in dynamic industries does however seem far-fetched. As Scherer and Ross (1990, p. 660) concludes: “What is needed for rapid technical progress is a subtle blend of competition and monopoly, with more emphasis in general on the former than the latter, and with the role of monopolistic elements diminishing when rich technological opportunities exist.”

2.2.2 Antitrust analysis in dynamic markets

This section focuses more explicitly on antitrust analysis in dynamic markets, and especially on the critique towards the use of traditional methods applied to markets characterized by rapid innovation. The relation between competition and innovation is, as illustrated above, not an issue on which the literature presents unambiguous conclusions. When introducing a dynamic aspect the issue becomes even more complex. To illustrate this Kallay (2001, p. 13) notes that: ”The notion of dynamic competition includes two facets. First, that competition is a general term for a *process* rather than a market structure. Second, that the nature of this competitive process is that firms survive the competitive market struggle not only by manipulating prices and trade practices within set product and technological parameters but mostly by resorting to original ways to compete. These new ways to compete include technological innovation […]. The latter notion creates a certain association between competition and innovation […].”

Audretsch et al. (2001) emphasize that theories of industrial economics have become more sophisticated during the last decades. This is illustrated by the apparent shift from static models, focusing on price competition alone, towards more dynamic models where product and process innovation are recognized as increasingly important. However, the authors recognize that economists and practitioners in competition law still favor perfect competition as the model that will provide the highest welfare for society. Audretsch et al. argue that this is in clash with the dynamic forces that are less likely to thrive in a market that is characterized by perfect competition. Consequently, their main conclusion is that

competition authorities should not intervene in markets characterized by rapid innovation.

Teece and Coleman (1998) argue that many traditional price tests likely will lead to erroneous conclusions in an antitrust case, in the context of rapid innovation. A commonly used price test by competition authorities examines whether a potential monopolist could profitably impose a small but significant and non-transitory increase in price (SSNIP), usually between 5-10%. Teece and Coleman believe that it is likely that the market will be defined too narrowly, given that performance and different attributes of the products are completely left out of the analysis. Market power in a narrowly defined market will therefore most likely be exaggerated, and monopoly tendencies will be found in high technology industries, even if these markets are characterized by a more competitive situation than traditional industries.

New methods for market delineation in antitrust analysis, proposed by e.g. Pleatsikas and Teece (2001), seek to capture some effects involved in markets characterized by rapid innovation. These methods are based on qualitative analysis that identifies customers' preferences, innovation activity, and market shares (over a longer period of time than what is commonly used by antitrust regulators today). Given that market shares in high technology industries tend to shift substantially when a new technological generation enters the market, a period of at least 4-5 years is recommended. In order to transform these suggestions for market delineation into a practical and qualitative measure that captures the dynamics involved for high technology industries, Pleatsikas and Teece (2001) advocate the importance of analyzing technological competition in a case-by-case manner. If the market is characterized by a constant strive for finding new products or technological solutions, it seems likely that the market is highly competitive. This implies that the authors assume that rapid innovation, *per se*, indicates that the market is competitive.

Katz and Shapiro (1998) make a short comment on the use of market shares in antitrust cases in high technology industries. They certainly agree that market shares should be given less weight in the analysis. If we can foresee that new firms will enter or that existing firms in any way can neutralize the actions of the incumbents, this of course disqualifies any analyses of market power based on historical market shares. Katz and Shapiro note that the important

thing is what assets the companies control. That is: ”[...] Market shares ’matter’ only to the extent that they reflect control over such assets,” (Katz and Shapiro, 1998, p. 43).

When analyzing what affects the competitiveness of an industry, Porter’s (1990) framework provides valuable insights. His claim is that four factors will give rise to an internationally competitive industry. These are: (a) *factor conditions* – the nation’s position in factors of production, such as labor and capital; (b) *demand conditions* – the more sophisticated the domestic buyers are, the more competitive internationally an industry will be; (c) *related and supporting industries* – the presence of domestic suppliers, and industries related to the industry, boost the competitiveness; and (d) *firm strategy, structure and rivalry* – how companies develop strategies, and the nature of domestic rivalry, will affect the competitiveness of the country. Porter also adds *chance* and *government actions*, not as determinants but as factors that affect competitive strength.

To exemplify Porter’s hypotheses it is useful to look at the Nordic market for mobile phones. Intense rivalry between firms will according to Porter create an innovative environment that, among other things, prepares firms for the global market. Thus, the domestic competition between the two large mobile phone suppliers in the Nordic countries, Ericsson and Nokia, may have been beneficial for both companies in a global perspective. Another aspect that seems to have influenced the development of the mobile phone market in the Nordic countries is government action. The governments in the Nordic countries decided in 1969 to cooperate on a mobile telephone network, and some years later successfully implemented NMT (Nordic Mobile Telephone network) as the ruling standard for mobile communications in the region. This was a decision that most likely had a strong impact on the competitive strength of this region (Meurling and Jeans, 2000).

The notion that a market is competitive when it is characterized by rapid innovation, and thus, that competition authorities should intervene with caution, if at all, in these markets, is thus supported by some analysts (e.g., Shapiro and Varian, 1999; Audretsch et al., 2001; Pleatsikas and Teece, 2001). However, it remains for antitrust authorities to evaluate market power, abuse of market power, and the effects on welfare of proposed mergers even in these kinds of markets. In other words, is it likely, following the Schumpeterian

hypothesis, that large corporations facilitate the innovative process, or is it likely that these large companies will dominate the market and thus use monopoly pricing?

2.3 The European Commission's guidelines

The complex issue of defining a relevant market for an industry characterized by rapid technical development has not been left unnoticed by the European Union. In 1991 the Commission "recognized the difficulties inherent in defining the relevant market in an area of rapid technological change, such as the communications sector,"(European Commission, 2002: 33). The Commission emphasizes that market definition in high technology industries is not a mechanical activity; rather it entails an analysis of historical data of past behavior, an investigation of the present market situation, and finally it requires a forward-looking approach. In this sense it is vital to consider and interpret previous observations, examinations and statements that have been made on the market under investigation. The Commission also stresses the importance of defining the relevant market in a correct manner, and thus include all products or services that portray the market, as well as its geographical scope. However, the main criterion for defining the relevant market is whether there exist competitive constraints on the price-setting conduct, which is tested for using the so-called SSNIP test.

When it comes to the issue of assessing the existence of significant market power, the Commission states that a company have significant market power when it has a position considered as dominant, i.e., when the firm has a position that to a large extent permits them to act independently of their competitors, and consumers. Methods for measuring market shares should according to the Commission focus on sales volume and sales revenue, which provide reasonable reflections of the firms' market positions. The Commission does however note that it is not only market shares that are relevant when determining whether a firm has a dominant position, given that high market shares only provide the possibility to have a dominant position. The Commission emphasizes the following evaluation criteria when determining whether a firm has a

position in which they can act independently of the other actors in the market:[6]

- *Overall size of the undertaking*: are market shares static over time, or have they changed substantially during the last years? Are sales volumes increasing or decreasing? This information might be indicative of the stage the market is in, i.e., if the market is becoming more saturated with one dominant player, or if it is likely that rapid innovation will shape the market during the following years as well.

- *Control of infrastructure not easily duplicated*: if a company has exclusive access to infrastructure that gives them an advantage over their rivals, it is likely that such a firm has the potential to exert market power.

- *Technological advantages or* superiority: the same reasoning lies behind this, i.e., if one company has a technical advantage, or is superior in any other aspect it is more likely that they will use this dominance so as to exert market power.

Other characteristics that the Commission emphasize are if there is *absence of or low countervailing buying power*, whether one company has easier *access to financial resources*, whether the products, or services, are *diversified*, if a company has a well-established *distribution and sales network*, and if their exists a lack of *potential competition* (European Commission, 2002).

Based on the literature (see section 2.2) the main weakness of the Commission's approach to antitrust issues is its focus on market shares, i.e., the reliance on static analysis of sales volume and sales revenue in order to measure the concentration on a market, and the focus on prices when determining the relevant market. According to the critics this approach does not provide an appropriate assessment of the underlying dynamics in the market. For example, the method does not capture how performance and different characteristics affect competition on the markets. New innovations may drastically

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[6] Presented here is a selection of the criteria mentioned by the Commission. For a full review see European Commission (2002).

change the market structure, something that will not be grasped by investigating competitive constraints on prices or market shares. However, the additional criteria from the Commission provide a complement to the traditional analyses. How this is to be applied in practice is, though, not outlined in any detail. In the next section we will analyze a hypothetical merger in the mobile phone market in order to discuss how the different theoretical guidelines, both those drawn from the literature and those of the Commission, are to be applied in practice.

2.4 Case study

In previous sections we have discussed some of the critique towards traditional antitrust analyses in markets characterized by rapid innovation, as well as the Commission's suggestions on how an antitrust authority should approach a case under these circumstances. However, to develop theories of how to execute an antitrust case and then to pursue these in practice are very often two different things. The aim of this section is therefore to examine the dynamic effects in an antitrust case with the help of a hypothetical merger case in the mobile phone market.

The chosen market portrays an interesting case, since it is likely that an antitrust authority, when using traditional methods, would not accept a merger in this market. It is also of interest, since in 1991 two large mobile phone companies in the Nordic countries, Ericsson and Nokia, were close to merging into one company.[7] This poses some interesting questions. Would the Nordic countries have experienced the same rapid development in the mobile phone market if Ericsson and Nokia had merged into one company? Is it the market structure, with two leading companies in a small geographic area, that have spurred the technological development in the market? Given this, what is the appropriate way of approaching a merger case in the market?

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[7] In 1991 Nokia was in a financial crisis due to bad investments in the television industry. One of the major owners, Föreningsbanken, suggested in a memo that Nokia should be sold to the Swedish rival, LM Ericsson. However, Ericsson was only willing to buy Nokia Telecommunications and Nokia Mobile Phones, and not the television division. The owners of Nokia insisted that the offer was for the entire corporation, and the deal was therefore not settled, something, which in retrospective can be considered as a mistake on the part of Ericsson (Bruun and Wallén, 2000).

A limitation of the chosen case study is that it only covers a small part of the complex industry for mobile phones, the market for the physical mobile phone. The system-side of the industry is therefore not incorporated into the analysis. Still, the market for physical mobile phones captures the dynamic aspect of high technology industries, given that the marginal cost of producing a mobile phone is insignificant compared to the cost of research and development, something which leads to the constant introduction of new, similar, product versions aimed at covering most segments of market demand.

In order to evaluate the dynamic effects of this specific antitrust case we will analyze the mobile phone market using both traditional analytical tools, such as market shares and sales volumes, as well as the Commission's criteria. We also introduce and develop a new method that emphasizes performances rather than prices. Data have been collected from a Swedish magazine, *Mobil*, which lists different mobile phone models, and specifies their different characteristics, as well as average prices from Swedish retailers.[8] The data are used to conduct a so-called price-performance measure that is used in order to evaluate the possible direction of the mobile phone market, i.e., what characteristics are important, and to what extent have these been important for the market structure?

2.4.1 The development of the mobile phone market

The development of communications technology can in many instances be considered one of the most influential innovations during the last decades. This sector has emerged as one of the most important contributors to economic growth in many economies throughout the world, not the least in Sweden and Finland where two large mobile telephone companies originate. Besides the mobile phone companies, many other sectors are involved in the growing business opportunities, i.e., network operators, regular operators, firms supplying components to mobile phones, and of course the retail sector. The mobile communications industry can be considered highly dynamic in the sense that it has experienced both a rapid growth as well as a continuous development of the

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[8] The data used are cross-section observations collected at one point in time *Mobil* (2002a). A complete list of the characteristics and mobile phone producers is presented in Appendix 1.

product in order to conquer new market shares. The annual percentage growth of mobile phone subscribers from 1969 until 1998 is a clear evidence of this (see Table 2.1) (Mölleryd, 1999).

This development has many explanations, where one can be ascribed to innovation, i.e. the continuous strive to find new product versions, using new technical solutions, in order to create an advantage in terms of market power. Another important explanation is the individual entrepreneurs that during the 1950s focused on bringing the telecommunication industry to a success story, both when it comes to technological advance, and the economic aspects that created a worldwide demand for a product, which was hardly known in the 1950s. This market, which is the focus of this report, is thus characterized by a high rate of technological development, and thus of a rapid innovation pace.

Table 2.1 The annual growth of mobile phone subscribers in Sweden

Year	Annual growth (%)	Year	Annual growth (%)	Year	Annual growth (%)
1969	46	1979	13	1989	44
1970	59	1980	16	1990	37
1971	21	1981	12	1991	22
1972	123	1982	23	1992	15
1973	74	1983	47	1993	25
1974	59	1984	45	1994	66
1975	60	1985	40	1995	45
1976	32	1986	39	1996	22
1977	26	1987	37	1997	29
1978	20	1988	41	1998	30

Source: Mölleryd, 1999.

The branch organization MTB (Mobil Tele Branschen) forecasts that by the end of 2002, 7.7 million people in Sweden will have a mobile phone subscription. This implies a market penetration of 86%, and that an estimated 2.3 million mobile phones will be sold during 2002. MTB also forecasts that more and more people replace their old phones with new ones that have more advanced

technologies (*Mobil*, 2002b). This shows that the market for mobile phones has been characterized by a rapid development during the last decades. The next section will present the development of market shares for the large mobile phone suppliers over the last years.

2.4.2 Market shares in the mobile phone market

Market shares for the worldwide mobile phone industry have changed rapidly during the last years. This is illustrated in Table 2.2, which presents market shares for the three largest suppliers, and the number of sold mobile phones between 1995 and 2002. In 1995, Motorola was the market leader with over 30% of the market, but six years later, the company's share was down by half. Nokia's market share has, on the other hand, grown from just over 20% between 1995 and 1998, to 36% in 2001. It is also interesting to note that the "other" mobile suppliers have almost half of the market. This indicates that it is feasible for new firms to enter the market, and also gain market shares over the dominant players. Ericsson is no longer the third largest supplier of mobile phones; in 2002 both Siemens and Samsung have a larger share of the market. New entrants have also been established relatively frequently on the mobile phone market, e.g., Trium, NEC, and Philips.[9]

Table 2.2 Market shares (%) for sold mobile phones in the world 1995-2001

Year	Motorola	Nokia	Ericsson	Other	Number sold phones (million)
1995	30.8	23.1	10.7	35.5	42
1996	26.0	20.4	12.3	41.3	66
1997	24.8	20.9	16.4	37.9	102
1998	19.8	22.9	14.6	42.7	163
1999	16.9	26.9	10,5	45.7	284
2000	12.0	31.0	10.4	46.6	382
2001	15.0	36.0	7.1	41.9	412

Sources: Bruun and Wallén, 2000; *Mobil*, 2002c.

[9] We should note that companies have both entered and exited the mobile market relatively frequently during this period, indicating an ease of both entry and exit. Another interesting feature of the market structure is that the market entrants are in many cases existing firms (e.g., Microsoft), who decide to add mobile phones to their product line (*Mobil*, 2002b).

In Sweden, and in the other Nordic countries, the situation is somewhat different, given that Nokia and Sony Ericsson[10] are the far most important suppliers. At GEAB stores in Sweden, Nokia 3310 is the most sold mobile phone model, followed by three Sony Ericsson models; T65, R600, and T68. Out of the 10 most sold mobile phones in Sweden (September 2002) there are five Nokia models and three Sony Ericsson models. Based on this data it is evident that the Swedish consumers have a high brand loyalty, i.e., they prefer the mobile phone models from the two large suppliers in the Nordic market. GEAB has also listed which mobile phones that provide the most revenue. This list shows that Sony Ericsson T68 is the mobile phone model that gives rise to the highest revenues, followed by Nokia 6310. This provides some evidence for the notion that Sony Ericsson has succeeded in their profiling towards more technically advanced mobile phones (*Mobil*, 2002d).

In order to evaluate the market demand for new technological solutions in the market it is also relevant to analyze the sales development of technically advanced phones. During the second quarter of 2002, 166,400 mobile phones that use GPRS were sold in Sweden. This is an increase of 715% from the same period in 2001, and is to be compared with a total of 505,720 sold mobile phones. This indicates that about 33% of the mobile phones sold have the more advanced technology GPRS. Sony Ericsson is the largest supplier of GPRS phones, with a market share of over 50% in this segment of the market. Nokia is the second largest supplier, followed by Motorola and Siemens. The sales statistics indicate that there exists a demand for mobile phones that contains GPRS.[11] During 2001, all large mobile suppliers introduced the new technique, but the growth in sales was relatively slow in the beginning. However, there has been a substantial increase in sales of GPRS phones during the last months, which is likely due to the fact that more and cheaper phones with the GPRS application have been introduced (IT Research, 2002).

The presentation of market shares and sales development illustrates one aspect of the traditional method of antitrust analysis. The conclusion that one could draw from this data, given that Nokia has

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[10] Sony and Ericsson's mobile phone divisions merged on October 1, 2001.

[11] However, this does not suggest that it is the *technique* that is demanded, given that most new mobile phones in the market have this application today, but few use it.

gained and kept a leading position on the mobile phone market is that they possibly have substantial market power. However, the data also show that the market shares have shifted considerably during the period, and that the sales of technically advanced phones are increasing. This suggests that a new solution might change the market structure in fundamental ways, thus indicating that a dominant position today may not persist tomorrow. Thus, the data presented so far do not provide us with sufficient information to decide whether or not to accept a proposed merger in this market. The next subsection will apply the Commission's criteria on the mobile phone market in order to evaluate how, and to what extent, their criteria enhance and improve the analysis.

2.4.3 The Commission's guidelines for approaching an antitrust case in the communication industries

In section 2.3 we presented some of the European Commission's criteria for how to decide whether one company is dominant, and thus can act independently of other actors in the market. Here we will apply and analyze these criteria in the empirical context of the mobile phone market.

The first criterion concerns the *size of the company*. Regarding the mobile phone market it is evident that Nokia has a more dominant position than the other suppliers. In 2002 Nokia's share of the market is close to 40%. The second largest supplier, Motorola, has a share that is less than half of Nokia's. However, if we look at the development over time it is evident that the situation was almost the reverse only seven years ago. In 1995 Motorola was the largest supplier with a market share of slightly more than 30%, and Nokia's share was about 20%. Thus, the market shares have shifted substantially during the last seven years, which shows that the market structure has been far from static. When investigating the sales revenues in the Swedish market we find evidence that Sony Ericsson produces the model (T68) that conceived the highest revenue in September 2002. This indicates that Nokia cannot act independently of other actors in the market.

With respect to the question of whether one company *controls infrastructure* that is difficult to copy, we do not find any evidence that there exist significant differences between the suppliers. However, in the mobile phone market it is important to take into

account the change of the infrastructure such as the move from NMT to GSM[12], and now the development of 3G[13]. How will this affect the mobile phone suppliers? Will one company gain advantages by establishing a product that is first to incorporate the necessary techniques that are required for the 3G systems? These are questions that are yet to be answered. What we do know today, though, is that Nokia already has presented a mobile phone that can be used based on the 3G systems. It should be noted that Nokia is not the only producer of mobile phones that can be used on the 3G systems. NEC, Panasonic, and Samsung launched 3G mobile phones before Nokia (3G Newsroom, 2002).

The third criterion of the Commission is about whether a company has a *technical advantage or superiority* in another respect. Regarding the mobile phone market it is natural to make the connection between Nokia's success story, and its early focus on design. Nokia has a world famous designer, who has been involved in the production to make the product more attractive for different segments of the consumer market. In contrast, Ericsson has had a stronger focus on technically advanced solutions, something which so far has been a less successful route given that other mobile phone companies have gained market shares by using the same technology in a cheaper and more consumer-friendly fashion.

When it comes to *counterbalancing* market position, the development of market shares shows that Nokia has gained the highest market share during the last years. However, there is also evidence that the market is more characterized by a few large companies, than one dominant player. It does not seem likely that Nokia can act independently of other suppliers in the market even if they today have a dominant position of sold mobile phones; new entrants might change this structure in fundamental ways.

Product or service differentiation is highly important in the mobile phone market, since this is still what drives the competition in the market. The introduction of new, slightly differentiated, models has had a strong impact on the market for mobile phones during the last

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[12] GSM is short for Global System for Mobile communication (Meurling and Jeans, 2000).

[13] 3G is short for Third Generation Mobile Telecommunications. The third generation systems enable wireless multimedia communication by applying high-speed data transfer and improved radio terminal technology (Meurling and Jeans, 2000).

years. Nokia has been successful in introducing new popular mobile phone models that attract a broad range of consumers. This has been an important feature in establishing their position in the market. Still, all actors in the market adopt this strategy. There exists thus little evidence that Nokia will stay dominant in the market simply on the basis of product differentiation.

A well-established *distribution and sales network* is another criterion that the Commission emphasizes. In the mobile phone industry it seems relatively important for the suppliers to have a good relation with the retailers. Information on the relationship between retailers and the mobile phone supplier is, though, somewhat difficult to obtain. Still, the sales data from GEAB indicate that the most sold mobile phones are from the regional suppliers. Regarding *potential competition* for the mobile phone market, it is important to investigate if there exist any product characteristic that could lead us to believe that other actors would want to enter. More "computer-like" mobile phones have likely been the explanation for Microsoft's decision to enter the market for mobile phones.[14] The mobile phone as a multimedia tool may also make Sony's entrance even more important.

The Commission's criteria provide us with some guidance regarding a more dynamic approach to an antitrust issue in the market for mobile phones. However, it should be noted that the interpretation of these criteria are solely the authors. Our conclusion is that they give a depth to the analysis, but they do not capture the performance and product characteristic in an explicit manner. In the next section we will introduce a measure that enhances this aspect of antitrust analysis.

2.4.4 The price-performance measure

In this section we estimate the price-performance ratio for two reasons. *First*, it permits an analysis of the response on price if we improve or increase certain product characteristics. This could be used to evaluate the effects of product differentiation in monetary

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[14] Microsoft's operative system, Windows, is incorporated in Orange SPV, a mobile phone that is to be introduced in Great Britain and Denmark. The phone is not yet available in the Swedish market (*Mobil*, 2002e).

terms. *Second*, and perhaps more important, the analysis could be used to provide a hint in what direction the competition *process* in the mobile phone market is heading. For example, if increasing the data communicating facilities seems important to the customer, it is reasonable to believe that Microsoft's interest in entering the mobile phone market will increase. Thus, the price-performance measure recognizes that there are more variables than price that are relevant for antitrust authorities when determining the competitive level in a dynamic market.

The price-performance measure is developed from an econometric model, which assumes that important quality characteristics determine the price level. The regression equation can be written as;

$$P_i = \alpha + \sum_{k=1}^{p} \beta_k x_{ik} + \varepsilon_i, \qquad (1)$$

where α is a constant, β_k are the slope parameters, x_{ik} is the value of characteristic *k* for observation *i*, and ε_i is an additive error term, which is assumed to have zero mean, constant variance, and to be independent and normally distributed. The data for different characteristics were collected from the Swedish magazine *Mobil*, which tests all new mobile phone models that enter the market. The quality characteristics in our data set include all listed characteristics/applications as well as the different brand names for the mobile phones sold on the Swedish market at this point in time, i.e. August 2002. The sample represents 84 different mobile phone models. In order to find the characteristics that were most influential on prices, we used a data mining approach. For a complete list of the different characteristics and brand names included in the analysis, see Appendix 1. In the regression we employed logarithmic form of prices, display, size, and talk time. The results are not qualitatively altered if we use a linear model. Thus the model is seemingly robust with respect to functional form. The estimation results are presented in Table 2.3.

Table 2.3 Parameter estimates for the price-performance model

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	10.9	1.4	7.63	0.000
Log (display)	0.546	0.099	5.52	0.000
Log (size)	-0.33	0.13	-2.60	0.011
Log (talk time)	-0.27	0.11	-2.58	0.012
GPRS	0.209	0.087	2.39	0.019
Modem	0.278	0.079	3.52	0.001
Three band	0.32	0.11	2.88	0.005
Nokia	0.200	0.080	2.48	0.015
Ericsson	0.24	0.13	1.87	0.066

The characteristics that showed to be most prominent for determining the price level are the following: display (size of display as number of rows), size (cm^3), talk time (hours and minutes), GPRS, modem, three band (phones that have access to GSM 1900), Nokia, and Ericsson. GPRS, modem, three band, Nokia, and Ericsson are dummy variables and could thus not be used in logarithmic forms. The overall fit of the regression is acceptable, given an adjusted R-square of 0.63. The signs of the coefficients are as expected, except the talk time parameter which indicates that a shorter talk time implies a higher price on the mobile phone. A possible explanation for this peculiar result is that a more technically advanced model has a shorter talk time given that other applications ‘steal’ some of the battery capacity.

The results show that the size of the display, measured in number of rows, is an important characteristic for determining the price in our regression model. Given this one may venture a guess, namely that a future competitor may be one that produces for example small TV-sets. In addition, this also supports the idea of the mobile phones are becoming multimedia tools, so that the entries of Microsoft and Sony into this market may only be the first signs of a changing market. The price-performance measure thus provides

useful information for implementing a forward-looking approach to an antitrust issue.

The fact that brand name seems to matter, given that a mobile phone from both Ericsson and Nokia yield a higher price, could mean two things. First, it could simply be capturing all the characteristics of the phone that are now omitted in our model. Second, it can simply be interpreted as the obvious statement that brands matter! Anecdotal evidence tells us that certain brands are more successful than others in different market groups, e.g., teenagers, businessmen, and so on. For example, Turvey (2001) finds that the Nokia brand holds a premium over other phones (he controls for 15 other variables). One of the authors of the present paper overheard a conversation at Vienna airport in May 2002: "[...] I would never buy anything but Nokia. Their menu-system is superior to both Motorola and Ericsson. Besides, my kids refuse to be seen with me with any other phone." Although the latter lack scientific strength it does support the notion that brands are important and that characteristics, other than pure technical features, matter. This is confirmed in our estimates, at least in the case of Nokia.

The finding that different characteristics are important for the price level is useful, and can also be analyzed in relation to market shares. Given that Nokia has the highest market share for mobile phones, it is reasonable to believe that they have been successful when it comes to developing models with large displays. This is also confirmed, as one of the most sold mobile phone models, Nokia 3310, was one of the first models with a large display. Nokia 3310 was introduced in the end of 2000, and it is still one of the most sold mobile phones in Sweden (*Mobil*, 2002d). Thus, a specific characteristic, large display, has been important in the development of market shares for mobile phones. This implies that different attributes, as well as the innovative process of developing new characteristics, has been influential in shaping the mobile phone market.

An important conclusion from the price-performance measure is thus that it provides a useful complement to the traditional analyses of the effects of mergers, such as measuring market shares and using price tests. The analysis of the price-performance measure may indicate how to delineate product markets, and it may also indicate future directions for product innovation.

2.4.5 Summary case study

The aim of the case study was mainly to evaluate different methods for antitrust analysis in a market characterized by rapid innovation. The results indicate that investigating market shares, even over a couple of years, is not a sufficient measure for determining market power. Competition authorities acknowledge this, and the Commission's criteria provide guidance on how to evaluate dynamic aspects of an antitrust case. However, the Commission is vague when it comes to how the criteria are to be implemented, and no explicit measures are recommended. Thus, the analysis of dynamic aspects in antitrust cases relies to some extent upon individual inferences about the market situation. This is perhaps not surprising given the inherent difficulty of forecasting the future, but it accentuates the importance of establishing methods and tools that are better equipped for antitrust analysis under these circumstances. Given that the companies in markets characterized by rapid innovation compete mainly on the basis of different product attributes, product design, and new technical solutions it is useful to have a method that emphasizes different characteristics. We suggest that the price-performance measure is useful in determining the characteristics that currently drive the market.

The finding that different characteristics have been important for shaping the mobile phone market in the Nordic countries hints towards the conclusion that intense rivalry between Ericsson and Nokia has positively affected the innovative pace on the market. Thus, we suggest that the environment with two equal competitors in the Nordic market have spurred (rather than impeded) innovation. This implies that if Ericsson and Nokia had merged into one company in 1991, the innovation pace in the telecom industry may not have been as rapid in the Nordic countries as we have experienced during the last decade.

2.5 Concluding remarks

The analysis presented in this paper point towards the conclusion that it is inherently difficult to build a model for how a competition authority should undertake a merger investigation, mainly because it is difficult to look into the future without a crystal ball. When aiming at a market definition it is vital to research the characteristics of the market at present, in an effort to understand

what will happen tomorrow. It is easy to draw the conclusion that a market characterized by rapid technological change today, will stay innovative in the near future as well. However, especially when looking at past experiences, it is evident that markets eventually will reach a level where there is little to gain from further innovations, i.e., when the market is saturated and there will be no demand for the new solutions, even if they are made available.

There exists some evidence that the Nordic market for mobile phones has reached this level today. Most people in these countries own a mobile phone and are seemingly not demanding the new technological solutions that are made available to them. If so, we may conclude that the innovative pace will now be slower in the future, thus the traditional tools could be as useful as the more dynamic methods suggested by Pleatsikas and Teece (2001). However, there also exists evidence, which suggests that the mobile phone market will continue to develop in the almost breathtaking speed that we have experienced during the last years. A new system for mobile phones (3G) is to be introduced in the not too distant future.[15] This will enhance and most likely increase the uses of mobile Internet. This development thus supports the notion that the market structure for mobile phones will not stabilize in the near future.

The idea of allowing mergers in a market that historically has been characterized by rapid changes, as the non-interventionists suggest, is intriguing. This recommendation assumes that the pace of rapid innovation will continue with the same speed as in the past and thus erode any dominant position created. We see two problems with this recommendation. First, why should we expect innovation to keep a high pace just because it may have done so historically? Second, if innovation is what drives competition, not price, a merger may be even more detrimental in the innovative industries. The latter argument gains some support from Porter's (1990) theories on what makes some regions stronger than others in different industries. Porter argues that intense rivalry in a domestic market may lead to stronger and more innovative companies, thus better suited to gain market shares in the international market. Hence, the pace of innovation is not exogenously given. Instead it is

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[15] The development of this system will probably take longer than anticipated in Sweden, given that it tends to take longer time than expected to build the necessary infrastructure.

determined by the market structure, and if a merger takes place this may well alter the nature of the innovation process.

In conclusion we would like to stress that, even if competition in highly dynamic markets tend to focus on the innovative process of identifying new product attributes, design, and technical solutions, prices are still a very important aspect in competition analysis. Prices reflect information about firm behavior and market structure that is very useful in antitrust analysis. Thus, an antitrust analysis of any market should according to our view entail a thorough analysis of a broad range of variables and methods, where price-tests, market shares, and product characteristics should all be included in the analysis.

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Appendix

Table 2.4 Characteristics and brand names included in the price-performance measure

Characteristics	Brand names*
GPRS*	Alcatel
Volume (cm^3)	Benefon
Weight (gram)	Ericsson
Talk time (hours)	Motorola
Standby time (hours)	NEC
Three band*	Nokia
Display (number of rows)	Panasonic
Colored display*	Philips
WAP*	Samsung
Modem*	Siemens
Fax*	Sony
Bluetooth*	Sony Ericsson
E-mail*	Trium
Calendar*	
Camera*	
Radio*	
EMS*	

* Dummy variable

Source: *Mobil* 2002(a)

Table 2.5 Summary statistics

Variable	Mean	Std. Deviation	Minimum	Maximum
Display	5.7857	2.5557	2	20
Size	111681	31953	64296	217616
Talk time	4.9907	2.1348	2	12
GPRS	0.2262	0.4209	0	1
Modem	0.6905	0.4651	0	1
Three band	0.1190	0.3258	0	1
Nokia	0.2143	0.4128	0	1
Ericsson	0.1190	0.3258	0	1

3 Competition Policy in Network Markets: Innovation and Mobile Telecom Standards

Henrik Glimstedt

3.1 Introduction

We are living in the times of network markets.[16] For once, it seems to me, there is something real lurking behind a widely spread societal cliché. Investments in telecommunications and computer technology have been soaring throughout the two last decades. Only in the 1990's the world's yearly public investments in communication infrastructure doubled from ca 100 to 200 billion US$ (OECD 2001). As most observers of the current economy would agree, there has also been a tendency towards economic concentration in the new markets. In plain words: not only Microsoft but also network equipment manufacturers such as Cisco, Nokia and Ericsson are becoming more dominant in their market niches. Therefore, there is nothing startling in the flourishing emphasis on enforcement of competition law, as best exemplified by the spectacular anti-trust case against Microsoft.

Long before the case against Microsoft, technology standards have loomed large in the debate on competition tactics and anti-trust policies in network markets. The conventional wisdom explaining the effect of standards in network markets involves the concept of "network externalities" and "tippy" markets.[17] For example, IBM's

16 I want to thank Anna Krohwinkel-Karlsson for excellent research assistance.

17 Network externalities is an economic term that reflects the fact that the value of networks increases as the number of users connected increases. As more users adapt to the standard, that standard becomes increasingly attractive to others – and so on in a way that can be described as a positive feedback loop (Hawkins 1999; Hawkins, Mansell, and Steinmueller 1996; Schmidt and Werle 1998).To own or have other types of advantages in technologies that are essential to a standard is therefore highly desirable from a strategic perspective. In cases where the network effects are not exhausted or at any scale smaller than the market for a particular good or service, as Paul David demonstrated in his landmark article on QWERTY typewriting, the market 'tips' when a standard has gathered a critical mass of adherents (David 1985).

greatest accomplishment –the System/360-- was the first fully modularised computer system based on clearly defined standards. It was, however, a 'closed' proprietary standard, based on IBM's own patents.[18] The modular architecture of the 360's allowed IBM to drive down development costs and time to tailor the computer to customer needs. IBM's position as a dominant design interested the anti-trust division of the US Department of Justice. The Justice Department was not only vexed because the System 360 became the de facto standard in business computing, even if that in itself motivated scrutiny of how IBM used its market power. Another highly relevant question arose: to what extent was IBM able to leverage its the monopoly in computers outside computer hardware itself. Particularly, in developing or buying software IBM's customers were initially left with no other options than software IBM's services. In peripherals, such as printers and memory devices, the situation was about the same. Was customers indeed locked-into IBM's offerings? Under the threat of a full-blown showdown between IBM and the anti-trust division, the company disclosed the 360 standards, allowing outside partners to write software applications for the system. Eventually, this series of events clearly contributed towards the emergence of the independent software industry in the US.

Network externalities in the computer industry, the IBM case indicates, do not only arise from economies of scale. Just as with the telephone services, network effects in the computer industry arise when additional users adopts a particular standard. If the number of users of a particular computer standard increases to the extent that it becomes a dominating standard, the users will experience a lock-in effect, blocking customers to switch to a future superior system. In the economist jargon, the market has then "tipped", attracting even greater support from manufacturers of supporting functions (expert consultants, printers, scanner etc) as well as from the customers. At this point, it is alleged that the firm behind the dominant standard will be less motivated to innovate simply because migrating to competing systems comes at a even higher switching cost.

So, the growth of network markets stimulates network externalities to emerge, although this by no means can be seen as a automatic

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[18] This and the following paragraphs draw on (Chandler 2001).

economic tendency. (Lipartito 2002) In response to the growth of the network markets, both revitalised presence and enforcement of anti-trust and competition laws have been another dominating trend in the European economy since the late 1980s. We have witnessed how competition law has been more frequently activated, implying more active measures at the European level concerning mergers and acquisitions as well as an intensified fight against cartels (Konkurrensverket 2001). Also, Europe has since the last decades sought to establish a common ground for the establishment of Transatlantic regulatory co-operation in competition law matters (Bermann, Herdegen, and Lindseth 2000).

Yet we are witnessing another trend. With the increased centrality of fixed line Internet and it's counterpart in the world of mobile cellular communications –the third generation of mobile services or simply "3G" or the "Universal Mobile Telecommunications System" in the industry jargon– we have experienced an increasing use of *open standards*. By an "open" standard we simply mean that involved actors, private as well as the public ones, have agreed to codify the ways that equipment signals or 'speaks' within a network communication system, and to make this codified technology public knowledge to be shared among all interested manufacturers of communication equipment on equal terms. The standard is called *open* because there no private company is in full control of the standard and the details of the comparability interface are in the public domain. To the extent the standard draws on private intellectual properties, the owners of the patents have agreed to license the patents to all manufacturers using the open standard users on "fair and equal terms".

On many accounts, open standards represents a basic trend in electronic communication. Even more significant is that open standards are sponsored by *private* standardisation consortia. (Hawkins, Mansell, and Steinmueller 2000). In addition, open standards also defy traditional notion about standardisation in that they are built on 'baskets' of patents by competing firms, rather than being established as an instrument to tilt market to the inventors advantage in fierce competition with its market adversaries. (Glimstedt 2001)

Jack E Brown affirmes this trend:

> there is increasing awareness of a heightened need for joint ventures to develop new products in the most effective manner by drawing on the different skills and areas of competence possessed by different companies ....Cooperation—particularly with respect to interface standards and similar issues—may represent the logical way to further research and development objectives in this area. (Brown 1993)

Why do we need to concern ourselves with these paradoxical trends? What is the big deal? The use of an open standard setting process by collective decisionmaking usually lessens antitrust concerns over the exercise of market power. The short answer is that open standards has become a vehicle for closer collaboration between large firms. Given sheer size, collaboration on a private standard between, say, Ericsson, Nokia, Sony and Motorola raises rather steep barriers to entry. Also, as explained below, over-inclusive standard setting may deter the incentive to innovate simply because the standard may be far to broad and deep in scope, locking far too may aspects of the technology in question.

The relevant questions to ask seems fairly obvious: How do we reconcile the trend towards revitalisation of anti-trust with the trend towards formation of private standardisation consortia; what competition law practices should be developed in this particular industries? If standards are a basic feature of network markets, then one question for the competition authorities is to design the legal framework in such a way that the policies stimulates competition not only between alternative standards but also within standards.

3.1.1 Outline of the argument

What is about to follow is organised along two different axis. *Analytically*, the argument is based on a analysis of patenting within modular technology. Hence, the case study of the evolution of European mobile systems technology (GSM and UMTS) is intended to show how and to what extent close collaboration is compatible with innovative activities. Central to this analysis is the idea that system technology can be understood as modular systems and that the competition has moved from competition between different standards to competition within a standard. *Historically*, the narrative sections, which depicts the development of European telecom policy and competition policy, intends to show how

competition policy issues are embedded in a wider issue concerning European industrial competitiveness. Thus, antitrust policy cannot determine on an *a priori* basis whether social welfare will be maximized by an open or a closed standard. As with most antitrust issues, it all depends on the particular factual situation. Central to the historical perspective is the upshot that there is little insight into how firms collaborate and how institutions act to gained at all without firm understanding of how the market is shaped historically and politically.

But before we move into the terrain of European telecom politics, modular telecom technology and patent statistics, we will need to discuss another fundamental matter, namely the difference between static and dynamic markets. As I will argue below, competition policy issues are quite different as we are moving into the terrain of dynamic markets, that is into a space where conventional anti-trust economics does not apply.

Chiefly, this essay demonstrates that the analysis of network effects in dynamic markets needs to be anchored in a understanding of modular technologies that enables us to distinguish between architechtual innovations ("the system") and modular innovations (the "parts" or "sub-systems"). Secondly, the analysis of innovations within the GSM system at the modular level indicates that the European management and regulation of open standards may allow increased competition even if the general architechtual innovation remained intact over a long period time. What we witness, then, may be described as a move from competition between standards to competition within standards, or differently put a tendency from inter-competition to intra-competition. The underlying empirical evidence is strong for the case of intra-system competition within the GSM system. To what extent this finding has external validity in other high-tech sectors remains an open question.

EU has been successful in upholding competition within a sector typified by strong network externalities. The roots of this development, the paper also argues, are intrinsic to the historical evolution of EU standardisation policy. Hence, that paper makes the case that there is little understanding of market dynamics without a firm grip of the history of a particular market.

3.2 Network effects in static and dynamic markets

Indeed, network markets depending on open standards are dynamic, in which case the markets are moving targets. To the extent that end-customers adopt the services carried by the new technology, the markets evolve as standardised technologies develop. These paradoxes calls for a revised understanding of standardisation and technological collusion between firms. In dynamic markets the critical anti-trust issue is thus not the realisation of the economies of scale but, rather, how the standardisation will effect the path of technological change and innovation (Ellig 2001). Hence, the real threat to consumer welfare is not only connected to monopolies and restrictive practices in existing markets, but also with the continuos flow of new discoveries, new products and production methods. In particular, competition policy must not only focus on static competition within the already established markets, but also on dynamic competition in future markets, that is the competition to control the next standard. In the wider sense, firm strategies as well as public policy will determine which firms will have strong incentives the power to produce such types of innovation. Of particular importance for anti-trust policy, then, is to establish guidelines for the trade-off between present the present consumer interests (price/performance issues) and the long term effects of a standard on future innovations.

3.2.1 Winner-takes-it-all in static markets

The implication of network effects that have received most attention is the winner-takes-all (or most) scenario, resulting from increasing returns to scale under constant technology. In textbook economic theory, numerous competitors with access to the same technology compete on price. The classical trade-off between consumer damage/benefits reflects this notion of static markets. Monopoly is allowed when the increasing economies of scale is reflected in reduced prices, implying that the monopolist have not leveraged its monopoly power to increase profits rather than to reduce prices. Along the same lines of logic, the trade-off in telephony is based on the benefits of having a singular standard, allowing network effects to occur as the value consumers receive from a service increases with the number of users. Competition between different telephony standards would perhaps lead to lower prices but also fewer users per network. It is here assumed that

technology remains rather constant and that change occurs across firms simultaneously. For example, the US Department of Justice inquired among US automobile manufacturers to what extent the economies of scale translated into market power through increased up-front investments required from entrants (Glimstedt 1993). Fruitful competition is assumed to arise from a situation in which several actors with access to the same technology competes on price and quality of service. Unfair practices due to unevenly distributed market power is here seen as being expressed in unilateral price increases. Increasing market power due to network externalities is seen as a key problem, because standards may tip the market to the advantage of the owner of a particular standard. In such a situation, the welfare gains economies of scale following from increased standardisation will be overshadowed by the market power enjoyed by the dominant firm.

3.2.2 Tipping and lock-in effects in dynamic markets

In a growing number of industries, however, competitors with different resources and different technologies compete on the basis of their different bundles of resources, as well on prices. Characteristically, these industries are typified by rapidly changing technologies. Rather then being static, those markets are dynamic. In main stream standardisation theory, e.g. (Arthur 1989), is however not very helpful in this respect. Declaring that a price performance mechanisms and increasing returns to scale drive installed base and thus the choice of industrial standards misses the performance dimensions of competition, which is linked to dynamic economic development.

In dynamic markets, by contrast, profits depends per definition on fast innovation and product up-grading. Rather than being dependent on economies of scale and entry barriers, competitive position then hinges on constant re-configuration of capabilities. In resource-based theory, students of production functions have tried to open up the ‘black-box’ of production. In this approach, producers do not find productive knowledge as given – a matter of standardised blue prints available in principle at low or no cost at all. Rather, productive knowledge is a matter of capabilities that are acquired slowly and at relatively high cost through a historical process of experimental learning. At the most fundamental level, one of the main implications of this view is that individuals and

organisations are limited in what they do well and cheaply by what they have done in the past, since productive knowledge seldom is fully codified but exists as tacit knowledge.

Dynamic competition theory postulates that technology is rapidly changing and that unforeseen re-combinations of technologies may have dramatic effects on the nature of competition. When innovation is and discovery is possible, new entrants can leapfrog an incumbent by offering radically new types of products and services, resulting in dramatic shifts in market positions (Nelson 1991; Peteraf 1993; Teece, Pisano, and Shuen 1997). Andy Grove of Intel has referred to these periods of radical change as “major infliction points” in the development of an industry. Under such conditions, intellectual property rights, trade secrets and tacit knowledge, which have made it easy for the incumbent to defend its market position becomes a burden. This follows from the simple observation that established routines may well constitute barriers to internal change. On this view, the inertia is always a threat to rapid catch-up. Or as Dorfman (1987) put it: “Leading companies generally use technology as a means of reinforcing their position without changing the fundamental rules of the game.”

Also, most products in dynamic markets are in the nature of *system products*, that is, products that permit or require the simultaneous functioning of a number of complementary products (Rosenberg 1976). Simply put, system products, such as personal computers, depend on as complex system that allows the PC to function with applications, extended memory chips, printers, scanners, modems, TCP/IP connections etc etc. Improvements of such systems comes out of innovation in the parts of the system, allowing many innovators to try different approaches in tandem which increases the ‘genetic’ diversity within a given system (Nelson and Winter 1977).

3.2.3 The significance of standards in network markets

Standard setting plays a critical role in dynamic markets because of two factors: (1) consumer expectations and (2) interoperability concerns in system products. Consumer expectations are critical to the success of networks, either existing or emerging ones.The strength of a network’s market power depends on its users’ expectations of the likely behavior of other users of the network.

Consumers fear making investments in a network and then becoming stranded because there is insufficient consumer acceptance. Standards may alleviate those concerns, by assuring consumers that the network technology will be adopted. Interoperability—the capacity of products of one vendor to communicate or interface with the products of competing suppliers of complementary products—also plays a critical role in the success of networks. No network is an island and networks must depend on alliances with producers of complementary products.

Interoperability is a core function of most information technology products. (see below) Network products *(i.e.*, modems and cellular phones) are heavily dependent on interoperability standards. Interoperability standards also play a critical role in overcoming the concerns of stranding and the expectations of those producing complementary products. The fact that standard setting is crucial in network industries does not give it immunity. Ownership or control of important standards in a network industry may confer or permit maintenance of market power that could be used to raise prices or retard innovation. Whether this control is unilateral or is shared through the mechanism of a standard setting agreement, competition and consumers may be harmed by the illegal acquisition or abuse of this market power.Thus, for consumers to receive the full advantage of network efficiencies, firms in network industries must find some common ground to facilitate the interoperability of complementary products, while still competing with each other and trying to avoid being the victims of market power abuse.

Much of the research on standards competition focuses on the pure market competition in the selection of de facto system standards, as evidenced by the recent case against Microsoft. In dynamic markets, then, “tipping” describes a situation when better products are not adopted because dominant producers are enjoying the benefit of network effects. In such case, the incentive to innovate is reduced throughout the product cycle because the determinative stage is in the early phases of the cycle. Secondly, switching costs may discourage innovative efforts that might otherwise lead new firms to enter the market, especially if the new products is harder to integrate with full interoperability into systems supported by the dominating firm.

Two types of strategies might be used. First, the monopolist might bundle or tie its monopoly product to the next generation product. If successful, this strategy not only prevents the natural erosion of a monopoly it inhibits innovation. As Carl Shapiro observed in a hearing before the American Law Institute and American Bar Association:

> the primary method by which today's network monopolist can maintain its monopoly may well be to extend its control, as least in part, to the next generation of technology . . . antitrust concerns quickly arise when a firm controlling the standard in one product area uses its dominance to set and control the standard for the next generation of that product, or for a second, complementary product (Shapiro 1996, cited in Bolto 2001).

A second approach would be manipulation of standards, especially over complementary products. If a monopolist redesigns the interfaces for its next generation products solely to hamper the interconnection ability of the innovator into the complementary markets, it may be illegally leveraging its market power into the next generation. In the Microsoft Case, for example, Judge Jackson's claimed that there could be similar lock-in effects, or choice of sub-optimal products in the software market. The chicken-and-egg nature of the software market would create an operating system barrier to entry, implying that the entrants applications would not even get the chance to compete against the incumbent's product offering. Also, the customers will find that switching is uneconomical, as experienced by many PC users, because software developers and third party suppliers of hardware peripherals (printers, monitors, scanners, etc) are jumping on the dominating standard band wagon as well.

3.2.4 Open processes, modular innovation and essential facilities in dynamic markets

While the thinking behind the Microsoft case focused on the competition between system standards (e.g. Windows vs. Apple OS), it neglects the implications of competition between the producers that innovate in system parts, that is, the manufacturers of peripheral computer equipment, independent software developers etc. Even if a standard has reached a dominant position, competition may continue but not between alternative standards as much as *within* the standard.

Recent scholarship indicates that one way to couch the problem of inter-system versus intra-system competition is in terms of the trade-off between the benefits of differentiated products and the benefits of economies of scale that come from standardisation. of variety for consumers, and innovation incentives. Under particular conditions, standard setting may benefits consumers in three fundamental ways:

1. It can increase price competition, because standard technologies and products can be more readily compared and contrasted.

2. It can increase compatibility and interoperability, allowing new suppliers to innovate in new functions and services related to the underlying standard technology.

3. It can increase the use of a particular technology, giving the installed base enhanced economic and functional value to the extent that it is compatible with a large network of applications.

Combined, these effects work towards realisation of network externalities. A standard setting body, or a firm with *de facto* control over its own proprietary standard faces two choices in establishing the standard:

- The firm or group could restrict the standard setting process restricted to a subgroup of less than all competitors, which would usually lead to restricted access to the completed standard. The laws governing intellectual property do not require that an owner license its patents to all newcomers.

- The standard setting process could be open and collective, and all interested parties could be allowed to participate.

This choice has important legal and policy ramifications. The use of an open standard setting process by collective decision making usually lessens antitrust concerns over the exercise of market power. Open standard setting procedures, however, may lessen efficiency because of the need for consensus among competitors, each of whom may have its own proprietary technology. Thus, antitrust policy cannot determine on an *a priori* basis whether social welfare will be maximized by an open or a closed standard. As with

most antitrust issues, it all depends on the particular factual situation.

Farrell and Saloner demonstrates that independent firms collaborate and negotiate the exchange of technology to create “band wagon” system standards. In this type of attempt to set create market standards, both incumbents and new entrants play important roles (Farrell and Saloner 1986). Secondly, it has been recognised that the choice of an open or closed policy plays a major role in the competition between standards because this policy may affect the installed base (Grindley 1995). An open policy is likely to attract producers of complementary products and customers that may not want to be dependent on a single firm for supply. Third, it has also been argued that it is difficult for a single firm to create a standard without support from its competitors. Farrell and Saloner demonstrated conceptually that a hybrid arrangement involving formal standard committees, private firms and customer selection is a viable way of setting successful standards (Farrell and Saloner 1988).

What has *not* been observed or discussed to the same degree, however, is the possibility of vibrant intra-system development within dominant system standard through recombination of innovative but compatible sub-systems, parts or peripheral functions.

While dominant standards might result in network externalities that works towards the end of reducing the competition between architectural innovations, reduced architectural competition might shift competition towards competition between innovations at the modular level. In other words, if network externalities stabilises the architectural innovation, there might be a tendency from inter-system competition towards intra-system competition.

In 1995, to cite a widely discussed example, six major computer industry firms—Compaq, Digital Equipment, NEC, Microsoft, IBM, Northern Telecom, and Intel formed the Universal Serial Bus Implementers Forum (USB-IF), an organization of companies engaged in all aspects of personal computer development. The organization currently has over 500 members. Intel provides most of the engineering personnel who author technical specifications and is the designated administrator of the USB-IF. USB-IF establishes protocols to make computers easier to use in the hopes

of stimulating demand for personal computers. One difficulty in using computers is the proliferation of connection devices and technology to connect peripheral devices to personal computers. The USB-IF standards allow peripheral manufacturers to know that the devices they make con-form to a universal specification, achieving industry-wide compatibility and interoperability between peripherals and PCs. Products that meet the specification requirement are placed on an approved list and companies are urged to advertise their products as “USB compliant.”

If the standard is effective, manufacturers of peripheral devices will be able to design products that will work with all PC-compatible computers and other peripheral devices. Consumers will be able to purchase computers and peripheral devices that are known to be compatible and interoperable, thus increasing certainty, decreasing search costs, and giving them products that are easier to assemble and use.

3.2.5 Analysis of intra-system competition and market power

Network collaborations, including open standard setting entities, can readily appear to have market power because of the size of the members or the potential popularity of the technology. Often those may be useful *indicia* of market power. Market power, however, requires more than mere size; it requires the ability to control prices or output, or diminish innovation. A fruitful view on competition within standards has been proposed by Richard Langlois who hints that network externalities may be analysed as cases of “essential facilities”(Langlois 2001). Central to this view is the idea that technology standards, once they have contribute to growing network externalities, can be seen as bottleneck resource essential to all actors wanting to do business in a particular industry. The classic case of essential facilities economics involves a private monopolist that owns a bridge (the essential facility) that all competitors must use to cross a river for its supply of a particular raw material and for the shipping of the finished goods. As one expect, such a position would lead to extreme market power.

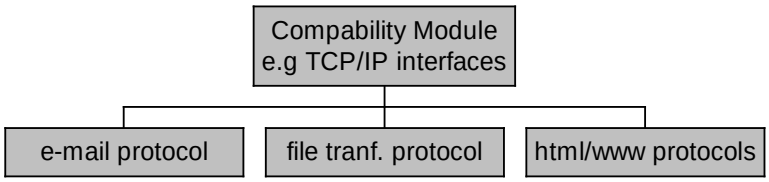
Langlois suggests that network effects from standardisation may be analysed along the same lines. The example would then involve a company that controls the technology behind a dominant standard.

If access to this technology is required for market entry, the controlling party would capture almost all available rents in the industry through offering licensing agreements to new entrants. (Langlois 2001).

This proposition is rather easy to operationalise. According to Langlois, one way of analysing the emergence and workings of network externalities exploits the modular architecture of modular computer technology. By the modularity concept, it is implied that the innovation consists of clearly defined parts that communicates via ”interface guidelines” (the standards). In the world of computer communications and wireless Internet, having interconnect is not enough. To establish meaningful communication the system has to take connectivity to a higher order of *interoperability*.

Because computers need to communicate, the computer industry has had to tackle network-to-network communications issues in a more complex way. In essence, seamless interoperability is achieved when, as indicated in Figure 3.1 below, different PC's and Mac's are able to read, download and read and change files, e-mail and graphical informaton on a Unix computer via the Internet (Bar and Borrus 1999).

Figure 3.1 Modularised and expandable system architecture



As the basis for formal or informal standardisation the information and communication technology industry (ICT) is relying on a so called "layered functional model." The layered model enables engineers and companies to handle this increasingly complex technology as a modular design (Baldwin and Clark 1997). A modular system is composed of units (modules) that may be designed independently but still function as a integrated whole.

System designers achieve modularity by partitioning information into *visible design rules* and *hidden design parameters.* Visible design rules fall into three categories:

1. An *architecture* which specifies what modules will be part of the system and what their function will be.

2. *Interfaces* that describe in detail how the modules will interact, including how the modules will fit together, connect and communicate.

3. *Testing rules,* for testing a module's conformity to design rules and for testing one modules performance relative to another.

Engineers tends to lump these elements of the visible information together, referring to them simply as the architecture, the interfaces, or the standard. The hidden design parameters (also known as the hidden information) are decisions that do not affect the design beyond the local module.

One advantage of the essential facility perspective, it seems, is that the perspective allows us assess to what extent an open standard, which is based a basket on pooled patented technologies, may result in monopoly for the participating firms and/or to what extent will the same open standard lay the ground for future innovations by new entrants following the same technological path. As will be discussed what follows, the distinction between architectural and modular innovation will be a crucial to in this assessment.

By the way of summary: modularity may open for the possibility of vibrant intra-system development within dominant architectural designs through recombination of innovative but compatible modules. The essential facility perspective proposed by Langlois can be applied to the end of determining to what extent dominant standards might result in network externalities that works towards the end reducing the competition between architectural innovations, reduced architectural competition might shift competition towards competition between innovations at the modular level. In other words, if there might be a tendency from inter-system competition towards intra-system competition under a market regime that allows network externalities stabilise the architectural system innovation.

3.3 The case study: Architectural and modular innovation in wireless telephony

In this project, we propose to undertake a study of open standards, integrating dynamic economic theory with a case study of open standards in contemporary mobile communication systems. Our choice of industry is far from accidental.

Mobile telephony is however a 'system product.' Several products need to work together simultaneously to produce the desired output. The components of the system must be compatible with one another or, differently put, must be held together by a set of interoperability standards and a system architecture. For firms, the strategic value of standards is increasing with the number of actors in an industry. Mobile communication has rapidly moved from committee set ex-ante standards to a hybrid form in which market private standardisation for play an increasing role. As in other markets, the trend towards open communication standards provides innovators and manufacturers with a basic problem: how should private actors agree on what standards to use? Traditionally, there have been two ways to set a standard. In the world of telecommunications, standards have typically been set by a voluntary committees, such as the International Telecommunication Union (ITU) or the European Telecom Standardisation Institute (ETSI), that specifies ex-ante what communication protocols should be implemented in the phone systems and what frequencies it may use for mobile purposes. In the world of personal computing, standards have been set in full competition by the leading manufacturer, creating a de-facto or ex-post standard. Although the are public, PC standard are often heavily protected by copy rights which is why there are refereed to as open-but-owned.

During the last decade, a new phenomena has supplemented these two basic forms of standard setting in communication technologies. Since the early 1990's, large private equipment manufacturer have, instead of relying on the semi-public standardisation institutions, increasingly formed private standardisation consortias to develop new standards. In essence, the participating firms share their technological expertise to develop a new communication technology, which they do think would be a useful carrier of a particular communication service. The result – the standard, or specification - is the published on the Internet and hence available for the public. In other words, the institutionalise what is known in

the industry as *publicly available specifications* or PAS. According to most observations, private firms engage in PAS because they think that the traditional committees are to slow and often to remote from the end-customer's point of views. Moreover, private consortia represent some kind of hybrid form, since they integrate the idea of ex-ante standardisation with private market-driven standardisation.

This trend raises a set of anti-trust issues. First, to what extent will large equipment manufacturers be able to use standardisation consortia to create band-wagon effects that give them long term monopoly positions -- will consortia create high barriers to entry, or are they indeed compatible with consumer interests? Secondly, under what legal circumstances have the consortia developed? These broader questions needs to be broken down into a set of more narrow research questions.

- PAS and future technological development: if a PAS for a basic communication technology by a group of large firms gains a dominating position, does it imply that the technology will be 'locked-in" for a long time?

- Open standards and PAS: how have they developed with the European Union and how widespread are the activities?

3.3.1 Integration of technology and services under the GSM regime

The European countries tried to establish a common standard for mobile telephony already in the early 1980s. At the supra national level, the Conference on European Post and Telecommunications (CEPT) assumed in 1982 the responsibility of creating a single European standard for mobile telecommunications.[19] Having a

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[19] The other important standardization body, the International Telecommunications Union (ITU) stayed initially out of the standardization of mobile telecom systems. Mark Zacher and B.A. Sutton maintain that ITU applied two basic rules, which significantly delayed ITU's efforts to take part in the standardization of mobile telecommunications: (1) the anti-competition rule stipulating that the members could not pursue competing activities targeting the communications market, e.g. the members of the ITU were not allowed to start to develop *alternative technologies* that would take away business from the telephony operators. In addition, ITU rules implied (2) that all members were obliged to hinder the expansion of rivals to ITU member operators. Taken together, these rules were designed to minimize competition in the telecom sector, nationally as well as internationally, and to make sure that

membership of around 25 of Europe's postal, telephone and telegraph operators (PTTs), the CEPT commissioned a sub-body called Groupe Spéciale Mobile (GSM) to set a pan-European standard. This body consisted mainly of representatives of PTTs with responsibility for the development of national mobile telephony systems and research engineers from the PTT research labs.

The objective behind the CEPT's 1982 effort was to achieve "harmonisation", i.e. to co-ordinate an effort to develop clear specifications for the interface between basic elements that make up a mobile telecom system, such as base station, switches and terminals. A political vision drove the harmonisation effort within CEPT. In particular, CEPT's leadership wanted to create not just a mobile telecom system covering all major European countries. It also wanted to increase the size of equipment markets for the European manufacturers (Ruottu 1998).

Given the well-known tippy nature of network markets, it should thus come as no surprise that the leading actors in mobile telephony were unable to agree on a single European standard. Although the GSM group's efforts in the early 1980s lacked impact, new cards were dealt by the mid-80s. During 1985 and 1986 the GSM group's efforts were fuelled by the anticipation of digital technologies in mobile telecommunications. The work on specifications of a digital system peaked in 1986/87, when the blueprint for the future digital GSM standard was laid out. As we will see in the following account of the European standardisation process, it was only after a complete reshuffling of the political and institutional leadership in European telecommunications that a international standard could be realised.

3.3.2 The struggle over the European GSM standard

The initial decision to create a pan-European cellular telecommunication system promoted of course various efforts among both manufacturers and operators to specify and invent the technological platform for the future GSM services. However, in

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all national operators enjoyed complete freedom in price setting for originating international calls while paying a fixed rate for them to the receiving country. Neither were they allowed to lease lines to third party operators at the national market.

the early period in the history of GSM, there was huge technological uncertainty. Much was however expected from the digital technology. As for technological paths, the GSM Group contemplated two version of the same basic technology. At an early stage, the need for more bandwidth in the air made the so called TDMA-technology attractive. The other option available at this time, the FDMA-technology, which mainly was deployed as the basis for digital mobile telephony on the American continent, was seen as being much inferior to TDMA by the Europeans. Rather than using one frequency per phone connection, the TDMA divided the frequencies into time-slots and thereby enabled the frequency to carry as many as 8 simultaneous conversations.

In spite of their shared opinions of the advantages of the TDMA over the FDMA technology, the Europeans pry apart on the choices between two versions of the TDMA, i.e. wideband-TDMA and narrowband-TDMA. The backdrop to this division within Europe is hardly surprising. Germany and France strongly subsidised development of digital technology, hoping to ensure a dominating position for their national suppliers. The large European countries, Germany, France, the UK and Italy, joined forces in the mid-1980s in an effort to draft the specifications for a contender to the European digital GSM-system. This effort was based on wideband-TDMA. All in all, substantial resources in equipment and man-hours were sunk into the pan-European project. The operators and telecom vendors, who put their money on wideband- TDMA in the mid-1980s, were determined to reap the profits from these investments. France Telecom backed by Alcatel and the German public operator, DPT, receiving backing from Siemens, championed the wideband alternative (Ruottu 1998). Both France and Germany were determined to promote their respective national vendors as clear leaders of the European telecom technology. To other key actors, such as Nokia and Ericsson, the French-German proposal was simply considered to be too proprietary, i.e. too much based on French and German intellectually property rights (Cattano 1994).

On the other side of the fence, the Nordic countries were able to create some unity around narrowband technology. On this side, Sweden played a heavy role in providing the key input both for the discovery of the principles for the specification of narrowband technology and the political leadership in the narrowband camp (McKelvey, Texier, and Alm 1998; Mölleryd 1999; Ruottu 1998).

But the specification of the narrow-band platform for the European standard, which was in many respects was achieved by engineers at Ericsson and Telia, was dependent on a set of already existing technologies.

The narrow-band specification built on and utilised basic cellular technologies protected by a number of established intellectual property rights stemming from mainly three sources: Motorola, AT&T/Bell Labs, Bull and Philips. Only to a far lesser extent did the GSM specification initially draw on patents owned by successful exploiters of the GSM technology, Ericsson and Nokia. The bulk of Ericsson's and Nokia's patents in GSM came towards the later part of the 1990s, and were as we will discuss below more related to applications of new services than to basic system specifications.

The two European main camps – the Franco-German group and the narrow-band camp championed by actors in the Nordic region, e.g. Ericsson, Nokia, Swedish Telecom – were both facing the end-game, beginning with a CEPT meeting in Madeira a in February 1987, which aimed at agreeing on which of the two proposed technologies should be selected as the technological standard for the future GSM system. As the reports on the Madeira meeting shows, the initial outcome of that meeting reflected the strong division within Europe. While the choice of TDMA as the basis for digital technology remained uncontested, the choice between wide and narrowband technology was hotly debated. Two strong contenders were presented to CEPT, one wideband solution from the Franco-German group and one narrowband solution from the Nordic Group. Out of CEPTs 15 member countries, 13 countries supported the Nordic narrowband solution whereas the wideband alternative only received backing from its initial promoters, France and Germany (Bach 2000; Ruottu 1998).

3.3.3 European liberalisation and institutional changes, 1987-1992

In the wake of European deregulation, also the future of the GSM system was becoming a critical issue for the Commission of the European Communities to the extent that the Commission was beginning to conceive European Telecom infrastructure as linked to the European Single Market Project. Naturally, the Commission

saw with discomfort Europe gearing up for repeat performance of the stalemate of the standardisation of analogue mobile telecom systems. Lacking voice within CEPT, the Commission opted for a radical solution, which was made public in the *Green Paper* published at the time of the Madeira meeting. (COM (87) 290) The Green Paper outlined the Commission's challenge to PTT dominance of European telecom markets by suggesting Community-wide competition in the areas of network equipment, terminals and communication services. In 1988, the Commission proposed the creation of a European Telecommunications Standards Institute (ETSI), a crucial institutional innovation with far-reaching consequences for the implementation of GSM.

In this process, CEPT lost its initiative and leadership in the European telecom scene to the Commission, which supported ETSI rather than CEPT as the key locus of European telecom standardisation processes. ETSI started hence to play a more active role in the European standardisation process. The Commission's leadership was highly instrumental in the success of European telecommunications policy. This example shows that European institutions do not remain mere aggregates of their members' interests but develop institutional self-interests and become corporate players in their own right. Differently put: they have become strategic actors (Sandholtz 1993).

Under great pressure for the Commission, the GSM project was removed from CEPT and transferred to a new standardisation body that was created in 1988 on the Commission's initiative. . According to Woods (1996), the new supra-national body, European Telecommunications Standardisation Institute (ETSI), laid a new framework for the European telecom scene, which undermined the ties between national industrial policy issues and standardisation. In many respects, ETSI's institutional design is a direct response to the deficiencies of CEPT. Having ensured enough voice in ETSI, the Commission focused on three moves to minimise the influx of national industrial policy interests into the decision process (Bach 2000; Ruottu 1998).

- ETSI was opened to the emerging private operators and vendors.

- ETSI distanced itself from the consensus based decision-making process typifying CEPT. Whereas qualified majority was needed for only a limited number of questions, simple majority principles pertained to most voting procedures.

- The Commission was also made able to prevent ETSI from adopting standards that it believed would block European trade.

Given the changes in membership and voting procedures, Germany and France found themselves not only isolated but also on the brink of defeat in the European standardisation wars. But what ultimately mattered, as pointed out by David Bach, was the fact that the Commission already had adopted a Council Decision on 22 December 1986 on standardisation in the field of information and telecommunications, which requires EU members and their telecommunications administrations to use official European standards in public procurements. To this effect, the Commission publishes Commission Decisions on Technical Regulation, alerting members to a new ETSI standard and requiring its use in public procurement. This institutional arrangement ensures that ETSI standards will be the basis of public networks in all member states, as ETSI has become the EU's principle standard setting body in the area of telecommunications (Bach 2000).

Differently put, Germany and France were unable to block the GSM process since the Commission changed voting procedures to qualified majority voting principles. If ETSI had adopted GSM without German or French support, the government of those two countries would yet have been forced under EU law to use GSM as the basis for the public mobile telecom network. Also, since the Commission was able to prevent new standard proposals that it deemed would have a negative impact on European trade, any new proposal of French or German origin in the area of mobile telecommunication could be stopped by the Commission.

Thus after successfully isolating the Franco-German camp and moving key issues in the European standardisation process, the EU Commission pawed the way for the Nordic narrowband solution.

The underlying rationale of the GSM Memorandum of Understanding was that manufacturers were forced to serve the whole GSM community, both suppliers and operators, on fair, reasonable and non-discriminatory conditions. The companies that refused to accept this condition were not entitled to supply equipment to a number of operators with in the EU (Bach 2000; Ruottu 1998).

3.4 The GSM standard and the essential patents

The narrow-band specification built on and utilised basic cellular technologies protected by a number of established intellectual property rights stemming from mainly three sources: Motorola, AT&T/Bell Labs, Bull and Philips. (See Table 3.1)

Table 3.1 Number of essential GSM patents per year and firm

	1977-91	1992-94	1995-97	1998-2000	Sum	Percent
Nokia	2	1	35	5	43	27%
Ericsson	4	7	14	9	34	21%
Motorola	16	1	0	0	17	11%
Philips	11	0	0	0	11	7%
Siemens	1	0	5	2	8	5%
Bull	8	0	0	0	8	5%
AT&T	5	1	0	0	6	4%
Alcatel	1	2	2	0	5	3%
Others	13	4	7	4	28	18%
Total	61	16	63	20	160	*100*%

Note: For a comprehensive description of the data set and references, see Appendix 1.

Only to a far lesser extent did the GSM specification initially draw on patents owned by successful exploiters of the GSM technology, Ericsson and Nokia. The bulk of Ericsson's and Nokia's patents in GSM came towards the later part of the 1990s, and were as we will discuss below more related to applications of new services than to basic system specifications.

For Bull, these technological achievements stemmed from know-how in encryption field, whereas the other early movers' patents were based on advances in the fields such as switching, radio

transmission and speech coding. Philip's patenting in these fields, however, was not based on a clearly defined strategy as for to what extent the company should enter in the GSM industry.[20] From the early patenting activity, it is however possible to conclude that the most formidable actor in the GSM field was not European but based in the United States. Of all essential technologies in the GSM technology, Motorola held the dominating position with the notable exception of digital switching.

Table 3.2 Citations in essential GSM patents

			Citations		
		Patents		Percentage of patents with	
Country	**Simple counts**	**Weighted by citations**	**Average no. per patent**	**0**	**50+**
Finland	35	241	5,9	23%	0%
USA	33	1448	42,9	6%	33%
Sweden	28	307	10,0	21%	4%
France	18	595	32,1	11%	17%
Germany	17	255	14,0	18%	0%
Japan	9	203	21,6	0%	0%
UK	7	175	24,0	0%	14%
Canada	5	45	8,0	0%	0%
Netherlands	5	51	9,2	60%	0%
Switzerland	1	18	17,0	0%	0%
Denmark	1	7	6,0	0%	100%
Ireland	1	47	46,0	0%	0%
Total	160	3392	20,2	15%	11%

Note: See Table 1.

The overall importance of the US skill base is further revealed if we weight the patents according to the number of received citations, a measure that has been used to indicate the centrality of a discovery to a particular technological field. (Trajtenberg 1990; Hall et.al. 2001). As is indicated by Table 3.2, US patents have received far more citations than for example the patents held by Swedish and Finnish firms (e.g. Ericsson and Nokia). Whereas Swedish GSM patents had received 307 citations by May 2002, the US GSM patents had received some 1448 citations. The centrality of US research is further emphasised by the fact that US companies are the holder of the very key patents, as indicated by patents with +50 citations.

[20] In fact, some of the Philips essential intellectual property rights in GSM, such as the speech coder, are licensed at no cos*t*

This picture tells, however, only part of the story. Table 3.3 below shows the composition of references made by the essential GSM patents.

Table 3.3 References to essential GSM patents

	1960s	1970s	1980s	1990s	Sum	Percent	Self-citations
USA	21	118	206	259	**604**	61%	22%
Japan	3	9	56	61	**129**	13%	7%
France	1	11	24	12	**48**	5%	2%
Sweden	0	0	8	39	**47**	5%	12%
Finland	0	0	0	45	**45**	5%	11%
Canada	0	0	5	30	**35**	4%	2%
Germany	0	4	14	8	**26**	3%	5%
UK	0	1	9	16	**26**	3%	0%
Others	1	4	11	19	**35**	4%	n/a
Total	**26**	**147**	**333**	**489**	**995**	100%	11%

Note: see Table 1.

Since references define the pieces of previously existing knowledge upon which a patent builds, it can be concluded that the essential GSM patents draw mostly on US wireless technology.

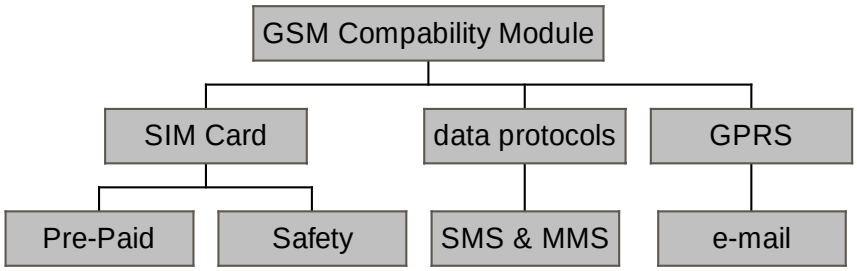
In particular, the GSM specifications built on a number of US defence research related building blocks. In the US, digital radio was developed for military communications. Initially the technological findings were kept secret, but already in 1948 Bell Labs scientists began to publish key concepts relating to advanced mobile communication systems, such as the hexagonal cell system (cellular radio) and TDMA modulation. Linear predictive speech coding methods used for GSM were also developed by the Bell Labs (Beise 2001). Although some of the key patents were held back from public scrutinisation for military reasons, most secret wireless technologies were relegated into the public patenting domain by the late 1970s (Millman 1984).

Bell Labs' reasons to share technology is well known and needs no further discussion here. However, the strategic considerations of Motorola, the controller of the majority of the key patents in cellular mobile communication and the only important non-European actor in the GSM effort, recalls some consideration. Against the backdrop of weak market shares in Europe, Eric J. Iversen argues, Motorola pursued an aggressive IPR policy because unlike its main European opponents in the market, Motorola's revenues from GSM were less tied to switching technology which

generates long-term revenue streams than to radio-terminal equipment and radio-base stations, which are more oriented towards one-off revenues. The company carefully devised a licensing strategy to create revenue streams from the European markets based on an aggressive defence of its outstanding R&D investments (Iversen 2000).

However, what stands out in the analysis of essential patents is the nature of the post-1990 patenting activities. While we may think that a standard will “freeze” the technology until a new standards is accepted, the adding of new essential patents show that the GSM standards has been developed through modular innovations, as extensions of the GSM system (see Fig 2).

Figure 3.2 Structure of the expandable and open GSM Standard



Much of the additional patenting was related to innovations such as the SMS-protocol, further development of the SIM-Card and pre-paid services. Combined, that sequence of innovation resulted in a major innovation, namely ”mobile messaging.” In addition, the data also reveals that the dominant position of Motorola in the basic GSM patent has not excluded the European firms form contributing to the GSM standard. On the contrary: the companies that intensively market GSM products in the lead markets, that is Ericsson and Nokia, are the most heavy contributors to the post-1990 essential patents.

3.5 Transforming the standardisation process

By the late-1990s, a new European standardisation paradigm was well under way. Despite the improvements that occurred with ETSI, which were demonstrated by the GSM success, many European

actors still found the process too slow and too poorly anchored in the end-user's preferences. The need for speed and improved user-influence is certainly not a new phenomenon in European standardisation policy. Under the Commission's early attempts at detailed harmonisation of technical standards in the mid-1980s, the lead times were simply beyond imagination. "It took...", as one observer noted, "...10 years to pass a single Directive on gas containers made of unalloyed steel, while the average time for processing 15 harmonising directives which were passed as a package in September 1984, was 9,5 years. Meanwhile, private or semi-private standardisation bodies... were processing thousands of technical standards each year." (Majone 1986, p.24)

Over the following years, the Commission brought forward series of reform proposals under the heading of "The New Approach to EU Standardisation", all aimed at the establishment of a more efficient and market-responsive machinery for European standardisation. (COM (91) 521). As observed in connection with the discussion of GSM, the creation of ETSI in 1988 was part of this process. The old technocratic and national industrial policies ideas were thus replaced by the politics of competitive advantages because ETSI offered powerful private trans-national economic actors a platform for difficult negotiations on establishing common standards.

As indicated by the disappointing development of data communication standards, however, it was difficult to ensure adequate representation for end-user interests in the reformed standardisation institutions. While the value of standardisation lay in their responsiveness to market needs, the consumer and end-user representation in telecommunications and data communications standardisation was almost non-existing. By 1995, there were simply no efficient mechanisms for user and consumer representation put in place.

In most cases, private interests groups or private standardisation consortia were not seen as legitimate since they were perceived as a possible threat to the decision-making process. Strong voices were certainly raised against the participation of private standardisation bodies because they were seen as skewing the standardisation process towards industry interests at the expense of consumers. (see in particular, Economic and Social committee, 1991, 91/C 120/09 6.5.91 Opinion on the Commission Green Paper on the

development of European Standardisation: Action for faster technological integration in Europe.)

Nevertheless, from 1996 and onwards the Commission sought to establish a mechanism for integrating the private standardisation bodies into the European standardisation process in order to achieve both speed and market-orientation.

3.5.1 Privatisation of the standardisation process and the relaxed competition law.

Collaboration within private standardisation bodies facilitates collaboration in the market. But are standard consortia really different from cartels? Fundamental to the technological exchange between the private firms is, for example, an emerging private regime for exchange and distribution of revenues from intellectual property rights or patents. In the case of mobile Internet services, the world's leading wireless companies have completed the definition of what is known as the *3G Patent Platform* (UMTS Intellectual Property Association 2001). This arrangement provides a system for evaluating, certifying and licensing 'essential' 3G patents. The platform specifies the maximum amount of royalties per product category to be paid by any licensee. Patent fees are to be collected and distributed through a system in which the last manufacturer in the value chain constitutes the collection point so that all formerly involved activities that result in the product are covered.

3.5.2 Trends in US high-tech standardisation

Since the post-war era, and arguable even before, the European countries have been in a position of first-movers in international standardisation. The United States, by contrast, have been somewhat removed from the standardisation processes. Unlike the European system, with its monopolies, the US system has been market driven, decentralised and sector oriented. On the private sector side, 300 trade associations, 130 professional and scientific associations 40 general membership organisations and 150 private standardisation consortia set (in 1992) a total of 51.000 standards. Typically, the US government has a weak position in this. The governments involvement has mainly been a matter of regulatory

oversight and competition policy. Uppermost in this regard have been concerns about network effects and anti-trust.

The liberal, uncoordinated approach to standards in the USA was shaped by late 19th century US anti-trust laws that blocked co-operation within industry associations, encouraging firms to merge and giving rise to the vertically integrated firm. With those firms, technological industry standards became intra-company standards. Standards became primarily the responsibility of professional managers who naturally favoured self-certification.

An early effort to achieve broader US standard co-ordination should be noted. Herbert Hoover, both during his long tenure as Secretary of Commerce (1921-28) and later as President favoured an increased role the Commerce department in standard setting. Roosevelt Democrats, however, abandoned Hoover's policy and tried a co-ordinated managerial approach. What was left of Hoover's effort to co-ordinate standardisation collapsed due to court challenges.

Since then, US firms and the government has been unable to agree on a single framework for standardisation, implying the enormous heterogeneity described above. Rather than reducing fragmentation, the characteristic response to calls for increased co-ordination under government leadership has been to treat heterogeneity as a commercial asset, that is organisations that merely kept records of available voluntary standards. The US governments policy was later codified in the 1975 Trade Act, which formally recognised the private sector's role in standard setting and affirmed the preference for voluntary standards.

At the level of economic thinking, the fragmented US standardisation has since the last two or three decades been characterised as a cornerstone for US competitiveness. Particularly, US firm's liberal approach to standardisation has been seen as a competitive advantage. European competitors have even processed that the fragmented standardisation has constituted an unfair competitive advantage in trade, praising the US lack of co-ordination (see below for a discussion of European "New Approach" to market-led standardisation). Arguably, this tendency towards privatised ex-post standardisation has, throughout the 1990s, been reinforced by the Internet experience:

- The US federal government sponsored Internet Engineering Task Force, has pioneered a new so called “light” approach to standardisation, implying just-in-time-standards. Users develop new standards quickly and send them out to other groups of users requesting comments for corrections, relying on the Internet as both a tested.

- The US Patent Office has been almost unique in its willingness to grant new patents and intellectual property rights, stimulating new entrants to new standards based on open-but-owned intellectual property rights. This, together with decades long efforts to regulate IBM and AT&T’s monopolies, has shifted areas previously controlled by the large firms to a larger set of high-tech firms.

- All organised technological collaboration between groups of firms, including the IPR platform described above, has only been possible under the relaxed anti-trust legislation in Europe and in the United States (Jorde and Teece 1992). On a strict legal interpretation of anti-trust regulations in both the US and in Europe, sharing between firms of their technical information is similar to the sharing of pricing and other types of essential market information. Recent case law permits the sharing of technical information in connection with standardisation processes without interference from anti-trust enforcement since the late 1980s. In the US, the passing of the National Co-operative Research and Production Act in 1993 made it safer for firms to relocate standardisation from formal standardisation bodies to private consortia (Tate 2001).

3.5.3 EU standardisation after 1990

The core of the more recent thinking in European and US antitrust law is that it, in modular technologies, the firm’s and the standardisation consortia’s problems are related to long-term innovation rather than to short-term profits. To work properly, complex modular technologies require collaboration between suppliers and users of the various components. In Europe, the Commission has allowed the possibility of exemption under Article 81(3), which regulates information sharing. In both cases, information sharing is seen as crucial in network markets, which

may ultimately benefit consumers (Seabright and Halliday 2001; Toth 1996).

Two different but interrelated sets of ideas underpin the development of open standards. First, traditional ways of creating and agreeing upon telecommunication standards have proved too slow and cumbersome to be effective in a world in which technology changes at a fast rate. Secondly, it is a well-established fact that Europe's bodies that develop ex-ante standards (i.e. standards that are set before products are put to the market) suffer form being to late and being out of touch with end-user demand. The fate of OSI, which was unsuccessful compared to the TCP/IP protocol, is a particularly illuminating example of this. It shows, in particular, the dangers of creating standards in splendid isolation from end-users' preferences. (Schmidt and Werle 1998). To achieve better co-ordination with end-users, Europe has taken steps to integrate US market-led standardisation practices, particularly focusing on private standardisation consortia.

The idea of co-ordinated technological consortia is a deeply rooted European tradition. As noted by Hawkins, the first real prototype of the consortium model appeared in Europe. The European Computer Manufacturers Association (ECMA) was founded in 1963 to deal with growing concern in Europe that the mainframe computer market was too concentrated amongst a few, mostly US-based companies. ECMA established many of the basic organisational characteristics of the consortium. Membership is voluntary, industry-wide, and international (within the European region), the focus is on special technical problems, the process relies on voluntary technical committees, and financial support is on the basis of member contributions. ECMA was among the first ICT-industry organisation to issue PAS. Moreover, ECMA established close relationships very early on with the International Organisation for Standardisation (ISO). In the late 1960s and early 1970s, ECMA was one of the main advisors to ISO Technical Committee 97 in setting up the first major international computer standardisation program, the Open System Interconnection. From the beginning, ISO reciprocated by placing ECMA recommendations on a fast-track whenever they were presented for consideration as international standards (Hawkins 1999).

On the European view, the convergence of telecommunications and the Internet calls for network interoperability, which can be

achieved if critical interfaces between network elements are clearly defined. This was also spelled out already in the 1997 Green Paper on the Convergence of the Telecommunications, Media and Information Technology Sectors (EU 1997), stating that:

> ”…one of the most important consequences of the blurring of technological borders between information technology, telecommunications and consumer electronics is the increasing globalisation of services. The inherently global nature of the Information Society calls for any standardisation in support of its development to be similarly global. Users may want access from any terminal to any service, independently of the technology used, or the geographical point of such access, within a multi-vendor environment. *A major objective for standardisation therefore is to achieve interoperability between networks and services. Technological harmonisation is not an objective. However, standardisation is a tool which can reinforce both general policy objectives, such as the creation of an Internal Market for communications services, and the regulatory framework.* Encouraging best business practices in areas related to data protection and security of digital signatures may be supported by standardisation and consensus-building within an appropriate regulatory framework.” (Italics added here)

To illustrate the need for open standards, the European Commission has on several occasions pointed towards the role of browser technology (e.g. Netscape and Microsoft Explorer) as gateways to the Internet services.

> ”The Internet community is trying to build on open standards that allow both interoperability and competition. Open standards are particularly important with regard to hardware and software tools for Internet use and access. Items such as browser software are in a way the "entry ramps" to the information superhighway, and it is important that they be based on open standards so that all users may have equal access to the Internet. Otherwise proprietary standards and their attendant licensing schemes will control access to content and electronic commerce transactions, and will adversely influence licensing and other market behaviour.” (EU 1998a 56)

3.5.4 ETSI's special role as a consequence of the quest for interoperability

In formulating a policy which includes access to Internet services in the concept of universal services, the EU has also recognised that interoperability is the key. In order to set out a strategy and policy orientations for Europe's information infrastructure, The Commission issued a communication on the benefit of the Wireless Information Society. (EU 1997a) It advanced the notion an overall strategy is urgently needed to provide technological regulatory certainty for the wireless communications beyond voice services.

This called for a new approach to standardisation issues, which resulted in the EC Communication on Standardisation and the Global Information Society (EU 1996a) Here, the policy makers involved in the making of a new European standardisation policy for the ITC area saw problems in the earlier system of formalised standards due to the slow working methods and endless processes to reach consensus. Market driven standards implies, as also recognised in the Communication, that several common technical specifications may emerge in parallel, followed by a shakeout in which on or possibly two common technical standards representing the technology that is dominant in the market are all that survive. Whilst the ideal standardisation process consists of an open consensus…it is not unusual for dominant market players to reinforce, by means of technological specifications, their dominant position in the market place." (EU 1996a: 3)

Today, the Commission observed, this often takes the form of private standardisation consortia, which draw up a common technical specifications with the aim of establishing a de facto standard - what the authors of the Communication calls PAS (Publicly Available Specifications). The tendency by industry to joint consortia to formulate technological specifications for de facto standards has, according to the Communication, to be seen in connection with the slowness of the formal standardisation process. In a study of the rise of consortia in Europe, Hawkins (1999) outline an intriguing approach to monitoring emerging ICT industry dynamics that is useful in interpreting these findings. This approach classifies various groupings of ICT interests as *incumbents* as existing suppliers of telecommunication and computer products and services with an extensive installed base of technology linked to an established customer base; *insurgents* as newer firms seeking build market shares for goods and services based on new technology; and *virtual communities* centred around emerging configurations of dominant users of networked services, especially in an Internet environment. A look at the groups of consortia founder members makes it clear that incumbent and insurgent perspectives led most of the consortia formation that occurred throughout the 1990s. In setting up consortia, incumbents were looking for new ways to maintain and increase revenues by maximising and enhancing existing investments in network facilities in order to exploit the commercial possibilities of these new markets for electronic services. Consortia like ADSL-F, ATM-F, NMF and TINA-C emerged predominantly among incumbents with these objectives.

Insurgents sough to use consortia to develop market share quickly by breaking up some of the vertical integration that still existed among incumbents. This yielded consortia like OMG, IMA and the Open Group who focussed more on the articulations between software, digitised content and networked services than on platforms and network facilities as such. In some cases these agendas overlapped, yielding high degrees of joint participation (as with DAVIC, OMG and W3C). Other consortia tended to gravitate towards specific incumbent interests or competencies, particularly those consortia oriented mostly to telecommunication like TINA-C, ASDL-F or EURESCOM. (Hawkins 1999).

While PAs in many ways take on the form of standards, they are an instance of co-operation between private companies. As such they have to be assessed based on the principles of European and national competition law, i.e. Article 85-86 of the European Treaty. From this vantage the PAS does not constitute a standard, sine its an entirely private arrangement between two or several firms. This assessment of the PAS led the Commission to the position that PAS could be turned into legally defined standards if they were confirmed by formal standardisation organisations, such as ETSI. Formal standards, therefore, present a particular form of legitimacy which distinguishes them from de facto standards and PAS, and which allow national and Community law to have resource on them (Hawkins1999). The emerging idea was that PAs which were developed by private actors could be recognised as proper standards if they were adopted ETSI (EU 1996a).

Based on the formula of European technology consortia, the European Commission tries to revitalise ETSI and helped it carve out a new niche in the standardisation process. To reinforce the establishment of this middle way between de facto and formalised standardisation, the Commission was instrumental in setting up a new European standardisation body, the ITC Standards Board, serving the purpose of co-ordinating standardisation processes within private industry and the formal standardisation processes within ETSI (ICT Standards Board 1999).

3.6 Heterogeneity in open 3G standards

Just as with the GSM standard, the standards for the third generation mobile services have been hotly debated. It should thus not come as a surprise that efforts to tip the market in favour of standards sponsored by leading Swedish actors, such as Ericsson in alliance with Nokia of Finland and Motorola of the US, have been prominent features of the Internet Economy. Some of these standards have been intensely contested. A case in point is the battle over interface standards for mobile Internet services, or the so-called 'Third Generation' of mobile telephony known as Universal Mobile Telecom Services in the European context. In sum, Europe's bold strategy for 3G services –UMTS-- were perceived in negative terms by leading American firms, such as Qualcomm, as well as trade strategists in the US Congress.[21] It was Ericsson's and Nokia's move to punch through it's version of so called spread spectrum air interface standards (W-CDMA) that irked the Americans, who insisted that the ITU should adopt a approach which allowed an family of interoperable standards. At this point, the original champion of CDMA technology, Qualcomm, threatened to block the international standardisation process through aggressive protection of its vast intellectual property rights in CDMA. The US positioned weakened as Motorola, the holder of the majority of the essential GSM patents, and the US GSM operators joined forces with the European 3G effort. US GSM operators also cut a deal with US TDMA operators, agreeing to make TDMA and GSM compatible. Qualcomm was thus isolated. The Europeans, on the other hand, became troubled by Qualcomm's success in the Asian markets. China's sudden interventions as the Chinese authorities hinted they would consider Qualcomm's technology if the US were to adopt a positive stance towards China in the upcoming WTO-negotiations. These developments constituted the backdrop to the deal between Ericsson and Qualcomm in March 1999, which resulted in:

- extensive cross-licensing of patents,

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[21] This and the following paragraphs draw heavily on my analysis of the politics of 3G systems. See in particular: (Glimstedt 2001)

- Ericsson's acquisition of Qualcomm's network manufacturing operations in United States and

- an agreement on how CDMA and W-CDMA should constitute the core of a family of interoperable 3G standards backed by the ITU. According to Congressional sources, Trans-Atlantic Business Dialogue, a private industry forum for co-ordination of European and US business interests, provided the venue for the final rounds of negotiations between the parties.

In effect, the two major camps –one led by Ericsson and one led by Qualcomm-- came to agreement as for how to co-ordinate their respective technical resources. As reflected in Table 2 below, simple count of essential UMTS patents registered by ETSI, the European Telecom Standardisation Institute, clearly reflect this agreement to share technology.

Table 3.4 Distribution of essential IPR in UMTS

Ericsson	Nokia	Qualcomm	Others, incl NTT and Motorola
38%	28%	28%	6%

European Telecommunications Standardization Institute

Also, the simple count of essential patents reveal that Nokia, Finland's mobile giant, has made substantial contributions to the technology behind UMTS. These figures needs, however, to be refined. The present author expects the balance between Ericsson and Qualcomm to change once the patents are weighted by number of citations. Because the average Qualcomm patent has been in existence for a longer of period of time, it is likely that it has gathered more citations, reflecting a more important technological contribution. This is consistent with the view that Qualcomm owns some of the basic CDMA patents on which also UMTS is built.

UMTS covers however only one single aspect of mobile Internet, namely the air interface that connects the handheld phone to the radio base station in the spectrum.

As indicated in Table 5 below, which lists a handful of the main technological standards involved in the convergence between

Internet and mobile communications, that firms are moving towards small and focused standardisation groups that are sponsored by a group of firms.

These, so-called standardisation consortia' publicly available specifications are used as interoperability standards. A major implication of communication standards is that they make the thorny task of system integration relatively simple because the standards provide the developer with a clear interface and protocols for how functions should be implemented.

Table 3.5 Service by standardisation body and type

Service	Standard	Comment
Radio Interface for wireless broadband services	W-CDMA	This is Ericsson's version of CDMA technology, which was adopted by ETSI in 1999 for UMTS. Europe's UMTS strategy is co-ordinated with other GSM-related standards within the global The Third Generation Partner Program (3GPP)
MultiLayerSwitching Protocol for integration of ATM and IP in mobile switches	MLSP/ATM	Voluntary standards set by ATM Forum, MPLS Forum and adopted by IEFT. Co-sponsored by Cisco, Nortel, and Ericsson among others, which have participated in joint interoperability tests.
Wireless LAN and WLAN	IEEE 802.11	Widely used voluntary industry standard sponsored IEEE, adopted by Ericsson.
Short distance wireless connections	Bluetooth	Voluntary industry standard with Ericsson and Nokia as major sponsors and developers
Enhanced SMS, adds graphics and sound to the popular SMS standard	MMS	Sponsored by Ericsson and Nokia through 3GPP and WAP Forum
OS for handheld communicators	Symbian	Open-but-owned OS standard developed by joint venture between Motorola, Psion, Ericsson, Nokia and Panasonic.

Take the recent version of the ATM technology (asynchronous transfer mode) also known as Multi Layer Protocol Switching (MPLS). This technology has have become significant because it underpins a series of applications, ranging form fixed multi-service networks to next-generation radio base stations and mobile

switches. Standardisation consortia are heavily used to quickly develop new standards and get firms onboard the project.[22]

In the case of ATM/MPLS, the private consortia (ATM Forum and MPLS Forum) developed standards that were co-ordinated with end-customer demands in the corporate LAN sector in order to ensure compatibility between end-customers' preferences and the development of core network technology. Large-scale voluntary standardisation bodies, such as the Internet Engineering Task Force, IETF, can later adopt these standards. Network externalities are also generated through the creation of a growing community of producers of a particular technology. From a firm's perspective, the common adoption of a particular communication technology or a stack of communication protocols by a large number of firms tends to create a pool of skilled developers of that technology. In other words: open standards have become attractive since they allow many actors to improve technology at the level of the modules in parallel lines to the extent that the innovations improve the parts of the system and not the way that the parts are hooked up to each other.

To continue our ATM-example here, the involved firms have arranged joint interoperability tests to demonstrate to the end-customers that ATM based products by Nortel, Ericsson and Cisco are fully compatible with each other and that the components live up to the promises of differentiated Quality-of-Service across the whole network. So, one aim behind the combined standardisation and interoperability tests is to build markets for the products that can be derived from the generic protocols. Another effect is that the standardisation consortia enable the large firms to connect to the smaller but technologically sophisticated ones. In case of the ATM-related standardisation processes, connections were built up between Ericsson, Cisco and smaller firms like General Data Communications, Mariposa, and ACC through the work within the standardisation organisations. Later, these firms were acquired by Ericsson or gained position as first tier system suppliers of advanced routers and switches.

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[22] The following accont of ATM draws on (Glimstedt and Zander 2003).

Seen from this perspective, the ICT industry is typified by both intense *inter*system competition and *intra*system competition. Open standards are critical to both forms because they (a) allow sponsors of new architectural designs to rapidly define new standards and (b) facilitate the modular innovations that increase the number of innovative actors and the number of entry points for innovation.

These two forms of competition and collaboration are, in practice, indistinguishable. Take Symbian, the joint venture by the three major wireless phone manufacturers (Motorola, Nokia, and Ericsson, later joined by Panasonic and Sony) to leverage an operating system known as Epoch for use in future smart phones. This was popularly regarded an "anti-Microsoft" strategy, since it was widely reported that Microsoft had been courting the manufacturers to use PocketPC (earlier Windows CE). Since the Epoch operating system was technologically superior to PocketPC (consuming less memory and having better real-time determinism), it provided the manufacturers with an alternative that made them stay independent of Microsoft, and keep control of the "smart phone" market.[23] Symbian opens new entry points for innovation. The main sponsors share the burden of improving the basic core of the operating system within Symbian's basic operations while the modular design facilitated adapting the OS it to firm-specific user interfaces. Thus Ericsson has to develop one user-interface while Nokia is collaborating with Palm Computing to implement its popular interface on top of Epoch. Also, Symbian has become an attractive partner for a wider range of actors seeking to explore wireless technologies.

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[23] Although the independence of Microsoft is routinely questioned by analysts (Shosteck 1999), the selection of an independent browser (Opera) for Symbian's reference products indicates the parties' ambition to remain outside Microsoft's control.

3.7 Conclusions

The tele- and datacom markets has been growing at soaring rates over the past decades. In absolute size, for example, the public investments in communication infrastructure doubled from $100 billion to $200 billion between 1990 and 1999. Much of this growth is linked to the introduction of new communication technologies, such as TCP/IP networks, and mobile telephony. Initially this paper pointed out that open standards plays a larger role in development of new network technologies. What makes this phenomena interesting is that open standards are increasingly developed and promoted by *private* standardisation consortia. This raises serious anti-trust issues, mainly because dominant network standards are laying foundations for network externalities. In addition, the paper then rose the question about the need to move beyond main stream anti-trust theory for stable markets into competition policy issues for dynamic markets because the expanding communication market is characterised by a high degree of innovation and economic dynamism.

In discussing the network externalities in dynamic markets, we concluded that the policy goal for dynamic markets are mainly concerned with the rate of technological change. Also, we concluded that essential facilities economics is a more fruitful approach to the analysis of standards than the more often used tipping and lock-in effects.

Basic to the essential facility approach is the conceptual distinction between architectural and modular innovation. Architectural innovation refers to a system containing several modular sub-units (modules). For example a car is an architectural innovation containing discrete sub-systems such as a range of different engines and gear boxes. Thus *modular innovation* denotes *innovation within the sub-systems*, improving or developing the functionality without replacing the architecture as such. An improved and more gas efficient engine is thus an example of modular innovation. This distinction is clearly of value for analysing innovation in other modularised systems, such as computer systems and communication network systems. Essentially, the study of essential patents in GSM their GSM the architecture/module distinction on patenting we were be able to study empirically to what extent architectural designs based on PAS are providing innovators with

platforms for further innovation at the level of modules. This distinction is fundamental in the discussion of competition between and within standards, because it enables us to observe to what extent manufacturers compete on innovation in new modular features for the same basic system. As for the empirical analysis of open standards, this paper was builds on a dataset of so called essential communication patents, which are to be understood as the technological underpinning of communication standards.

The major implication for anti-trust policy is to determine to what extent control of the architectural innovations, such as the GSM system, may have forced the end-customers to accept a less innovative system. In moving onto the core issue, then, the case study of open standards in mobile telephony tried to determine to what extent open standards in this particular market has been blocking or enabling technological innovation and, if new innovations has been introduced into the system, those innovations were introduced by new entrants.

Some of the empirical findings were unexpected if not downright surprising. Particularly, the analysis of GSM related patents indicate that the Europeans were far from dominating in the digital mobile technology as they were setting the standards for the European market. On the contrary, the European firms were depending on mainly US technology and, in particular intellectual property rights controlled Motorola and AT&T. In plain terms, the American actors structured the European GSM industry through its licence policies. Pertaining to the essential facilities perspective, analysis of essential patents show that the existence of a architectural dominant design (the GSM system) did not result in lack of innovation. differently put, standardisation did not result in a ’frozen’ technology. On the contrary, the data analysis clearly shows that the number of essential GSM patents increased after the standard was set in the early 1990’s. That Nokia emerged as a innovator, leader in SMS-messaging and principal holder of market-driven essential patents clearly indicates the dynamics of intra-system competition. The analysis of 3G confirms this view to the extent that it shows that, under the European “New Approach”, the UMTS system seems even more open to innovation at the modular level.

While Ericsson and Nokia have a strong patent portfolio in 3G patents, Motorola’s role is replaced by another US company,

Qualcomm. This company was among the early champions of so called spread spectrum technology, which now is used as a fundamental principle for the UMTS. The discussion of the UMTS architecture also reflects that despite the firm control of UMTS technology exercised by three leading firms, new firms are coming into the picture because the basic architectural innovation (e.g. the UMTS standard) allow new entrants to innovate at the level of complementary modules that plug-into the open UMTS standard. Significantly, the analysis show that the barrier to entry are kept relatively low because the UMTS architecture supports a range of clearly defined open standards, such as TCP/IP, IEEE standards, and ”Bluetooth.”In addressing the issues concerning the making of open European standards, the part of the case study carried the burden of showing how transformation of the European standardisation system resulted in a negotiated European standard for mobile cellular communication, GSM. The paper showed that GSM resulted from the Commission of the European Union’s intervention into the problem-ridden process of setting a pan-European standard for mobile telecommunications in the wake of the European Internal Market project. In the longer run, the conventional way of setting open standards in traditional standardisation committees proved slow and burdensome. Inspired by the development of US standard setting procedures, the EU authorities in the 1990s activated the so called New Approach policies, leaving the initial responsibility to develop standards to the private industry. This section concluded that EU authorities fully accepts private standardisation as a strategy to drive down costly lead times and to closer co-ordinate the standardisation process with end-users demand and preferences. In EU-jargon, market-driven standardisation is a tool for increased economic competitiveness.

By the way of conclusion, the paper supports the idea that we are witnessing a tendency away from competition between standards to intra-system competition. Our historical perspective on the construction of this market shows that intra-system competition did not result from industry structure. Rather, this form of competition was closely related and determined by a intermediary variable, the EU policies that shaped standardisation processes. Also, this trend is evident in that the UMTS standard consist of a spectrum of additional standards, allowing new entrants to innovate at the modular level once the basic standard is agreed upon.

From competition policy point of view, it seems fair to conclude that the new European approach to telecom standardisation has been successful to the extent that the policies has allowed a dominant standard and yet, through its emphasis on open standards, maintained competition at the modular level. It is beyond the scope of this rather modest paper to determine how general this trend is outside the GSM industry.

But authorities may want to try to assess the degree of openness of an architectural innovation, that is how it is possible for smaller firms to exploit the benefits of open standards and innovate at the modular level. Combining the idea of dynamic markets with the modular perspective on the rise of intra-system competition presents a viable cornerstone for such a analysis.

Appendix: Statistical overview of patents related to GSM

To identify the essential IP's (Intellectual Property Rights) in the GSM standard, we used a database provided by ETSI (European Telecommunications Standards Institute).[24] ETSI requires its members to notify essential IPRs, and publishes these in the form of a written and electronic document that is regularly updated.[25] We used the ETSI database as of April 31st 2002 to get an overview of essential patents in GSM.

The "original" ETSI list contains 1613 declarations belonging to the GSM project. However, many of these are equivalents since most companies apply for patents in more than one country, and often all of these are reported to ETSI. We used the EspaceNet online database of the EPO (European Patent Office) to eliminate such double counts.[26] Based on search criteria such as the patent number (or, in some cases, the patent application number or the title), the database supplies a list of all patent documents worldwide that are equivalent to the original hit. In this way, we were able to reduce the original 1613 entries to 242 patents.[27] Out of these, 165 were found to have a US equivalent. Five patents, which were still only in the application stage, were excluded. The remaining patents were either European (issued with an EP-number) or International (issued with a WO-number). However, when looking at the documents, it seems that most of the patents without a US equivalent have been applied for in the US, but for different reasons, they appear not yet to have been granted there.

We decided to base our first statistical overview of essential patents in GSM only on the 160 US patents. There are two main reasons for this. First, most companies seem to include the US almost without exception when applying for patents. Second, we have access to an extensive downloadable database on US patents: the NBER Patent

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[24] Prepared by Anna Krohwinkel-Karlsson, phd candicate.

[25] http://webapp.etsi.org/IPR/Search.asp

26 http://se.espacenet.com. The method was adopted from Bekkers *et.al*. (2000).

27 The reduction was mostly because of double counts, but we also had to exclude about 20 entries that were unidentifiable because of lacking data in the ETSI records.

Citations Data File.[28] Broadly speaking, the data comprise detailed information on almost 3 million US utility patents granted between January 1963 and December 1999, and all citations made to these patents between 1975 and 1999 (over 16 million). In addition, there is data on inventors, assignees, etc. The main data file includes two main sets of variables, those that came from the USPTO (United States Patent and Trademark Office), so called "original" variables; and those that were created from them, i.e. "constructed" variables (e.g. self-citations). The files were subsequently updated as of April 31st 2002 for information regarding the identified GSM patents.

Using patent citations

Most patents contain a list of previous patents, so called 'citations'. The original function of citations is to delimit the scope of the property rights awarded by the patent. Thus, if patent B cites patent A, it implies that patent A represents a piece of previously existing knowledge upon which patent B builds, and over which B cannot have a claim. The applicant has legal duty to disclose any knowledge of "prior art", but the decision regarding which patents to cite ultimately rests with the patent examiner. The presumption is thus that citations are informative links between patented innovations. First, citations made may constitute a trail for spillovers, i.e. the fact that patent B cites patent A may be indicative of knowledge flowing from A to B; second, citations received may be telling of the 'importance' of the cited patent. The analyzed GSM patents made between 0 and 34 citations to previous patents, with an average of 9 citations made. By 31st April 2002, the GSM patents had received between 0 and 153 citations from latter patents, with an average of 20 citations received.[29] 15% of the patents had not yet been referred to by anyone.[30]

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28 http://www.nber.org/patents; NBER Working Paper 8498 (2001), "The NBER Patent Citations Data File: Lessons, Insights and Methodological Tools", by Bronwyn H. Hall, Adam B. Jaffe and Manuel Trajtenberg.

29 This is significantly higher than the average across all patents from corresponding technological classes, which could be seen as an indication of the "essentialness" of the GSM patents as declared by ETSI.

30 Please note that citations made (and measures constructed there from) is a "static" figure that does not change over time, while citations received is "dynamic" and has to be continuously updated for all patents in the file. It often takes several years until the first citations are received, and consequently, most of the GSM patents with 0 citations were assigned in 1997 or after.

Granted the use of forward citations, a sensible weighting scheme must be constructed. A straightforward possibility is to weight each patent by the actual number of citations that it subsequently received. This linear weighting scheme then assigns a value of one to all citations and all patents (Trajtenberg 1990).

Finally, our analysis includes a measure of 'self citations', i.e. to what extent a patent cites inventions patented by the same assignee. As pointed out by Hall *et. al.* (2001), this has important implications for the study of spillovers: presumably citations to patents that belong to the same assignee represent transfers of knowledge that are mostly internalized, whereas citations to patents of "others" are closer to the pure notion of (diffused) spillovers.[31]

[31] A problem with this measure is that some companies have multiple assignee identifiers, e.g. representing different branches. In that case, only a citation within the same branch will be counted as a self-citation.

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4 Business-to-Business Electronic Commerce and Competition

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4.1 Introduction

While there is no doubt that business-to-business electronic commerce is growing increasingly important, the very notion of "business-to-business electronic commerce" is nebulous. There is a whole range of business practices that rely on the use of information technology, new communication technology and the Internet in varying degrees, and it is not at all clear when a company or a sector of the economy ceases to just "use computers" and enters the realm of electronic commerce.

The nebulousness is somewhat unfortunate for analysts, however, since complementarities and system effects are known to be important in facilitating usage of communication and information technology to transcend into productivity growth. It is also somewhat unfortunate when more narrow consequences of electronic commerce, like its implications for the working of markets and competition, are to be analyzed. While it is quite clear that developments are taking place, quantifying changes in ways that are readily analyzed may prove difficult. Nevertheless, I hope the reader will – as I have – leave this chapter with the view that standard economic analysis is quite helpful in discussing – and at some level understanding – current developments.

This chapter aims at providing some background and foundation for discussing and analyzing the consequences of increasing use of business-to-business electronic commerce in the economy. I address three questions:

- what does the business-to-business electronic commerce landscape look like, and what improvements of ways to conduct trade have followed from electronic commerce so far;

- what are the implications – in terms of efficiency and organizational structure – of business-to-business electronic commerce for more complex supplier relations intermediate between idealized markets and corporate hierarchies;

- what implications follow for appropriate competition policy and appropriate action.

There is substantive evidence that electronic commerce is for real. There are official and semi-official statistics – some of them somewhat dated – corroborating that substantial volumes of transactions are conducted in ways that use information and communication technology in new ways. Moreover, there are consulting-firm reports that confirm the notion that a great deal of firms work hard to stay in the frontline when it comes to being visible and making transactions on the Internet. In addition, it seems clear that some firms have come a long ways toward achieving further integration in the sense of, for example, using the Internet for exchanging technical specifications and other details vital to much of business-to-business transactions. Finally, it is also clear that there have been substantial activity in recent years in devising *organized marketplaces* where information and communication technology is used intensively in the price-formation process; the most prominent example is the use of auctions conducted over the Internet. My aim is to build on this, and try to draw some conclusions in the directions indicated.

This chapter is organized as follows. In the next section, I will try to define business-to-business electronic commerce, and quickly discuss some key economic issues that are raised by its expansion. In section 3, some quantitative and qualitative evidence regarding the use of business-to-business electronic commerce is provided and discussed. In section 4, I introduce a little bit of the economic theory of supplier relationship, and in section 5 this theory is complemented with a discussion of the implications of business-to-business electronic commerce in complex supplier relationship; most of the section is devoted to a case examination of the automotive industry. In section 6, I try to assess the implications of business-to-business electronic commerce for competition policy; in section 7, I sum up the main points.

4.2 Demarcations, definitions and distinctions

Although this is not an essay on definitions – and certainly not an essay on semantics – it is crucial for the ensuing discussion to make clear that e-commerce in general, and business-to-business e-commerce in particular, are taken to mean different things by different people. Clearly, however, there is a common underlying idea of – something like – changes in the way business is conducted that follow with the introduction or expanding use of Information and Communication Technology (ICT). A serious attempt at a definition is made in Popovi (2002), where an e-marketplace is defined as: "a virtual online market where buyers, suppliers, distributors and sellers find and exchange information, conduct trade, and collaborate with each other via an aggregation of information portals, trading exchanges and collaboration tools." This definition promises, in my view, to be quite useful since it captures a number of important elements exhibited by e-marketplaces that represent a significant development relative to traditional means of conducting trade.

4.2.1 A hierarchy of steps into B2B e-commerce

It may be useful to make a rough hierarchy of steps a firm may take towards engaging in business-to-business e-commerce:

1. using computers and email;[32]

2. having an active website on the Internet;

3. using the website actively for disseminating information and advertising;

4. having a working sales and/or purchasing functionality on the website (or having similar capabilities in a closed online network);

[32] However silly this may seem, this is used as an indicator in numerous studies dealing with electronic commerce; see e.g. Hobley (2001) or OECD (2002).

5. communicating and exchanging contract proposals and technical specifications by electronic means using a common software platform;

6. conducting trade involving several parties online, the prime example being online auctions.

While the initial items on this list hardly need be discussed in our context, the distinctions within the second half of the list are crucial in discussing the potential and the consequences – in terms of competition and otherwise – from an increasing reliance on electronic commerce. Basically, whereas using the Internet as an interface for purchasing and selling does not seem to have any significant economic implications relative to the earlier state of affairs, integration of software platforms and organization of online markets are likely to have significant implications for competition and for the working of the economy in other regards.

4.2.2 Economic issues – some preliminary thoughts

In order to fix ideas, I will start at this point by briefly discussing some potential implications of a growing use of electronic commerce.

4.2.2.1 Fixed costs

Perhaps the most salient feature of the information economy or the "new economy" – or, for those disliking the notion, the structural changes coming with the increasing use of ICT – is the increasing importance of fixed costs. This feature follows unavoidably, I think, from the increasing importance of information, but it is nevertheless bound to have profound implications for the working of the economy. While the most prominent examples of fixed costs growing more important are, probably, the software and telecommunication industries, the simple act of establishing presence on the web may constitute a substantial fixed cost for a small firm. The same basic logic applies for taking further steps towards conducting e-commerce. For example, the security and reliability arrangements necessary for the execution of money transaction over the Internet constitute a fixed cost; obviously, further steps toward a platform for exchanging specifications, negotiation, and bidding bring further such fixed costs.

The most immediate question arising from the importance of fixed costs is how Small and Medium-sized Enterprises (SMEs) will be affected. In particular, one might fear that SMEs will be disadvantaged, and that competition will be negatively affected.[33]

On a general level, such fears are probably well founded. Fixed costs do generally constitute a barrier to entry, and this observation is, moreover, strongly corroborated by theory as well as evidence in industrial organization.[34] The implications of the basic observations are not obvious, however. The fact that fixed costs are, likely, more important than they once were may call for policy response in some regards, but the appropriate response is not obvious and it is certainly beyond the scope of this paper.

More narrowly focusing on e-commerce, one may, however, ask the question whether the potential development "up the ladder" by the steps 1 through 6 necessarily inflicts additional fixed costs on SMEs. More specifically, it is not clear that climbing the ladder requires that both parties in a specific business-to-business transaction make large investments. It is not hard to think of cases where the opposite may be true. A large company conducting e-commerce with its suppliers may, for instance, make an investment in a platform that is easy and cheap enough to use for its suppliers not to be deterred. Moreover, and importantly, this is presumably in the large company's interest. As a matter of fact, the argument that taking steps towards using e-commerce may be conducive to *attracting* potential suppliers has been made.[35]

In addition, the technology development springing from the emergence and increasing use of the Internet provides tools for business-to-business information-exchange tools that bring smaller fixed costs than pre-Internet electronic information-exchange tools. The pre-Internet "EDI technologies" (Electronic Data Interchange) were, for instance, adopted in some supplier relationship in the automotive industry.[36] An interesting aspect of this fact is the conflict of interest regarding the adoption of competing Internet-

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[33] These issues are the focused on by Anell (2002).

[34] See e.g. Tirole (1988).

[35] A.T. Kearney (2001).

[36] Helper and McDuffie (2002).

based technologies between parties having made sunk investments in EDI, and parties not having made such investments.

Clearly, however, the development of platforms and other tools will in some cases lead to increasing fixed costs per company involved, and then the likely result of an increasing reliance on e-commerce is that some SMEs end up being foreclosed.

To briefly stress the main point: While there are hazards relating to potential foreclosure of SMEs due to fixed costs, this will likely be a problem mainly in cases where there is a sound economic basis for it; that is, in cases where there are real fixed costs arising at the margin when additional firms are involved. It does not seem likely that foreclosure generally will be practiced whenever there is a possibility for such foreclosure. Quite to the contrary, the interests of large stakeholders seem likely often very well aligned with the interest of promoting competition.

4.2.2.2 Information and price formation

It is often argued that e-commerce is little but a high-tech variety of mail-order commerce. This claim is sometimes basically true; consumer-to-consumer e-commerce, for instance, can be viewed as mainly a slightly more sophisticated and slightly more efficient development of listed advertising. It can, similarly, be argued that business-to-business e-commerce is little but a sophistication of old-time trade aided by fax-based exchange of information, ordering and negotiation.

There are, however, two important aspects of electronic commerce that refute the argument in the context of e-marketplaces. First, electronic tools – in particular the tools indicated towards the end of the list of steps discussed – have the potential of being used in integrating a buyer and a seller further than old-time technology could; we will argue below that this is one of the main sources of the considerably cost-saving potential of e-commerce. This potential will resurface when the distinction between “competitive” and “collaborative” supplier relationships is made below. The second aspect, which may be more important, is that the information that parties to a transaction have about each other and about their competitors may be different from what they would have under traditional forms of trade. When going from bilateral negotiations to an electronic auction, for example, competitors learn

more about each other. It is well known that relatively small differences in information can have a significant impact on the possibilities to collude in auctions.[37] Generally, the more information is conveyed by an auction procedure – and the more recent information being conveyed – the more susceptible is it to collusion.[38]

4.2.2.3 Auctions and renegotiation

There is one aspect of e-marketplaces using auctions that has received relatively little attention, but which may be important in practice; in particular, it may be important in business-to-business contexts. This aspect is that an auction does not necessarily end with the bidding, but that negotiations between the seller in a standard auction, or the buyer in a reverse auction, may follow instead, and that these negotiations need not end with the lowest bidder getting the order. The main reason for this is that the buyer is interested in several dimensions of the contract: price, speed of delivery, quality, security of service and so on.[39]

While this may seem in principle not to constitute a problem – transactions as well as the participation in the auction are all voluntary – I suspect that this should be a source of concern. The main reason is that it jeopardizes norms about how business is conducted, and that it may hurt SMEs in the short run, and thereby hurt competition in the long run. The reason is simple: while SMEs – or new participants on the arena – may be competitive in terms of price, they are bound to be less competitive in terms of their reputation. This creates the risk that larger participants are preferred at equal prices, and this, in turn, is problematic if the intrinsically advantaged established players can negotiate "post-auction pre-trade" with superior information. The end result may be that SMEs or new actors abstain from participating at all in the end. This risk is analogous to the "political risks" faced by enterprises participating in bidding on public-sector contracts competing with public bodies or publicly owned closely held companies, and the tradeoff, too, is similar insofar that there is a tension between short-

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[37] See Klemperer (1999 and 2001).

[38] In addition, second-price auctions are more vulnerable to collusion; see Klemperer (1999).

[39] See Kinney (2000) for a discussion, and some corroboration of this being true.

run and long-run competition. What is not analogous is that each one of several buyers has little incentive to act in the interest of long-run competition since externalities across buyers generate a free-rider problem.

4.2.2.4 Disintermediation

There has been considerable dispute among economists about whether the information economy will lead to organizations and companies growing larger or smaller. Similarly, there has been a discussion about the future of intermediaries in general. Will there, for example, be any scope for travel agents when tickets are available online from airlines and other companies directly? In general, it is of course far too early to answer that question, but a few remarks may be called for.

While some intermediaries are likely threatened, other intermediaries are likely to emerge. In particular, the expansion-of-market potential may call for intermediaries specializing communication and trust building.[40] Also, it can be argued that some e-marketplaces are tantamount to traditional intermediaries.[41] As a general matter it seems clear, however, that there is far too little evidence to tell at this point.[42]

4.3 Empirics

It turns out that there is very little "hard evidence" on B2B e-commerce. The official statistics from, for example, the OECD contain little beyond figures describing Internet usage and computer literacy.[43] Eurostat performed, however, pilot surveys in 2001 for a number of European countries.[44] The resulting survey evidence provides some indication of the penetration of e-commerce across

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[40] This is alluded to in Federal Trade Commission (2000).

[41] Kinney (2000) expresses this view, in particular relating to freemarkets.com.

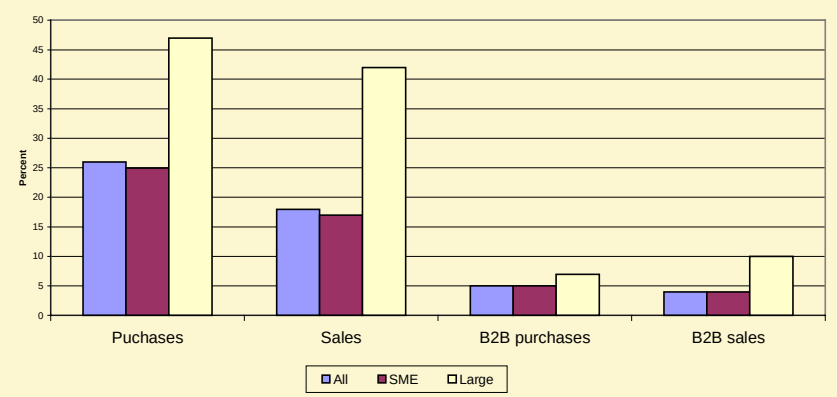
[42] See Koch and Cebula (2002).

[43] OECD (2002), in particular chapter 4, provide some background, but does not get beyond simple statistics about computerization in general and survey evidence on the reasons for e-commerce taking off slowly.

[44] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom.

countries and industries at that point in time. Figure 4.1 shows the proportion of companies with web transactions in purchases and sales, and the proportion of companies using specialized business-to-business e-marketplaces. The salient features of the data is that while “e-sales” and, more so, “e-purchasing” were quite widespread, in particular in large companies, the use of specialized e-marketplaces was quite small, around 5 percent.

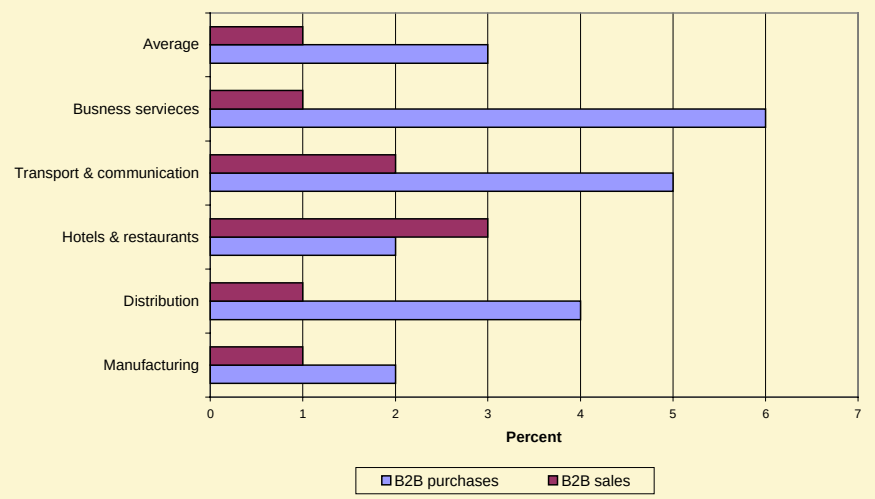
Figure 4.1 Companies with web transactions (2001)



Source: Eurostat (2002, table 2.4.1).

In figure 4.2, the use of specialized e-marketplaces is shown for a number of industries (together with an average). It may be worth noting that “e-purchases” are more widespread than “e-sales” except in “Hotels & restaurants”; this is consistent with the notion that in most industries business-to-business e-commerce is more developed and developing more quickly than business-to-consumer e-commerce – end sales may contribute to the low “e-sales” numbers. Note the low over-all number, manifest also in figure 1.

Figure 4.2 Use of B2B e-marketplaces across some industries (2001)

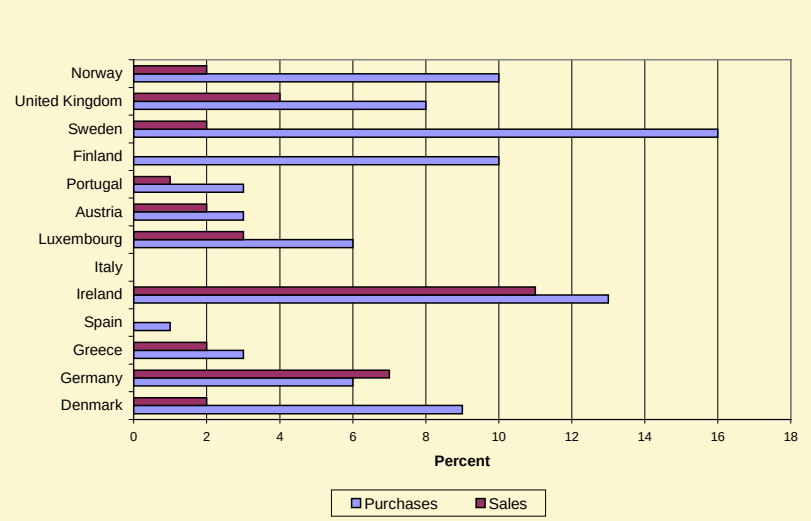


Source: Eurostat (2002, table 2.4.1).

In figure 4.3, the use of specialized business-to-business e-marketplaces is shown across a number of countries.[45] One may note that there is an instance – Italy – of a country where figures are available, but zero both for purchases and sales. Another fact worth noting is that the Scandinavian countries rank highly over-all, and that the pattern that "e-purchases" are much more widespread than "e-sales" is particularly striking for the Scandinavian countries (taking note of the fact that there is no figure for sales for Finland, however). One may also note the relatively large difference between Ireland and the UK, with Ireland having a higher penetration of business-to-business e-commerce.

[45] Figures are unavailable for some countries.

Figure 4.3 Companies using B2B e-marketplaces across countries (2001)



Source: Eurostat (2002, national figures).[46]

In a survey by Hobley (2001), one aspect surveyed was the "proportion of establishments engaged in online data exchange with suppliers/customers." The EU-10 average[47] for 1999 was 20 percent, and the projection for 2001 was 41 percent. Within this sample of countries, Sweden did not stand out; the 1999 figure was 25 percent, but the projection for 2001 was only 39 percent.

There is, however, some complementary evidence regarding the nature of e-marketplaces, and the sectors in which e-commerce plays a significant role.

4.3.1 Glimpses of the e-business landscape

In this section, I will give some ideas about features of existing e-marketplaces, and distinctions between them. I will first discuss

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[46] The zero observation for Finland on Sales is a missing value.

[47] Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, Sweden, and the United Kingdom.

ownership, and then some characteristics of the industries penetrated.

4.3.1.1 Ownership and scope of e-marketplaces

There is substantial and significant variation in the scope of different e-marketplaces. Some are run by entrepreneurs with the ambition to become a major marketplace for an industry or a set of industries; some are set up by individual firms. Three kinds of e-marketplaces are generally distinguished in this regard:[48]

- third-party e-marketplaces;
- consortia e-marketplaces;
- private e-marketplaces.

Third-party e-marketplaces are distinguished, first and foremostly, by being run by a party that is independent of buyers and sellers. In general, third-party e-marketplaces aim at providing an environment where buyers and sellers meet at an equal footing, that is, where neither party is unduly advantaged. Also, third-party e-marketplaces tend to be open for new actors entering without too much impediments. In addition third-party e-marketplaces aim at organizing trade among many buyers and many sellers in a market, and in many cases they act as brokers (rather than traders) in the sense that they do not buy and sell, but only provide the arena for exchange. Third-party e-marketplaces have much in common with consumer-to-consumer e-marketplaces, the Internet auction sites – with eBay the most well-known one – being the prime example.[49] As is the case for these consumer-to-consumer sites, the third-party e-marketplaces have an interest in developing institutions and norms that facilitate good faith in transactions. Indeed, some third-party e-marketplaces develop and use instruments like rating systems and escrow systems (tools for securing payment).[50]

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[48] See Popovi (2002).

[49] Andersson and Arnberg (2002) provides an overview and some analysis in Swedish. The importance of trust-building is stressed.

[50] See Popovi (2002).

Consortia e-marketplaces are distinguished by the property of being set up and owned by leading actors in the market where the e-marketplace operates. Still, however, they are in general run as independent entities, being, for example, independent in terms of its management and board. A key reason for initiating a consortium e-marketplace is the momentum gained by having a set of large players – buyers or sellers – on board at the outset, thereby facing much better prospects for reasonably quick expansion. Consortia e-marketplaces are in general less open, and circumstances where sizable investments are needed to enter and exploit the possibilities of business-to-business e-commerce are likely to favor consortia e-marketplaces.

Private e-marketplaces are run by individual companies, and their key distinguishing feature is that they are much less open than the other types of marketplaces. The benefit of this is that the actors that use a private e-marketplace can retain a fair amount of privacy – information is spread among a smaller set of participants. In particular – and this is likely more important – the firm that runs the private e-marketplace can protect knowledge and information about its own business practices.

A distinction between different exchanges that is important in some regards is that third-party, consortium and private e-marketplaces represent a sequence of marketplaces that are successively less dependent on earning money on their own. In particular, while third-party e-marketplaces are profit maximizing in most cases, consortia exchanges are expected to at least break even; private exchanges face no such constraints. This fact combined with the high-fixed-costs, low-marginal-cost feature of e-marketplaces contributes to the potential problem of independent exchanges not obtaining critical mass, and not attaining close to efficient scale of operations. Consortia and private e-marketplaces are likely to do better by being able to internalize critical-mass problems.

4.3.1.2 Industry specifics

There are some things to be said about what kind of e-marketplaces emerge in a particular industry. It seems, for example, that third-party e-marketplaces tend to emerge in fragmented industries, such as the construction industry; according to Popovi (2002) there are currently more than 15 e-marketplaces serving the construction

industry. The electronics, chemicals and medical industries seem to constitute similar examples of sectors where third-party e-marketplaces play an important role. Also, third-party e-marketplaces seem to be important in the context of highly standardized objects or commodities, where the impediments to anonymized exchange are bound to be much less important than when it comes to more specialized objects of trade.

The automotive industry seems to be a prominent example where consortia e-marketplaces are an important phenomenon; there are a limited number of buyers that – one and one, or together – have considerable market-making potential in their relationship with a large number of heterogeneous suppliers; the buyers can also likely exercise considerable market power. We will return to the automotive industry below. The health-care and aerospace industries seem to exhibit similar characteristics, and the steel industry seems to be an example where the sellers have been able to initiate a powerful consortium e-marketplace.[51]

Private e-marketplaces are, of course, primarily used by large corporations; such corporations, however, tend to use several types of e-marketplaces parallely.

4.3.1.3 Some performance evidence

Systematic evidence on performance in the context of business-to-business e-commerce is even harder to find than is evidence on practices. Nevertheless, there are some pieces of evidence – in particular for markets for relatively standardized products – that clearly should be accounted for.

The Internet site Autodaq specializes in used cars emanating from rental companies and leasing firms; it sells cars primarily to dealers. The site is thus an example of a third-party e-marketplace. Moreover, it employs an auction format with the possibility for users to use a proxy-bidding mechanism – that is, to submit a "reserve price" to a bidding agent that participates in the auction and bids at a prespecified bidding increment until the reserve price

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[51] The potential of e-commerce in introducing/improving competitive elements in, for example, specialized health care is interesting both in terms of studying e-commerce, and in terms of the importance of public policy in making it work.

is reached. It also employs an inspection system where the car is inspected, described and photographed by an inspector. Autodaq is thus a business-to-business auction site specializing in cars, and taking measures to deal with potential problems with unknown quality that are exacerbated by buyer and seller not meeting and the seller not directly being able to inspect the car.

Garicano and Kaplan (2001) studied prices and transactions on Autodaq, and they report two important findings. First, they found considerable savings, the magnitude being 5 percent of car value and thus a much larger fraction of transaction costs. Secondly, they found no evidence of adverse-selection problems being aggravated. The results thus indicate that potential gains are large, but it is important to keep in mind that measures are taken to avoid adverse-selection problems, and that used cars is a reasonably standardized commodity. We will come back to the importance of this.

4.3.2 Glimpses at the steps towards e-commerce

In this section we will say a bit more about the sequence of steps towards full-fledged e-commerce discussed in section 2.

4.3.2.1 Exchanges

While auctions are used frequently in the context of business-to-business electronic commerce, it may be worth noting that the logic of auctions can be taken one step further by having a simultaneous, continuous auction going on in real time. This is the recipe for an exchange e-marketplace. Examples of exchanges are primarily found in the energy and commodity sectors; much of the doings of Enron is a good case in point, albeit much less voluminous and much less advertised today. Of course, the publicly organized markets for, for instance, electricity – the Nordic ”NordPool” being one – are examples of e-commerce sites in this sense. Exchanges may play an important role in opening up futures and options markets for the commodities in question;[52] this should – the sobering lessons from Enron aside – contribute to facilitating efficient trade in the commodities in question.

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[52] See Popovi (2002).

4.3.2.2 Collaborations

As I discussed in section 2, it seems likely that integration beyond transferring existing business activity from fax machines, phones and paper to the Internet is paramount for realizing the potential gains from e-commerce. Going beyond transfer includes, for example, parties working with specifications and blueprints using a common platform, and, taking still another step, could include virtual cooperation between buyer and supplier in design, development, or sales forecasting. Dell has invested a major effort in developing a ”virtual supply chain.”[53] We will come back to this after having discussed supplier markets in some depth.

4.3.2.3 Payoffs

It seems quite clear that e-commerce is a potentially powerful means of containing costs. Reading, for example, the A.T. Kearney report *Assessment of Excellence in Procurement 2002*, it is stressed very forcefully that companies that have made investment in e-commerce – and “e-supply management” which is the recurrent buzzword of the report – have received very good returns on those investments, and that the greatest returns have materialized for those who have gone the farthest in embracing e-commerce. In particular, the report mentions “e-RFPs” – that is, electronic Requests For Proposals – and Internet negotiations.

Interestingly, another source of potential saving that is stressed in the cited consulting report is that companies can source “deeper into their spend base”; i.e., that e-commerce tools and e-commerce integration facilitate outsourcing. Although this is not surprising, it is not at all self-evident; whether electronic commerce – and, for that matter, the information economy in general – will, in the end, contribute to outsourcing and disintermediation is disputed. The only robust observation is that there are forces at work simultaneously changing costs and benefits of such arrangements.[54] I will come back to this.

While the message that savings have been made but that further savings are possible seems unproblematic, one should note – and

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[53] See Popovi (2002) and A.T. Kearney (2002).

[54] See Koch and Cebula (2002) and Varian (2002).

we will come back to this – that there is an element of "leveraging a company's sourcing expertise," and that the same presumably goes for the sourcing power, that is the market power. It is, in fact, quite obvious that there is a potential for mounting monopsony power (in the cases concerning buyers managing their supply), and it is important to keep in mind that this is not self-evidently socially beneficial.

4.4 Economics of supplier relationships

It is not meaningful to approach issues arising in the context of complex business-to-business transactions without making some crucial distinctions about different modes for organizing production vertically. There are two important distinctions to be made. First, a company faces choices about whether to "make or buy", i.e. whether to produce an input in-house or buy it from another company. In this context, the "make strategy" is referred to as vertical integration, while the "buy strategy" is referred to as a market solution. Secondly, however, a company buying inputs from other companies faces choices about what kind of relationships to develop and nurture with suppliers. The particular aspect of the relationships which has been subject to focus in the economics literature is their competitiveness/collaborativeness; competitive relationships are often associated with a US business tradition, while collaborative ones are associated with a Japanese business tradition.

4.4.1 Vertical integration and disintegration

The issues of vertical integration vs. market-based vertical relations are important in the context of e-commerce for two reasons. First, there is a close link between the basic observations in this context and the basic observations regarding competitive/collaborative inter-firm vertical relations. Secondly, the questions that are often raised about the organizational implications of e-commerce touch on vertical integration/disintegration as much as they touch on inter-firm vertical relations.

The notion of an organizational choice involving economic tradeoffs similar to the tradeoffs faced by economizing firms and consumers stems from Coase (1937). The notion put forward –

based on the concept of *transaction costs* – was that firms should be expected to make organizational choices in such a way that transactions – like the acquisition of an input – are made on markets if the transaction costs associated with the market transaction are smaller than the transaction costs that would be associated with making the substitute transaction inside the firm; transactions are made internally if the opposite relation prevails.[55] Although a bit vague, these ideas have gained conceptual and empirical content over the last decades. An important observation generated by this work is that the make/buy distinction can be viewed as a choice between two *organizational regimes* that differ in a number of dimensions, and that other combinations of attributes across dimensions – although feasible in principle – are very rarely observed and likely inferior. Somewhat crudely, organizing an activity inside the firm involves: relatively strict rules for how things are done; relatively weak performance incentives; and dispute resolution internally rather than in court. A market-organized activity is characterized by: freedom regarding means and methods; strong performance incentives; contract-based remuneration; and dispute resolution frequently taking place in court.[56] An instructive empirical manifestation of the regimes is provided by the organization of sales by either employed salespersons or independent salespersons. It has been documented that independent salespersons not only have more freedom to decide on day-to-day operations, but also differ from employed salespersons in being remunerated mainly on a commission basis (employed salespersons receiving close to fixed-wage remuneration), and in facing no restrictions against selling competing products parallely.[57]

Determinants of organizational modes have also been identified in recent research. Generally, it seems clear that there are two key attributes of transaction that make internal organization attractive, namely:[58]

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[55] The choice is sometimes referred to as one between *markets* and *hierarchies*.

[56] General treatments of this organizational dichotomy can be found in Williamson (1985 and 1996, Ch. 4), Holmström and Milgrom (1994) and Söderström (2001, Ch. 2).

[57] See Anderson and Schmittlein (1984) and Anderson (1985).

[58] See Holmström and Milgrom (1994), and Hart (1995) and Williamson (1996, Ch. 4) for elaborations on the two points.

- *cooperation* being important – in particular cooperation regarding hard-to-contract aspects of an activity;

- *investments in specific assets* being sizable.

An important reason for cooperation being hard to sustain in market transactions is that performance-based incentives that can be codified in a contract are hard to direct to cooperative activities. Strong incentives lead, quite generally, to unintended "effort-substitution incentives"; that is, while certain desirable actions are encouraged, undesirable neglect of less-rewarded actions is a consequence which is hard to avoid.[59] Specific assets refer to assets whose value in alternative use is much smaller than in the intended use. If a party invests in an asset that is specific to a bilateral relationship the other party gains bargaining strength, and the investing party may be subject to "hold-up" – aggressive bargaining exploiting the fact that the investment is already committed – by the other party. If an asset is specific to both parties, neither one party's ownership nor contracting is in general able to solve the hold-up problem, and vertical integration is likely superior.[60] There are, of course, other factors that also explain integration; vertical integration can, for example, solve double-marginalization inefficiencies in bilateral-monopoly contexts.

Although inside-the-firm transactions do not qualify as business-to-business transactions, there is an important question frequently being asked about the extent to which business-to-business e-commerce – as well as ICT in general – is likely to change the tradeoffs underlying organizational choice. While there is ample evidence of sensible observers having strong views on the issue – in most cases the view being that the evolution of ICT will facilitate marketization and vertical disintegration – hard evidence is sparse.[61] It is also clear that some of the strong views spring from ignoring the fact that ICT affects internal transactions and the efficiency of internal transactions as well as market transactions.[62]

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[59] This is a very important observation in incentive theory; see in particular Holmstöm and Milgrom (1991).

[60] See Williamson (1985) and Hart (1995).

[61] See e.g. Lucking-Reiley and Spulber (2001) for a discussion touching on this.

[62] This point is made by Varian (2002).

4.4.2 Collaboration and competition in supplier relationships

The economic approach to vertical relations focused on vertical integration vs. market transactions for a long time. Over the past decades it has, however, become increasingly clear that both the internal-organization regime, and the market regime are stylized notions that are too simplistic when further understanding of the vertical organization of production is sought. While the understanding of internal organization is relatively peripheral for our purposes, the understanding of supplier markets is important.

An important source of the further understanding of supplier relationships was provided by Japanese firms. It turned out that the relationship between large Japanese corporations and their suppliers was an intermediate form, incorporating traits from both internal and market transactions. In more precise terms, prevalent features of the relationship between corporations and their suppliers are: that there is a fair amount of cooperation and knowledge sharing going on within the relationship; that performance incentives are blunted by after-the-fact adjustments to unforeseen contingencies where parties act generously relative to their contractual rights and obligations; and that the "working assumption" of the relationship is that it will continue in the sense that, for instance, an underperforming supplier is given assistance and a "second chance" before the relationship is terminated.[63] In addition, dispute resolution in courts is rare relative to standard market relationships.[64] This set of arrangements constitutes a *hybrid form* in the sense that it is intermediate between market transactions and internal transactions in a number of respects; the mode of contracting is often referred to as *relational contracting*. This is not inconsistent, however, with the basic notion that organizational choice is a choice between a discrete set of alternatives, each requiring a particular configuration of institutional supports to work well; in the context of Japanese vertical relations, it has been argued

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[63] See e.g. Aoki (1990) and Williamson (1996, Ch. 12).

[64] See e.g. Williamson (1996, Ch. 4).

that Japanese labor relations and Japanese banking have been important for relational contracting to work well.[65]

The distinction between relational contracting and "standard" competitive contracting – or, in other words, the distinction between collaborative and competitive supplier relations – is important for us because it is possible that the development of e-commerce will affect those contractual regimes differently; it is possible in principle that e-commerce will make either mode of contracting superior. It is also important because of its importance in the automotive industry, which we will discuss in some detail below.

4.5 Business-to-business e-commerce and complex supplier relationships

This section of the chapter is in a sense devoted to asking the question "What's new in supplier relationships as a consequence of e-commerce?" By asking this question we aim at sorting out what likely consequences of an increasing use of e-commerce are best seen as "piecemeal improvements" of existing practices, and what likely consequences will bring qualitatively new practices. There is, obviously, not a single certain answer to this question, but I believe it is useful to sort out what – from an economist's point of view – seems likely to bring structural changes to the economy, and what seems merely to be improvement of current modes of production and organization. I will start by making some general observations, and then go on to discussing what is happening and what seems likely to be happening in the near future in the automotive industry.

4.5.1 General thoughts

On a general level, it seems likely to me that most improvements of current practices will not bring dramatic structural changes. Examples of improvements I have in mind are the rationalization of office work that e-commerce makes possible, like exchanging contracts, specifications and other documentation electronically rather than manually; to the extent that a step is taken in which

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[65] Aoki (1990) and Williamson (1996, Ch. 12).

manual *re-typing* is avoided, improvement may be sizable but it seems to me that fundamental organizational changes will not in general follow. The same seems to be true for the possibility of moving from catalogue pricing and negotiations towards organized markets incorporating price formation; this will not by itself bring structural change. Improvements may be significant here too, however.

There are other developments which I believe will be important, however. First, the organization of marketplaces where information about transactions is accumulated and, in principle, can be aggregated and used by the party controlling the marketplace is important if the party has an interest in controlling the price-formation process. This aspect is, in particular, crucial in assessing the implications of e-commerce for competition policy. Secondly, the growing use of e-marketplaces, parallel with the growing use of ICT throughout the economy, may lead to relative price changes that have implications for how activities are organized. To take an example that is somewhat contrary to popular stereotypes, the exchange of somewhat sensitive data (like contracts, blueprints and specifications) electronically may lead to trust becoming relatively scarce – or, to put it differently, to aggravated adverse-selection problems – in a way that favors modes of organization fostering cooperation. In such a case, collaborative supplier relations and vertical integration would become relatively more attractive as a result of improvements of e-commerce capabilities.

4.5.2 The automotive industry as a case in point

The automotive industry is appropriate for exploring and discussing business-to-business transactions because its diverse set of business-to-business relationships captures salient features of general issues. More specifically, the inputs of manufacturers include the whole range from standardized commodities to specially designed parts. The automotive industry has, moreover, been subject to extensive study regarding the nature of supplier relationships; much effort has been invested in classifying supplier relationships on a scale from competitive to collaborative, as well as in studying vertical integration. The automotive industry is also distinguished by using a large number of relatively non-standardized components, making sourcing problems relatively complex.

Within the automotive industry a number of business-to-business e-marketplaces have been established. The most renowned one is Covisint which is a consortium e-marketplace, initiated by Ford, General Motors and Daimler-Chrysler, with most of the major manufacturers and a large number of suppliers currently being members.[66] Some automakers have chosen to launch e-marketplaces on their own, however. In addition, manufacturers as well as suppliers are active on several e-marketplaces parallely.

Leaving competition-policy issues for the next section, a number of issues are raised by the use of e-commerce – inside and outside e-marketplaces – in the automotive industry. The issues include what gains have been made and have the prospect of being made in a foreseeable future; and what structural changes have happened of can be foreseen.

4.5.2.1 Efficiencies

The most significant gains seem to stem from the relatively tangible improvements of information transfer.[67] Scheduling and inventory management is subject not only to intra-company rationalization, but also to more efficient management across company boundaries. This is due to the availability of timely and accurate data, and to the development of web-based technology that is relatively cheap and is conducive to using and exchanging information efficiently. The development of the protocol XML (Extensible Markup Language) has been tailored for exchanging product, scheduling and inventory data between computers.[68] The development of XML is also an improvement relative to older non-web-based e-commerce tools both in terms of performance and in terms of fixed costs.

There are important instances, however, where gains from information transfer have been limited by the fact that companies are reluctant to give away sensitive information. For example, companies are naturally reluctant to share capacity-utilization

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[66] A thorough overview of the history and background of Covisint is provided by Helper and McDuffie (2002); Covisint's website also contains some information (http://www.covisint.com/).

[67] The main sources for the rest of this section is Helper and McDuffie (2002) and the interviews cited in the References.

[68] Cf. HTML (Hypertext Markup Language).

information in a context where there is price competition. A company's bargaining position is undermined by the information that it has idle capacity at a certain point in time, and this is an impediment to mutually beneficial transactions that could in principle be coordinated by e-commerce tools.

Another, quite obvious, source of potential for efficiency improvement is the decrease in search costs for relatively standardized products. From the manufacturers' perspective, it seems clear that gains have been made by the use of organized e-marketplaces in that they have been able to deal with a larger set of suppliers, extending their input market geographically. This observation is frequently made in the context of markets in general.[69] It is clearly valid and important, but a similarly important complementary observation is that it applies mainly to relatively standardized commodities.

4.5.2.2 Structural changes

A question which we have alluded to already is whether the development of tools for business-to-business e-commerce will provide a competitive advantage to either mode – competitive vs. collaborative – of organizing supplier relations, or, possibly, if it will give rise to a superior mode of organization making the distinction between competitive and collaborative relations irrelevant.[70] The answers to both questions seem to be no. The reason for this is the fact that there are to some extent distinct sets of e-commerce tools that are useful in competitive relations and that are useful in collaborative relations – auction tools are more useful in the former context and tools for e.g. collaborative design are more useful in the latter context. This, combined with the fact that each manufacturer is likely to adopt tools that are valuable given their current organization of supplier relations, indicates that the distinction will continue to be relevant. Nevertheless, it seems clear that leading e-marketplaces – in particular Covisint in the automotive industry – will have an influence on the relative

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69 For example, in A.T. Kearney (2001 and 2002).

70 In this context the terms ”exit” and ”voice” are used essentially synonymously with competitive and collaborative respectively in some literature.

attractiveness of different modes by their priorities in developing competitive vs. collaborative tools.[71]

The fundamental reason for the likely continued co-existence of competitive and collaborative supplier relations is the fact that there is an intrinsic tradeoff between cooperation and competition. In specific terms, a manufacturer cannot expect a supplier involved in cut-throat competition exerting effort on making improvements that benefit the whole chain – including perhaps competitors. While technology may alter this tradeoff a bit, it cannot – contrary to some new-economy hype around the turn of the millenium – fundamentally alter the fact that it constitutes a constraint. Thus, distinct modes of organization are likely to continue to co-exist since the relative benefits of each depend, among other things, on aspects of the particular input or transaction. In addition, there are strong complementarities among the institutional supports of each mode.[72]

There is a parallel discussion in the automotive industry about the possible "modularization" of the product, that is the possibility that the manufacturing of a car to an increasing extent consists of assembling modules like e.g. seats, safety systems and electricity systems. This development has not really taken place so far, but there is a discussion of the possibility, and also of the possibility that e-commerce may facilitate it. It seems, however – similarly to the to relative strengths of the competitive/collaborative modes – that e-commerce tools are likely to benefit both modular and non-modular solutions.[73]

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[71] Helper and McDuffie (2002) also stress the importance of the struggle between the two main providers of computer code to Covisint, Oracle and CommerceOne; the two codewriters have had different ideas about the openness of the marketplace in terms code as well as information.

[72] Thus, it is – to use jargon – perfectly possible that discretely different modes co-exist for "multiple-equilibrium reasons."

[73] Helper and McDuffie (2002). Modularization would mean a step towards cars being "built-to-order"; this is discussed in Helper and McDuffie (2001) where comparisons are made with personal computers. The huge difference in the number of parts and their degree of customization between a car and a personal computer is argued, however, to make "build-to-order" of cars unlikely in the foreseeable future.

4.5.2.3 Auctions and business ethics

The emergence of e-marketplaces has lead to an increasing use of auctions. There are a number of points to make with regard to this. First, the auction is an old and well established mechanism for conducting trade that has many appealing properties from an economic-efficiency point of view.[74] The fact that e-marketplaces shift price determination from list prices and negotiations to auctions is therefore in many cases a good thing. Auctions are, indeed, an important ingredient in making competitive supplier relations more efficient. Secondly, however, auctions suffer from the fundamental limitation that the object determined in the auction – almost always the price – is one-dimensional. It is much more difficult to arrange auctions of non-standardized contracts than of standardized contracts because *bidding* needs to take place in more than one dimension, and this limitation becomes relevant when auctions are conducted for non-standardized inputs.[75] A potential solution is to have the buyer announce his valuation – in terms of an "index function" that can be implemented by a computer – of a number of attributes of an input, attributes such as price, quality and terms of delivery.[76] Besides this being somewhat artificial it raises issues about transparency. If all attributes of bids are made visible to all participants in an auction, participants may opt out because they consider some of the information generated to be sensitive. If, on the other hand, not all attributes are made visible, bidders will not be able to infer the best bid from available information, and the very transparency that is one of the key virtues of an auction is lost.

As a matter of fact, there is ample account of instances where either lack of transparency or rightout repudiation of the presumed principle that the winner of the auction should get the contract have left participants discontent.[77] Although one can argue that this is a business-ethics problem that, while possibly temporarily aggravated by a technology shift, may arise independently of the trading and negotiation arrangements in place, it seems to be a serious concern among many suppliers. In addition, the virtues of auctions

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[74] See e.g. Klemperer (1999).

[75] One may note that auctions are used also for complex objects like art and fresh food, but in those cases attributes are fixed and bidding need take place only in one dimension there too.

[76] Helper and McDuffie (2002).

[77] Kinney (2000); Helper and McDuffie (2002); personal communication.

compared with other trading arrangements are no longer a foregone conclusion; in fact, one no longer deals with an auction, but with a more complicated semi-structured negotiation process. The fact that this is considered a problem is – as far as I can see – a manifestation of the limits of using auction-type markets for non-standardized contracts. More fundamentally, the tradeoff between cooperation and competition is at play.

4.6 Competition issues and competition policy

There are two arenas for competition issues to arise in the context of e-marketplaces, namely the market itself and the "market for markets." On the market itself the question is if a given business-to-business electronic-commerce arrangement may jeopardize competition on either side of the market; questions about the ownership and operational control of marketplaces naturally arise here. On the market for markets, the presence of strong network effects may lead to concentration and strong first-mover advantages.[78]

4.6.1 The market itself

As regards competition and competition policy on markets where trade on e-marketplaces is important, there are – as far as I can see – two main issues that deserve attention from a competition-policy perspective. First, there is a risk that e-marketplaces can serve as a platform for coordination and collusion. Secondly, e-marketplaces controlled by a subset of the players on one side of the market may wish to exclude competitors on that side of the market.

4.6.1.1 Tacit collusion and monopsonistic pricing

Tacit collusion refers to a situation where a number of firms with a common interest try to and succeed in coordinating their behavior in a way that is beneficial from their point of view. Since agreements between firms that constitute restraints on trade in

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[78] This section draws on, among other things, Federal Trade Commission (2000), Harbour (2001), Office of Fair Trading (2000) and Popofsky (2001). The views expressed, however, are my own.

general – and price-fixing agreements in particular – are illegal, firms cannot contract on collusion; they may nevertheless be able to sustain collusion by means of explicit or implicit promises or threats. Thus the notion of *tacit* collusion. Collusion is most commonly discussed in terms of sellers trying to sustain monopoly rents, but the situation where buyers try to sustain monopsonistic pricing is similar; the discussion in this section will be framed in terms of buyers and monopsony since buyer coordination is more relevant on some business-to-business e-marketplaces.

The theory of tacit collusion is pretty clear: it is easier to sustain collusion[79]

1. the fewer firms being involved, that is the more concentrated is the market;

2. the more quickly and the more accurately the firms can observe each others' actions – in particular deviations from the tacit agreement;

3. the smaller the short-term gain from deviating from the agreement;

4. the more patient are the firms involved.

While the first point is obvious and the last two points rather immediate, the second point is important in this context and – at least when specific consequences are derived – non-obvious; an implication of it is that firms may post price information on the web in order to facilitate collusion, and that catalogue-type Internet commerce may be more susceptible to tacit collusion. This very observation is closely related to the hazards implied by e-marketplaces since an e-marketplace may generate accurate and credible real-time information about pricing and trade. An e-marketplace with a small number of buyers, a large number of sellers and such information available to buyers would be fertile ground for tacit collusion. Whether this is likely to be a real problem or not depends on some key parameters (beyond 1-4 above):

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[79] See e.g. Tirole (1988).

- who gets what information how quickly;

- the existence of substitute trading possibilities where information about trades are not as readily available.

In practical terms, my reading of the implications of this is that competition policy needs to be at least as intrusive when it comes to dealing with tacit collusion on e-marketplaces as it is in dealing with tacit collusion in general. That is, competition authorities need to have powers to access intra-company information and, importantly, intra-marketplace information in enforcing competition law. While the specifics of enforcement are somewhat different – and some of the intra-marketplace information is quite readily at hand – the degree of intrusiveness called for seems comparable to that applied to other suspects of tacit collusion. In the application of competition policy, there may be reasons to demand some disempowerment of the information generating capacities of an e-marketplace.[80] In addition, *exclusivity arrangements* imposed by buyers in the example – any side of the market where concentration calls for scrutiny more generally – should be examined with a fair amount of suspicion. Requirements that all trade be made on a particular arena may have a sound justification, but such justification must be weighed against the risks for tacit collusion.

It is worth noting that tacit collusion seems to be a potential problem both for consortia e-marketplaces and for independent e-marketplaces. As to buyer- or seller-sponsored consortia, it would of course be possible that rightout monopsonistic/monopolistic behavior take place, but such behavior would be clearly illegal and considerably easier to subject to action.

4.6.1.2 Exclusion

Exclusion refers to a situation where a subset of firms on one side of the market controls an essential facility from which they may wish to exclude competitors on the same side of the market. This seems to be a problem only for consortia e-marketplaces controlled by parts of the industry. While assessing anticompetitive damage

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[80] A potential precedent noted in Federal Trade Commission (2000) is the action taken against a fare dissemination system used by airlines.

and possible procompetitive benefits of exclusion and refusal-to-deal arrangements is difficult, it does not seem to be more difficult in the context of business-to-business e-marketplaces than in other contexts. The potential exclusion incentive, therefore, does not seem to raise fundamentally new issues for competition policy and antitrust enforcement. There are also indications that it has not, so far, been a problem.[81]

4.6.2 The market for markets

A market has, quite generally, features common with a public good in that there is not in general rivalry concerning the use of a market; to the contrary, there are often positive externalities from participation across parties using the market. In light of this it is clear that there is no reason to presume that the market for markets necessarily would work very well.

4.6.2.1 Monopolization and foreclosure

The key problem with "market provision of a market" stems from the very fact that it has public-good qualities; in different terminology, the market can be considered a natural monopoly. One question to ask is whether competition is desirable in the provision of markets. There are good reasons to answer the question affirmatively in the case of business-to-business e-marketplaces, however. First, markets are not in general proprietary, but e-marketplaces are; the owner of an e-marketplace can effectively exclude users (exclusion of competitors in the sense of last section aside), and is thus capable of acting monopolistically. This, in turn, generates monopoly distortions in terms of restrained use and possibly suboptimal levels of quality. Secondly, e-marketplaces are likely an example of a context where innovation is important, and the evidence seems quite overwhelming that monopoly is not the ideal breeding ground for innovation.

Asserting some competition in the market for markets seems, however, to require rather intrusive action. One would want e-marketplaces to comply with demands in terms of for example

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[81] Federal Trade Commission (2000).

interoperability with other e-marketplaces. The issues that arise are somewhat similar to those arising in the software industry.

Currently, however, monopoly in the market for markets does not seem to be an acute problem. This is in part because the growth of business-to-business e-marketplaces has not been as quick as was believed a couple of years ago. The most important reason, however, is that independent e-marketplaces have, in many cases, fared badly in competition with consortia or private e-marketplaces.[82] Consortia and private e-marketplaces are likely to internalize the monopoly distortions, and if this trend persists competition on the market itself is likely to deserve more attention than competition in the market for markets.

4.7 Conclusions

The objective of this chapter has been to say something about the importance of business-to-business electronic commerce for the way supplier markets work; for the way the organization of complex supplier markets may change; and for the appropriate focus of competition policy.

The conclusions can be summed up as follows.

- E-commerce is growing and helping companies make considerable savings. In particular, improvements in inter-firm administration of planning, scheduling and production give rise to sizable savings.

- The use of e-marketplaces with price formation by means of auctions makes some markets more competitive, but this seems to happen mostly on markets for relatively simple and standardized goods and services.

- In complex supplier relations, e-commerce tools are used to improve practices in both competitive and collaborative such relationships; some tools are clearly geared towards improving either the competitive or the collaborative mode of organizing a supplier relationship. E-commerce tools do

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[82] See e.g. A.T. Kearney (2001, 2002).

not seem to alter the basic trade-off between competition and cooperation however, and there is no clear tendency – and no reason to expect a clear tendency – towards one type of relationship dramatically gaining market share.

- E-commerce raises issues about competition and competition policy both in the markets where e-marketplaces are present, and in the "market for markets."

- The most important consideration for competition policy is likely to be the risk that e-marketplaces can facilitate tacit collusion. This is an important concern in cases where concentration is high on one side of the market. The information generated at an e-marketplace may be helpful for sustaining tacit collusion, and competition policy needs to pay attention to this aspect in particular.

- In enforcing competition policy aimed at tacit collusion, competition authorities must be able to access information from within companies and from within e-marketplaces.

- Enforcement of competition policy aimed at tacit collusion may need to restrict the information generated and made public (or semi-public) at e-marketplaces.

- An e-marketplaces run by a subset of companies in an industry may try to exclude competitors of those companies. This is an important concern, but such practices seem not to have emerged strongly so far. The challenge for competition policy seems similar to other instances where control of essential facilities is important.

- Monopolization of the market for markets may be a problem calling for competition-policy action, but current developments seem to indicate that this is not a major issue in the near future.

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Interviews

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5 Will Music File Sharing over the Internet Influence the Commercial Market for Pre-recorded Music?

Stefan Hellmer

5.1 General background

It is perhaps a general opinion (and a fear) that the market for pre-recorded music changed dramatically in the late 1990s primarily due to new technology. Instead of being forced to go to a store, or an Internet site, to buy a pre-recorded LP-album or CD-album, Napster.com and MP3.com made it possible for us to download music files from the Internet in a new "MP3" format. Assuming that we have a computer and the necessary software, this can be done at almost zero cost. The general opinion might be that since we now can get basically all music for free over the Internet we do not have to buy a specific CD-album. The fear comes from the music industry claiming that this is not just illegal from a copyright perspective, it will also lead to decreasing revenues and therefore lower music production.
We have seen technological changes before in the music industry. Ever since music was recorded on wax cylinders for more than one hundred years ago we have seen the development of flat, vinyl, disks in different formats and quality (LP, EP and singles), the magnetic tape and, during the 1980s, the development of "digital" music on CDs. Although these changes were more gradual in a sense that both the supply- and demand side could adapt to these technologies gradually, they were not all without problems and the same fear as we see today was visible then. When, for example, Sony Betamax started to produce and sell VCRs for home use, the Universal Studios sued Sony Betamax. The fear was that home recording of films would stimulate consumers to make illegal copies of copyrighted material thereby reducing revenues posing a serious threat on film industry and film making. This case was taken up to the Supreme Court, which ruled in favour of Sony Betamax. We all know that this was not the death of the film industry. More films than ever are now produced and distributed

through more channels.
The question is if the downloading of music in MP3-format over the Internet constitutes a real threat on the music recording industry or if this threat is as "empty" as in the Sony Betamax case. Will the industry for recorded music adapt the new situation and find, for example, new distributing channels, or are we now seeing the death of the music recording industry as we know it?

5.2 Purpose

The first purpose is to discuss the *commodity* recorded music. Recorded music has long been considered to be a private good. One important question is if the development of the MP3-format and its possibilities to be distributed freely over the Internet means that recorded music more and more has become a public good. If so, the lack of rivalry and/or the lack of exclusion in consumption could have a tremendous impact on the way recorded music should be priced and distributed.
A second purpose of this study is to explore if there are any present visible evidence for a dramatic change in the sales of CD-albums during the 1990s to the year 2001, especially during the late 1990s. If we can see any change, the purpose evolves into an investigation whether this can be linked to the activities around the downloading of music in MP3-format.
A third, and final purpose, is to try to investigate the size of the downloading activities and attitudes towards music as a "free" good among university students.

5.3 Method

The theory on private versus public goods will be used in the discussion on music as a commodity. Technological changes over time will be part of this discussion. The result of this general exercise will result in a discussion of market structure and pricing strategies.
Hard data on sales of CDs will be used in order to track trends on quantities and their values in different parts of the world.
Finally, a small survey on the campus of Blekinge Institute of

Technology, will serve as a guide to get some picture of these activities and the attitudes concerning the downloading of music.

5.4 What is MP3?

MP3 is short for Motion Picture Experts Group-Layer 3 and is a compression format for audio files (Alexander, 2002). This "new" format is essential for all activities of interest concerning file sharing. The music on a CD-album is stored in digital form. This means, among other things, that a CD-album, or parts of it (the individual songs) can be stored on any computer. Something stored on a computer can also be sent "out" to others via the Internet. One major problem of this is the size of audio files. An ordinary three-minute song can take up 30 megabytes of space on the hard drive and a complete album can take up to 700 megabytes of space. Not only does this mean that any hard drive will soon be filled up, the time it takes to send a file of this size over the Internet can be counted in hours. With the help of the MP3-technique, a three-minute song of 30 megabytes can be compressed to between 1,5 and 3 megabytes, i.e. less than 1/10 of the original size. In addition, this can be done with almost no effect at all on quality.
Once a song is on MP3-format it can be played using an "internal" player in the computer, for example Real Player or Winamp. It can also be downloaded to an external MP3-player or be burned on a CD and played using a DVD-player or similar.[83] In this smaller format it can also be sent out to others over the Internet at a fraction of the time compared to the original size. The MP3-format song can of course also be de-compressed and burned and then played on an ordinary CD-player.

This format has had a tremendous impact. It is now possible to store thousands of songs on any computer; songs that are downloaded at basically zero cost. It is possible to send them over the Internet quickly and to use a number of different media to play them on.

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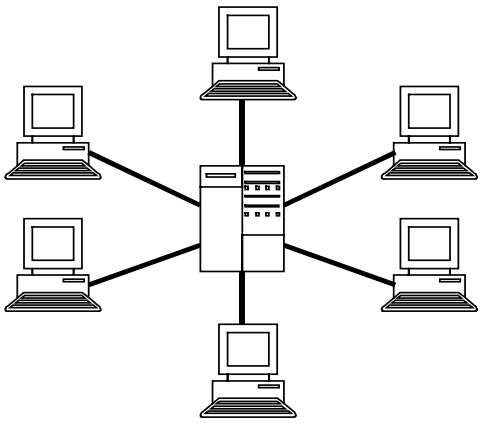
[83] An increasing number of stationary and portable CD-players can now also play the MP3-format.

5.5 What is peer-to-peer?

Peer-to-peer, from now on p2p, on the Internet refers to a network of computers with the same networking program that can communicate with each other. Within this network it is possible for the ones connected to access each other's files. It is possible for one computer in the network to find, get access to, and download files from another computer's hard drive. The network design can be different. In one design the computers communicate through a centralized server (see figure 5.1), which can hold the files and/or rout the requests for files. Napster.com and MP3.com are examples of p2p networks with centralized servers.

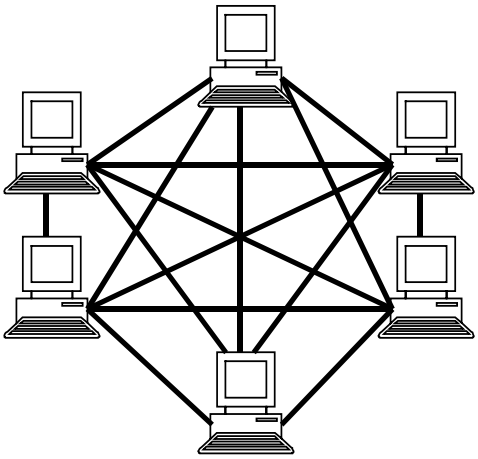
A design with centralized servers may hold a number of servers, but all traffic runs through these servers. It was this design that made it possible to take legal actions against Napster.com since basically all traffic could be traced in the servers.

Figure 5.1 p2p with centralized server



The design used by, for example Gnutella.com and Kazaa.com, is one with decentralized servers (se figure 5.2). In this design all the computers are servers themselves, so each search for a file can go through a number of different computers. In this design it is much more difficult to track and trace traffic and it is basically impossible to find out who did put out a file in the first place.

Figure 5.2 p2p with decentralized servers



Another feature of these p2p-programs that makes it hard for any legal action against them is that many of them use dynamic IP addresses.

A dynamic IP address means that each user gets a new IP address when logging on. This makes all the users basically impossible to trace making it hard for any legal action against the activity.

5.6 Some definitions

Music is in this paper defined as a commodity that is actively obtained by an individual consumer for listening at moments free of choice. It therefore includes CD-albums and singles, vinyl discs, prerecorded music tapes, DVDs and music available over the Internet. For all these examples the consumer decides the type of music to listen to and the time to listen to it. This definition of music does therefore not include general music consumption such as “having the radio on”, watching MTV or VH1 or general exposure in elevators, supermarkets etc. In addition, this definition does not include attending concerts. Even if this involves an active action from the consumer in that he or she have to buy a ticket and go to the concert and listen to an artist that the consumer have chosen to listen to, it is not considered to be a substitute to the purchase of, for example, a CD-album. For this reason, concert

attending is not included in the definition of music as a commodity, only music bought (or downloaded) for immediate and/or later frequent listening is included.

From this follows that the music industry is defined as the industry that provide this service to its customers, i.e., the music industry is producing, manufacturing, packing, shipping and retailing prerecorded music. The actual music industry goes of course beyond this definition in that it also includes tours and concerts, commercial items, music played on radio and TV etc. These parts of the music industry are, however, not included in the definition of the industry of concern in this paper. The reason is the assumption that these parts of the industry do not produce a close substitute to prerecorded music. As long as we do not have a perfect interactive radio or TV it is assumed that an individual's choice of *not* buying a record is the result of the free availability of the songs over the Internet and *not* the effect of that the songs are played on the radio or TV.

To summarize, the music industry is defined as the industry that, from a consumer perspective, provide a good that gives the consumer the freedom to decide the time, place and artist. Thereby limiting the industry to the production, manufacturing, packaging, shipping and retailing CDs, vinyl discs, prerecorded magnetic tapes and mini discs (MDs). Due to the very marginal activities (and sales) around vinyl discs, prerecorded magnetic tapes and MDs the data analysis is limited to CDs.

5.7 Music, a private or public good?

5.7.1 Private and public goods

A general discussion on whether information goods are a public or private good is done by Varian (1998), and a short discussion on music as a private or public good is held by Gallaway (2001). A division of goods in private and public goods is done with the help of *rivalry* and *exclusion*. With rivalry it is meant that one, and only one person, can consume a good and it is depleted after

consumption. An ordinary can of soda is one example. With nonrivalry we mean that the amount available to other people is not diminished. With exclusion we mean that others are prevented from consumption. When we drink a can of soda others are prevented from drinking that can of soda. With non-excludability we mean that one person cannot exclude another person from consumption. The rivalry condition depends on the commodity itself while excludability more depends on the legal regime. A strictly private good have both rivalry and exclusion in consumption. If we relax the rivalry condition we will get a public good with exclusion. A concert or cable TV is examples of this. There is no rivalry since more than one can look at TV or go to a concert, but there is exclusion since we need a ticket or have to pay the cable company (the legal regime). Table 5.1 summarize with some examples.

Table 5.1 Rivalry and exclusion

	Exclusion	**No exclusion**
Rivalry	*Private good*: can of soda	*Common-access resource*: fishery, hunting, highway
No rivalry	*Public good with exclusion*: concert, cable TV, membership in a sports club	*Public good without exclusion*: national defence, clean air

Perloff (2001, 628)

How does music fit into this table? To some extent we have rivalry. If one person buys a CD there is one CD less in the market. However, CDs are relatively cheap to reproduce or copy so we never actually experience a supply reduction. Consequently, the rivalry condition is weak.[84]

An effective exclusion builds on impossibility for us to listen to free music. We have to buy a CD in order to listen to it. We have to buy a concert ticket in order to listen to it. Music on the radio, TV etc. is not free either. Anyone who play music on, for example the radio, have to pay a fee to some organization acting in the artist's interest. In, for example Sweden, it is STIM (Swedish Performing Rights

[84] We can see market attempts to "create" rivalry with the help of, for example, "limited editions", "collectors item" and "directors cut"

Society) that is set to “safeguard the financial rights of composers and lyricists under copyright law” (www.stim.se). We even pay a small fee to these organizations if we buy an empty magnetic tape. The effectiveness of these actions is crucial for the exclusion condition. MP3-downloading and sharing music files over a p2p-network with decentralized servers will, no doubt, erode this effectiveness thereby eroding the excludability condition. Has then music become a strictly public good?

5.7.2 Information goods

Before elaborating further on this issue we need to shortly describe the concept of information goods as a commodity. Following Varian (1998), information products have, aside from the private/public good problem, two additional main properties that cause problems in market transactions.

First, it is an experience good. You have to know what it is before you buy it and by then it might be too late. In order to overcome this problem we are often exposed to *previews* and *pre-listening* to music on the radio, TV or in music stores. We also get *reviews* of films and CD-albums in radio, TV or in newspapers. To some extent the record companies also rely on an artist’s general *reputation*. Even if we have not heard say, Britney Spears latest album, we more or less know her music and the record company can rely on this reputation to sell records.

Second, information such as music is highly costly to produce but very cheap to reproduce, creating returns to scale. Having, in many cases, extremely high sunk[85] costs with marginal costs close to zero, creates problems in a competitive market. In competitive markets prices strive towards marginal cost, which if they are zero doesn’t, leave anything to cover the fixed (sunk) costs. We therefore rarely see any strictly competitive market in the music industry. First, music is a highly differentiated product and second, the market structure for distribution of music has become

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[85] Sunk costs are fixed costs that cannot be recovered in the case of failure. An “ordinary” fixed cost can always be at least partly recovered in the case of failure; a truck, machine or a house can be sold. A sunk cost however, is sunk. There are no secondary markets for a master tape, a video or a film script if a song or a film fails to generate revenues. There is no way to recover these initial expenses.

concentrated. After a number of mergers and acquisitions we have currently five large companies that have 95 % of the market at distributing level (Alexander, 2002).

5.7.3 Monopoly rents

It is important to note that a certain degree of concentration is necessary for an industry described above. High, and in some cases extremely high fixed and sunk costs in combination with very low marginal costs, require prices above marginal cost, i.e., deviation from perfect competition. The resulting monopoly rents (or at least parts of it) represents payments for the intellectual property rights owned by the artist and writers. This monopoly rent, or payment for the intellectual property right, is high in the beginning and is reduced over time, as the piece of music gets older. A more or less constant flow of new releases is therefore needed in order to maintain the monopoly rents.

The monopoly rents created by intellectual property rights can for this reason be seen as an important creator of incentives just as in the case of patents. Patents create monopoly rents and are therefore an important incentive for innovations and continuing improvements in order to maintain the monopoly rents. This incentive would probably vanish without patents or intellectual property rights since the product would diffuse quickly and be priced at marginal cost.

5.7.4 Technology

The technological progress in the music industry for reproducing and distributing music albums have, over the long run, lowered the marginal cost and have thus, at least in a theoretical sense, made markets more competitive. The early flat disc replaced the wax cylinder, since it was less costly to reproduce increasing the number of producers and thus the competition. After that came the vinyl disc and then the real revolution, the magnetic tape cassette. Now the marginal cost continued downwards and concentration in the industry was reduced as many new companies started (Alexander, 2002.). The introduction of the digital technique and CDs pushed the marginal cost further down so the competitive nature of the market should continue. We know that this isn’t the case, the

market is, as said, concentrated and the reason might be the evolution in recording techniques, the time in studios and VIDEO-production, i.e. the evolution of fixed and especially sunk costs.

Parallel to a trend with decreasing marginal costs, as a consequence of lower reproducing costs, we can observe a trend with increasing fixed costs. With changing recording technology, first from single to multiple tracks analog techniques, and later digital techniques, artists tend to stay longer in the studios. In addition, the start of MTV in August 1981 (www.mtv.it) meant that each single must have a VIDEO to be recorded and showed. So along with falling marginal cost we can observe a trend with increasing fixed costs. These fixed costs are also in most cases sunk costs. They are incurred before production and are not recoverable in the case of failure (Varian, 1998).

The trend for marginal costs works in favor for competition, while the trend for fixed costs works in favor for concentration. It seems that the falling marginal costs effect on competition dominated the effect from increasing fixed costs up to the mid 1980s. The concentration of the industry started with the introduction of CDs and Videos, a natural evolvement since this is one way to keep prices above marginal cost and gain monopoly rents thereby keeping the incentives for continuing production.

The pressure on the market, at least the supply-side of the market, have now further increased with the MP3-technique. Assuming an installed computer with Internet connection and free software, the marginal cost of downloading, creating and exchanging digital music is almost zero. This is, from an economic point of view, highly efficient:

> With no cost of manufacturing, packaging, shipping, or retailing CDs, downloads can be offered at a marginal cost of virtually zero and can be enjoyed by music fans at the cost of just a few minutes of computer time. Internet music trading thus represents a tremendous potential efficiency gain in music distribution. (Gallaway 2001).

All these features, especially the falling marginal costs and the availability of music over the Internet, lead to a situation where music is becoming a public good. There is no rivalry in consumption. Due to the low marginal cost and the availability, the amount of music available is not diminished by individual consumption. Also, due to the availability of free software and

unlimited downloading there are no exclusion, we can today, using p2p-software with decentralized servers, not exclude any person from downloading music “risk-free”.

5.7.5 Summing up

On the basis of this discussion we must conclude that music has become a, more or less, strictly public good. As such, finding a market solution is extremely difficult. A market for public goods only exists for products with excludability. The only way a product with non-rivalry and non-excludability to be produced is for the Government to produce it.

There is not much do be done about the non-rivalry in the consumption of music because of the low marginal costs. That leaves the excludability. The increasing activities in p2p lead us to a situation more and more towards non-excludability, leading, in the extreme case to a situation with no market at all. This will probably not be the outcome. There will exist consumers with preferences towards owning an album, but with the market features at hand, this album will be over priced and/or under supplied.

The music industry faces a tremendous challenge for the future. To meet the growing activities around p2p it is basically impossible to use legal actions, especially with decentralized servers. The only way the music industry can regain some of the earnings from the sales of CD-records is to focus on the non-excludability.[86] A number of ways to reach excludability should be possible. One way could be to make it legal to download a song a certain time after its release. Another way could be to charge the users, either per song or using a fixed charge per time unit. The technology for, at least the charge, should be available since different companies use it already (Unibet is one example). Activities like this would probably not stop the free “illegal” downloading completely. However, some consumers will probably rather download a song legally for a couple of cents than do it for free illegally. Some attitudes around these problems will be dealt with in the section describing the short survey. Another possible way would be to impose an extra charge

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[86] Or find other sources of income besides the sales of records such as concerts and commercial items and so on.

on empty CD-R's and to use these revenues to distribute back to the artists as currently is being done with magnetic tapes.

To summarize, music is becoming a strictly public good with non-rivalry and non-excludability in consumption. As such, the market for music runs the risk of becoming an ex-market. In order to stay a market with only private actors it has to solve the problem around excludability, i.e. the music market has to be able to exclude people from consuming music for free. One way to do this could be to charge people for each song they download from any p2p activity.

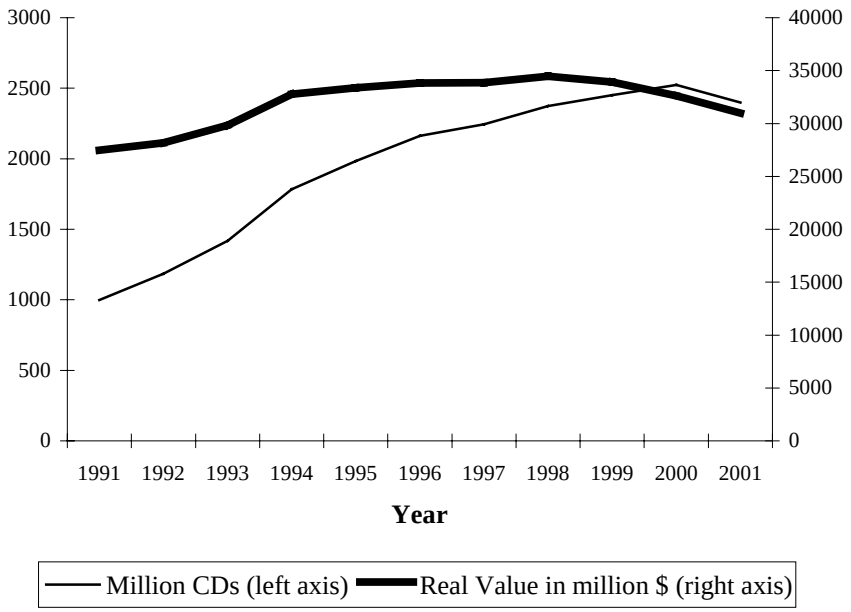
Can we then, so far, see any visible evidence that fewer CDs are being sold? The next section will deal with that issue.

5.8 The market for CDs 1991-2001

When MP3.com came online in 1997 and Napster.com came online in 1999 there was a general fear from the music industry that sales of CDs would decrease substantially. Although music is a highly differentiated product we will in this section see whether we can see any evidence of this on aggregated level. Using aggregated level is a shortcoming since we then can't separate new releases from old "best of" releases and we cannot separate different music genres, such as jazz, pop or classical music, from each other. Having that shortcoming in mind, figure 5.3, shows the number of sold CDs and their real value on a world basis.[87]

[87] All statistics in this section comes from "2001, the recording industry in numbers" published by IFPI (International Federation of the Phonographic Industry).

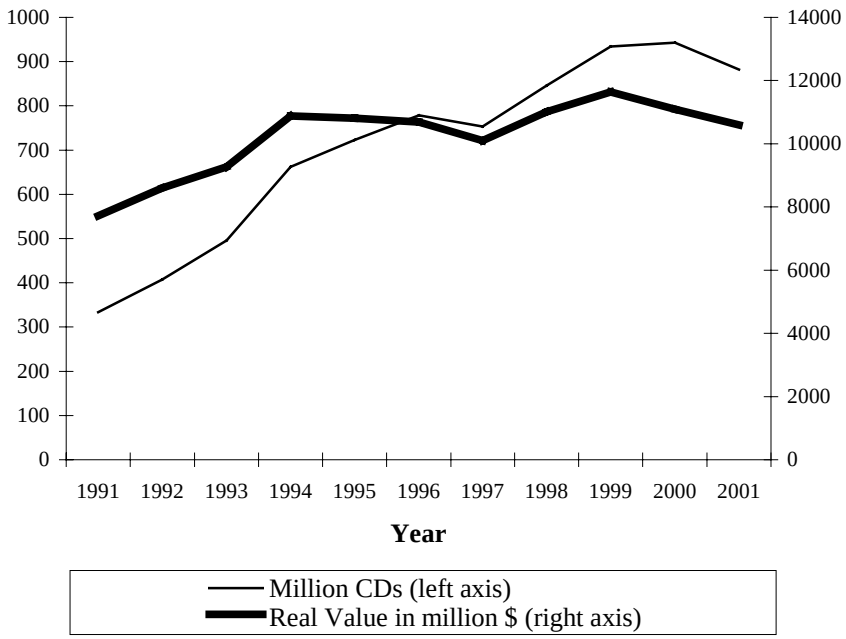
Figure 5.3 World sales in millions



Source: IFPI.

The number of sold CDs worldwide shows an increasing trend up to the year 2000. It is first in 2001 we can see a downward shift in unit sales. However, even if the number of sold CDs show an upward trend, the real value of sales shows a downward trend after 1998. Before we further elaborate on why that may be the case we show the same figures for the USA and Europe (figure 5.4).

Figure 5.4 Sales in the USA in millions

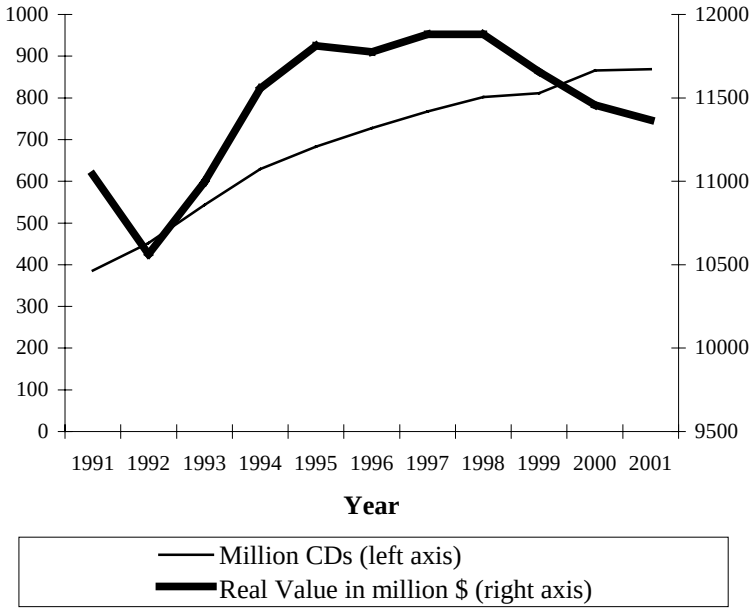


Source: IFPI.

The numbers for the USA show a slightly different pattern. The number of sold CDs drop after 1999 and so does the real value. We can also see that the real value dropped between 1994 and 1997 for reasons obviously not connected to p2p-activities. Figure 5.5 shows the same numbers for Europe. The interesting thing here is that the sales in volume increase for the entire period. However, the drop in real value starts in 1998 and seems to be more severe compared to the World and the USA.

A fall in real value connected to a rising volume can have a number of explanations. One explanation is that there has been a general fall in prices and another explanation might be that we now buy "different" kinds of records. One example is that consumers now might buy less "full priced" records and more "mid priced" or "budget priced" records.

Figure 5.5 Sales in Europe in millions



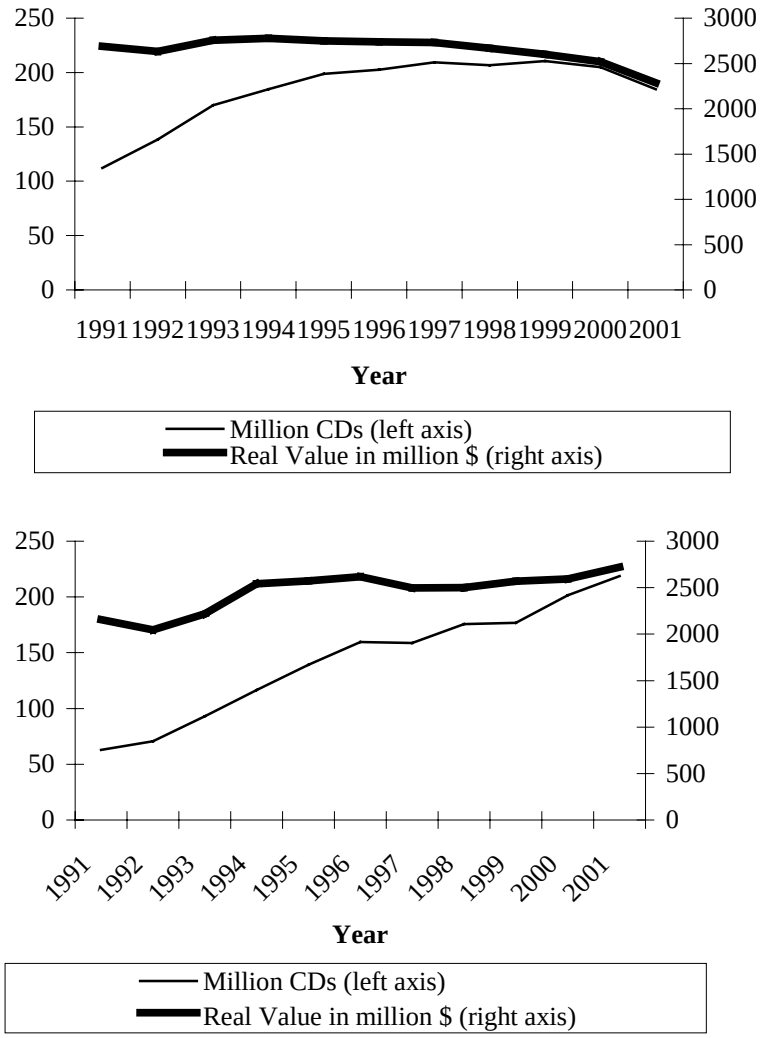
Source: IFPI

Europe is not one homogenous market. Behind the "stable" volume numbers and the falling value in the European numbers is the aggregate behavior of all countries included in Europe. The difference is highlighted in figure 6 that shows the figures for the two largest markets in Europe, Germany and the United Kingdom.

The top diagram of figure 6 shows the data for Germany. The volume of sold CDs was slowly increasing up to 1998, and then it stabilized and started to decrease in 2000 and continued down in 2001. However, the value of the sales in Germany has decreased since 1994, even with an increasing rate after 1999.

The picture for the UK is totally different as the bottom part of figure 5.6 shows.

Figure 5.6 Sales in Germany (top) and United Kingdom (bottom)

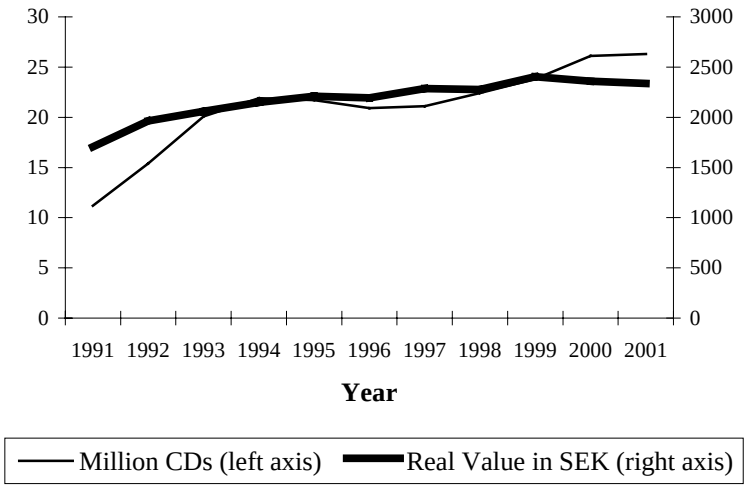


Source: IFPI.

For the UK we can see a more or less steady increase in volume sold CDs. The value does not show the same “dramatic” drop as for Germany and Europe as a whole. Although there is a slight decrease in 1996 the value is continuing to increase slowly.

The United Kingdom is the largest market in Europe with 25 % of the European market in volumes. Germany is the second largest market with a market share of 21 % of the market in volumes. The Internet penetration in the UK is 33,6 % and in Germany 24,3 %. These numbers show the proportion households in each country that have access to the Internet. The highest Internet penetration in Europe has Sweden with a penetration at 56,4 %. So, even if Sweden only is ranked number 6 by market share in Europe (3 %) we will devote some special attention to Sweden. Figure 5.7 shows the Swedish data.

Figure 5.7 Sales in Sweden



Source: IFPI

Apart from the drop in volume between 1994 and 1997, the Swedish numbers are similar to the ones in the UK. However, we can see a drop in value after 1999.

Can we then draw any conclusions from this exercise with numbers and figures? MP3.com was launched in late 1997 and Napster.com came online in mid 1999. On a World basis we can see a drop in value after 1998 and a drop in volume after 2000. However, the

regional geographical differences make it impossible to "blame" p2p-activities.

Even if the drop in sales is very different for different regions and countries, we can observe a more common trend in that the value is dropping after 1998/1999 for basically all except the UK. This fall in value can have a number of explanations. It can be the effect of falling prices and/or be the effect of changing buying behaviour. The changing behaviour can follow a number of patterns. It can, for example, be a general effect of consumers switching from full priced albums to mid- or budget priced albums. A number of additional hypotheses could be stated, but the data presently at hand does not provide us with the opportunity to test hypotheses like this.

5.9 The market for CDs January-June 2002

The general downturn in volume and value was in the previous section shown to be both marginal and erratic in the sense that it differed between countries. However, statistics from IFPI[88] show that the numbers are continuing downwards. Sales in the USA went down 8,8% in volume and 7% in value from January to June 2002. For Europe sales went down 7,4% in volume and 7,5% in value. Only two countries in Europe, France and Sweden showed positive changes for both volume and value compared to the same period 2001. A strong local market for domestic artists with new domestic releases explains the positive changes for these two countries (IFPI, October 2002). Germany and UK showed, however, negative growth for the first half of 2002. Germany decreased 8,2% in volume and 14,5% in value and UK decreased sales with 5,1% in volume and 6,2% in value. Denmark and the Netherlands saw the sharpest falls in Western Europe; Denmark down 22% in value and the Netherlands down 15,8% in value.

There are different possible explanations for these downturns. Slow general economic growth might be one of them. IFPI predicts that the numbers will improve for the second half of 2002. Sales during the first six months of a year make up around 40% of the sales for

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[88] IFPI [October 2002], The Recording Industry Interim Sales 2002.

the entire year. Also, sales figures are sensitive to the timing of new releases (Ibid).

Still, the reduced increase and the visible decreases in sales during 2000 and 2001 followed by this “massive” and almost general downturn in 2002 might indicate that something “is going on”. More disaggregated data on genres, top-list etc. is needed in order to make a more profound analysis, an analysis that most surely is significant. If this observed downturn can be attributed fully or partly to p2p-filesharing and if the downturn will continue through out the year 2003 the music industry faces a tremendous challenge and we will most certain see changes in the way the music market will function in the future.

5.10 The survey

This section will describe the results from a small survey at the Blekinge Institute of Technology. The survey was handed out to all present first year and second year business students during a lecture. All 157 present students answered the survey containing questions inspired by Gallaway (2001). In the survey presented by Gallaway (2001), 996 college students was asked about their music consumption habits and their MP3 activities. All the 996 students were in introductory classes in economics at either Southwest Missouri State University in Springfield, Missouri or Colorado State University in Fort Collins, Colorado. They represented a broad variety of majors and were considered as a “demographic group strongly identified with music sales, Internet access and Internet music downloads” (ibid.). The Gallaway-survey focused both on the size of the MP3 activities among the students and on the eventual willingness to wait to download or to pay for each download in order to make downloading legal.

The aim here is to try to investigate if the attitudes among Swedish students are approximately the same as for the American students or if we can see a difference in these activities and the attitudes connected to these activities. Note that neither of these surveys can claim to be representative for a larger more general group. The Swedish survey is not even representative for Swedish first- and second year students. The group consists only of students in

business classes at one university and there is no randomness in the selection of students answering the survey. The sample is taken more on a convenient basis during lectures. In addition, it is claimed that students at Blekinge Institute of Technology have higher access to the Internet compared to the average Swedish university student. All this will probably lead to different biases. For example, the share of students downloading, and the amount of MP3-files they download, will most certainly be an overestimate compared to the average Swedish student.

Before we compare the results we describe the result for the Swedish students. Table 5.2 summarizes the age distribution. Among the 157 respondents there are slightly more women than men. The mean age is just above 23.

Table 5.2 Age distribution

Age	Men	Women	Total
19-20	23	23	46
21-23	35	33	68
24-29	14	14	28
30-	4	11	15
Total	76	81	157

As table 5.3 is showing 96 of the 157 respondents are downloading and listening to MP3 music, and we will from now on focus our attention to these 96 active MP3-users. According to table 5.3 it is mainly men that are involved. Of the total 96 MP3-users over 60 % (61 of 96) are men.

Table 5.3 Are you downloading and listening to MP3-music?

Loading?	Men	Women	Total
Yes	61	35	96
No	15	46	61
Total	76	81	157

Table 5.4 gives us some estimation on the amount of files (songs) each user has on the hard drive (one observation is missing). Again we can see some difference between the men and the women.[89]

Table 5.4 How many files (songs) do you have now?

Number of files	Men	Women	Total
1-10	0	5	5
11-100	9	9	18
101-500	16	11	27
501-1000	11	9	20
More than 1000	24	1	25
Total	60	35	95

The middle of the classes and the number 1000 for the upper class provide us with a quick and rough estimation on the average amount of files. The total average is then 520 files, the average number of files for the men is 625 and for the women 330. So, not only do we have twice as many men as women downloading, the men holds on average twice as many files as the women.

The question now becomes whether these activities have influenced the respondents buying behavior. Are the respondents buying more or less CDs now? Table 5.5 shows the results.

[89] An attempt to use a binary logit model to estimate different impacts on, for example downloading and willingness to pay, was made. However, more observations are needed in order for each model to make sense and converge. One model can be described:

$\ln(D/(1-D)) = -2{,}29 - 0{,}10*Age - 0{,}19*Gender$. This model implies (as discussed in the table analysis) that the log of the odds of an individual downloading is reduced by 0,1 for each year the individual gets older and reduced by 0,19 if the individual is a woman. *D* in the equation is a dummy variable which is equal to 1 if the person downloads music and 0 if not.

Table 5.5 How has this activity influenced your purchases of pre-recorded CDs?

Influence	Men	Women	Total
Buy more	3	1	4
Buy less	46	23	69
Unaffected	12	11	23
Total	61	35	96

Of the total of 96 respondents that are downloading music, 69 (72 %) claims that they now buy less CDs. The interesting here is that we once again have a gender difference, 75 % of the men buy less and 65 % of the women buy less CDs (at least so they claim). Table 5.6 shows how the respondents answered to the question on how many less they buy.

Table 5.6 If you buy less CDs, how many?

How many *fewer*	Men	Women	Total
1-2	4	3	7
3-5	15	9	24
6-10	9	4	13
More than 10	12	3	15
Do not know	6	4	10
Total	46	23	69

Concerning the sample of students we can conclude that the download activities are significant, especially among the men. We have also found out that the amount of songs, or files, on the student's computers can in many cases be counted in thousands. The students also claim that they now buy significantly fewer CDs.

Faced with the fact that these activities are illegal, the students where asked about their eventual willingness to wait for releases or to pay a downloading fee in order to continue with these activities in a legal way. Table 5.7 gives the result.

Table 5.7 Are you willing to wait or pay in order to download "legally"?

	Do not want to wait	Yes, can wait at least 6 months	Total
Do not want to pay	37	25	62
Yes, can pay	18	16	34
Total	55	41	96

Of all 96 "downloaders", 41 (43 %) are willing to wait at least 6 months in order to download legally. A smaller share, 34 (35 %) are willing to pay for each download to make it in a legal way. There is a slight preference towards waiting instead of paying and only 16 out of the total 96 MP3-users express willingness to both waiting and paying.

Tables 5.8 and 5.9 gives the result divided on men and women and there are some interesting results. Of all the 35 women that are downloading, 23, or 65 %, are willing to wait, but only 9, or 26 %, are willing to pay for each download. The result is different among the men. Here, only 30 % are willing to wait and 40 % are willing to pay.

Table 5.8 Willingness to wait

	Men	Women	Total
Not willing to wait	43	12	55
Up to 6 months	16	22	38
Up to one year	1	0	1
More than one year	1	1	2
Total	61	35	96

Table 5.9 Willingness to pay

	Men	Women	Total
No willingness to pay	36	26	62
Yes, can pay	25	9	34
Total	61	35	96

Before summing up with a comparison with the "Gallaway survey" we will taker a closer look at those who have expressed a willingness to pay for each download. The respondents were asked to express their respective willingness to pay for each download with respect to the "age" of each song. The question was divided into the categories: "new releases", "released 6 months ago", "released between 6 and 18 months ago" and "older songs and classics". As table 5.10 shows, the willingness to pay is higher for new releases and decreases with the "age" of the songs. Table 5.10 shows the "accumulated" frequencies with the accumulation going "upwards". For, for example new releases, we have two respondents willing to pay more that 10 kronor per download and we have only one (34-33) willing to pay less than one krona.

Table 5.10 The amount of willingness to pay per song, accumulated frequencies

	New releases	Released 6 months ago	Released between 6 and 18 months ago	Older songs and "classics"
< 1 krona	34	34	34	34
1 - 2 kronor	33	22	16	18
2 - 5 kronor	20	8	1	5
5 - 10 kronor	10	2	1	2
> 10 kronor	2	0	0	0

It is obvious that the willingness to pay per download decreases with the age of the song, The amount of respondents of the 34 that is just willing to pay less than one krona increases from 1 for new

releases to 12 (34-22) for songs released 6 months ago to 18 (34-16) for a max 18 months old song.

Even if we in table 10 only have 34 individuals of 96 we can observe 59 respondents in total that do express some willingness to wait and/or to pay in order to download legally. This means that over 60 % of the respondents would accept some form of payment or other action if this would legalize the MP3-activities.

A final table, table 5.11, summarizes the findings for the survey at Blekinge Institute of technology (157 respondents) with the Gallaway-survey of 996 college students in the US. A complete comparison is impossible due to, for example, different questions. However, some comparisons are possible.

Table 5.11 Comparison with the Gallaway-survey

	Survey at Blekinge (N=157)	Gallaway-survey (N=996)
Own MP3-files	61%	65%
Own more than 1000 files	26%	7%
Buy more CDs	4%	7%
Buy less CDs	72%	36%
No impact on buying	24%	57%
Willing to wait	43%	60%
Willing to pay	35%	-

The most striking differences concern the buying behaviour. Even if there is a marginal difference in the category ”buys more CDs” there is a large difference between the other categories. Only 24 % of the Swedish students state that the MP3-activities do not have any impact at all on their buying behaviour. The same number for the American students is 57 %, i.e. more that half of the students in the American survey state that MP3-activities do not influence their behavior at all. In addition, it seems to be the case that the American students are more positive towards waiting (and even payment) compared to the Swedish students.

Some important issues need to be addressed here. The purpose of, at least the survey at Blekinge Institute of Technology, was to investigate the level of downloading and to see eventual willingness to pay or to wait for each download in order to make it legal. The results cannot be generalized for a larger population perhaps not even a larger population of university students. Liebowitz (2002) cite an investigation called “the Fine-study” which can be used to emphasize both the results of the two surveys and the problems in generalizing the result. According to this study, which coincides with the Napster time, sales of CDs at stores near universities fell by 2-3% while the sales of CDs in other stores rose by 7%. However, even if the results in this, and other studies, most probably overestimate the activities around MP3-file sharing, the results are important. As the use of Internet increases and spreads throughout countries we can expect an increased use of MP3-software and MP3-downloading. The decreasing sales of CDs during the first half of 2002 might be the first indication that the probable overestimates presented in this study will be reduced over time.

5.11 Conclusions

Due to new technology such as the MP3-format and free p2p-networking, the marginal cost of an additional song or entire album is virtually zero. One important consequence of the low marginal cost is that there is no rivalry in consumption since the music doesn’t deplete when bought (or downloaded). In addition, free p2p-software with no efficient legal regime leads in the longer run to a situation with non-exclusion in consumption. A commodity with non-rivalry and non-exclusion in consumption is, in a theoretical sense, a strictly public good. As such it has no private market since no private actor will produce a good that is free. Will then the music market collapse totally and be taken over by Government enterprises?

The answer to that question is definitely no, for a number of reasons. For a total collapse to happen we need a 100 % household implementation of the use of p2p-software and MP3-technique, a situation not likely to happen. Aside from a 100 % technique implementation we need also the consumer preferences towards pre-recorded CD-albums to vanish. None of these situations are

likely to happen, and definitely not at the same time. So, even if we do not have any “formal” exclusion or any exclusion formed by an effective legal regime, we will still have a technical exclusion, which, together with preferences for pre-recorded albums, will guarantee a future commercial market for pre-recorded music.

Still, with the market features described, this market for pre-recorded music will change. This study has, however, not been able to verify that the market did go through any major changes during the 1990s and the beginning of 2000. Recent data for 2002 indicate, however, that the sale of CDs both in terms of volume and value continues to fall at an increasing speed. In spite of this, the aggregated data used does not provide any clear-cut picture of decreasing sales that can be connected directly to MP3 or p2p-activites. There is a tendency for the volume and value of the sales to decrease, but the short length of the time series, with possible impacts just for the two latest years, does not give us the opportunity to only “blame” MP3. There are some possible hypotheses that could be stated at this moment, but it is beyond the possibility of this study to test these hypotheses. We need longer times series on a non-aggregate level. One hypothesis could assume that the falling sales in volume come mainly from falling sales of new releases of popular music. Assuming in turn that it is this kind of music that stands for a majority of the music that is downloaded. Other hypotheses could focus more on the observed decreasing value of sales. One explanation could be falling prices and another explanation could be a general tendency for consumers to switch from full-price albums to mid-price albums or even to budget albums. The final delicate task in an exercise like this would then be to connect any special trend or trend break to the p2p-activites. This would, however, demand highly disaggregated data on volumes and prices on a country basis, data not available in this study.

Even if we cannot quantify impacts in volumes or values we can be more or less confident that the music industry will be affected by MP3 and p2p activities. This conclusion is possible thanks to the theoretical discussion in this paper, statistics for the first half of 2002, and the results from the two surveys presented. The surveys conclude, among other things, that the activities around MP3 use are significant. Both surveys conclude that more than 60 % of the university students download a significant amount of music files into their respective computers.

Even if the two surveys show different numbers for the proportion respondents now buying fewer CDs, the proportion is significant. Both surveys conclude that only a marginal proportion buy more CDs as a consequence of MP3 and p2p.

A relatively high proportion of the respondents in both studies express a willingness to wait a certain time period and/or to pay a certain amount for each download in order to make it legally. Even if this proportion is different in the two surveys, it is an important fact.

The use of MP3 and p2p-networking for distributing music is highly efficient, much more efficient than the ordinary distribution chain for a CD which include manufacturing, packaging, shipping and retailing. To fight against a superior technology is fruitless. Instead of trying to fight against this technology, the music industry has to adopt and make use of the technology. Not only can we observe a willingness to pay for downloading music-files, the technology for making payments over the Internet exists. The problem is the price level and price strategy.

5.12 Related issues and implications for further research

Many issues and additional problems related to the activities dealt with in the paper have only marginally been mentioned or not mentioned at all. In order to make a more profound analysis it is mentioned that more disaggregated data is needed. The reason for this is the high level of differentiation of the content of a CD-album. We need to separate the data into, for example, top-list, best-of releases, assumed age of the consumer group, genre etc. since the downloading activities are most likely different in different groups.

In addition, we have only marginally dealt with policy issues. What can the music industry do if the sales in volume and value continue down and erode profit and monopoly rents? The paper focuses on the necessity of the music industry to make use of the MP3-technology and p2p file sharing. It is however beyond the scope if this paper to be more explicit on the precise technical solutions. Other solutions to the problem have been put forward by, for example, Liebowitz (2002). Digital Rights Management (DRM) is one possible solution, which uses a digital code on a CD that

protects it from being digitally copied. The use of DRM (or other types of protection) is however controversial and its effects unknown. Liebowitz (2002) provides a short and good summary over the upsides (control of copyrighted material etc.) and downsides (reduced use, efficiency loss etc.) of DRM technologies. A special deeper analysis is needed in this area.

This paper has been focusing on the music industry as a whole on an aggregate level thereby ignoring individual artists and musicians. The MP3-technique and p2p file sharing is not considered to be a problem for all artists, especially not to the ones unknown or "on their way up". For this group of musicians the MP3-technique and p2p file sharing is instead a new highly efficient way to get their music "out in the market". This might lead to yet another problem, the different goals for artist and their distributors. The artist's strive for an increasing group of listeners and the distributors strive towards increasing sales of records.

The music industry as described in the paper is now in the late 2002 not the same as it was in the late 1990s. The change will continue due to the increasing activities around MP3 and p2p. We can not see in what way exactly it will change only that the pressure on the supply side of the market has increased and will continue to increase. More research on technical solutions and their respective efficiency is needed. Also, critical analyses on the positive side of these activities are needed. A majority of the analysis done in the area focuses on the negative sides, such as loss of revenues and profits, ignoring the wider spread of music, the increasing number of artists etc. There is still a lot to be learned both for engineers and economists.

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6 Downloading Music from a Consumer Perspective

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6.1 Introduction

Music distributors in Sweden are a highly-concentrated oligopoly, dominated by five players. The five players: BMG Music Publishing, EMI Music Publishing, Sony Music Publishing, Universal Publishing and Warner Chappel together dominate the market. Apart from these five giant players, there exist a number of small, independent music publishers. When small publishers expand to a certain size, very often these independent players are absorbed by one of the big five music distributors (Vidigs Ahlin and Larsen, 2001).

Several threats in late 1998 and early 1999 influenced the foundations for the music distribution industry, and the way in which business was conducted. First music online became available through online retailers like CDNow and Amazon.com. Second, the Internet made possible distribution of music through compressed audio formats, accessible to anyone with a connection to the Internet (Rao, 1999). This is often referred to as peer-to-peer (P2P) file sharing.

From a consumer’s perspective the new distribution channels for music imply various advantages. Shopping music online from e.g. CDNow and Amazon.com offers consumers convenient shopping as well as increased product variety. It also enables music consumers to do price comparison shopping. But the new distribution channels that the Internet and World Wide Web provide also make it possible to download music. Practically this means that any desirable tune can be shared and downloaded to the consumer's own computer without cost. Instead of buying CDs, downloading music becomes an alternative for technically advanced consumers. Even though the media has written a lot about the phenomenon,

downloading music is at present only done by a relatively small part of the Swedish population. In the near future, it is forecast that music will be downloaded by larger consumer groups since more Swedish households will have broadband connections.

At present downloading of music is a highly debated area in Sweden. The debate concerns the way in which downloading music is influencing traditional sales of records. Statistics from IFPI, the International Federation of the Phonographic Industry, show that CD sales have decreased at the same rate as downloading music has increased (Johansson, 2002). Statistics from Forrester Research and Jupiter Media Matrix point in the opposite direction (Gustafsson, 2002a, 2002b). From the music distributors' point of view, downloading music is naturally perceived as a threat. Music distributors have started to experiment with new digital music models and concepts (Garrity, 2002b). In order to protect well-known artists such as Magnus Uggla, Shakira and Wyclef Jean, some CDs are now copy-protected (Johannesson, 2002). At present the debate is focused on whether downloading music will become a genuine threat to music distributors. Is it a powerful alternative to traditional music consumption? If so, can the behaviour of downloading music force music distributors to completely reshape their current business model?

In order to understand the consequences that downloading music will have on music distributors, an empirical study concerning consumers' attitudes to downloading music has been conducted. For an innovation to be spread through a population, it is of the utmost importance that the innovation reaches a "critical mass" representing 10-20% of a population (Valente, 1995). If a "critical mass" is not reached, downloading music will remain a marginal activity practised only by a few people. In this case downloading will not constitute a threat to music distributors.

The question therefore arises: is downloading music a behavioural pattern that will be adopted by large groups of consumers within a few years or will it remain a marginal phenomenon? Is downloading music an alternative to buying records for Swedish consumers or is downloading music rather to be considered as a complement? How should the new behaviour of music consumption be understood from a competition point of view?

6.1.1 Definition of some concepts

Present technology makes it possible to compress music into MP3 format and hence large-scale copying of music is feasible. The Internet is playing a crucial part in this, often, illegal process of copying music.

Downloading music is done over the Internet and the music can be saved and consumed from the hard drive, but also burned on a CD. Copying music from one CD to another can occur without access to the Internet. Our study focuses on the first kind of behaviour in which the Internet makes it possible for consumers to download music over peer-to-peer systems and save the music according to individual preferences.

There are different ways in which music can be downloaded. The most prominent and largest digital file distributors have been MP3 and Napster. They have been superseded by a series of new generation software that does not rely on central servers e.g. Gnutella and Freenet. These new programs utilise a decentralized P2P distribution network in which users can both receive files from others, as well as make files accessible to others without the intermediation of a central server (Alexander, 2002).

6.1.2 Research within the area

Knowledge about consumers' experiences from downloading music is so far almost non-existent. New distribution channels for music are e.g. Napster.com (inactive at present, September 2002), Kazaa.com and Audiogalaxy.com. These are all examples of different P2P programs opening up new forms of music-distribution between musicians and consumers. These P2P programs can be regarded as constituting a threat to traditional music distributors, but these programs can also be regarded as generating an increased interest in music (Rao, 1999, Gallaway and Kinnear, 2001, Martens, 2001). When and why these new forms of music distribution are used becomes an interesting question that needs to be addressed. In what way these programs are used and by whom are questions that until now have been neglected in the debate.

Articles within the field have mainly focused on commercial obstacles, legislative issues concerning copyright, security and also

economic aspects of downloading music (Scott, 2001). Most of these articles are rather descriptive in character; and there is a lack of empirically based studies. Very few articles make an attempt to be analytical; and if they do, they have mainly focused on the way in which distribution channels and the value chain are affected by downloading music (Daniel and Klimis, 1999, Rao, 1999, Vidigs Ahlin and Larsen, 2001). Research analysing consumer behaviour regarding downloading of music is also missing. There is a study of music consumption by Usenet newsgroups as a way for marketers to reach target groups (Sivadas, Grewal and Kellaris, 1998). But the behaviour of downloading music from a consumer perspective is not researched. It is not only the knowledge about consumers' attitudes toward downloading music that is almost non-existent. Knowledge about how these P2P systems will affect competition in the market is rare.

The main focus in this study is on competition from a consumer's perspective between traditional distribution and this new way of distribution. We have also made a descriptive study of how the situation is perceived by music distributors.

6.1.3 Research question

The purpose of the report is to provide an increased understanding concerning the experiences consumers have from downloading music compared to traditional consumption of music. This greater understanding of consumers will contribute to better predictions about the threat to music distributors posed by downloading music. Since the information is generated from consumers, it may be possible to predict the effects on future competition. The purpose of this report is also to briefly describe how the threat of downloading music is confronted by music distributors.

6.2 Methodology

Qualitative methods are appropriate when the aim is to enhance our understanding about complex phenomena such as consumer behaviour.

Our ambition has been twofold. One aim is to understand more about consumers' attitudes towards downloading music. The other

aim is to describe some viewpoints of representatives from music distributors[90] as well as the music industry with respect to downloading music.

6.2.1 Qualitative methods

Using in-depth interviews as a data collection method is one possible way of getting a thorough understanding of consumer experiences. Since downloading music is such a new way of consuming music, the decision was made to obtain as rich information as possible from the empirical study. In order to fulfil the aim of the study, the methods chosen were the use of in-depth interviews with music consumers supplemented by telephone interviews with representatives from music distributors.

As an effect of the restraints imposed by using qualitative methods to gather data, generalizing the results from a statistical point of view is not the aim. On the other hand, data gathered using qualitative methods are richer, more subtle and detailed than data obtained by using purely quantitative methods. By using these methods the experiences consumers have from downloading music will be more explicitly covered.

In-depth interviews as a method of collecting data provides the researcher with an opportunity to follow-up and do what is termed "probing" in the literature (Seymour, 1992). Probing implies the ability of the researcher to continue posing more detailed questions where interesting answers occur. The reason for doing this is to create a through understanding about consumer behaviour. In this context, it is possible to gain a much deeper understanding of the respondent's thoughts and feelings concerning downloading music. A qualitative research methodology provides a way of giving answers to questions about why people cognitively or emotionally act in a certain way.

There were different ways in which in-depth interviews could have been applied, either using semi-structured interviews or open interviews. Within the framework of this study, we used semi-

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[90] For a compilation of representatives from the music industry, See 4.6 Sample with representatives from music distributors).

structured interviews in which the interview was guided by a check-list (See Appendix 1).

In conducting qualitative research, it is more common to talk about "saturation" in the material, e.g. the content of the interviews converge. Additional interviews do not bring new information, instead they confirm viewpoints already obtained. The "saturation" obtained can work as a lower level for the number of interviews that need to be conducted.

Qualitative inquiry typically focuses in depth on relatively small samples, specifically selected for the purpose (Patton, 1990, p.169). The logic and power of so-called purposeful sampling is to select cases that are highly rich in information. In order to obtain this, the majority of the respondents were selected via the use of snowball or chain sampling (Patton, 1990). Since downloading music is such a marginal phenomenon, we wanted to find information-rich key respondents. Snowball or chain sampling is a sampling strategy that we found convenient. Snowball sampling is practised by interviewers simply asking respondents who else they could talk to in order to gain further insight.

To get information from music consumers with different backgrounds, educational levels etc. we recruited respondents at Heron City. The principle underlying that sample is called maximum variation sampling, and refers to a situation in which the researcher purposefully selects a wide range of variation on dimensions of interest (Patton, 1990).

Three pilot interviews were conducted at an early phase of the study in order to test the check-list for the in-depth interviews. These interviews were selected by convenience, sometimes referred to as convenient sampling (Patton, 1990).

An audiotape recorder was used to document the interviews. The audiotape recorder documented all the interviews except in two cases.

6.3 Theoretical framework: Diffusion of innovation

We have used diffusion theories as a starting point for understanding the adoption process of downloading music among consumers. The theory of diffusion is commonly used within the field of Consumer Behaviour. The theory of diffusion of innovations refers to the process in which a new product, service or idea spreads through a population (Solomon, Bamossy and Askegaard, 2002). Downloading music is in this respect treated as an innovation. In this study downloading music is treated according to the principles guiding diffusion theories. Innovations can be described in terms of the extent to which the behaviour of consumers is influenced by the new product, service or idea. If an innovation is successful, it spreads through the population. First it is only adopted by a few people, but in time it spreads through the whole social system.

Innovations can be classified according to how new the innovation is perceived to be. Innovations are classified in three categories reflecting the "newness": continuous innovations, dynamic continuous innovations and discontinuous innovations.

- Continuous innovations; have less impact on consumers. They are usually modifications of an existing product. This type of change may be used to set one brand apart from its competitors. An updated version of a mobile phone is an example.

- Dynamic continuous innovations influence the lifestyles of consumers to some degree. Microwave ovens are an example.

- Discontinuous innovations are those innovations that produce major changes in the lifestyles of consumers. Examples are: telephones, televisions and airplanes.

In this study, downloading music is treated as a dynamic continuous innovation. This is due to the fact that downloading music does not produce any major changes in the lifestyles of consumers, but as a new form of music consumption, it does influence the lifestyle of consumers to some extent.

In line with the principles behind diffusion theories (Rogers, 1962, 1971, 1983), an innovation is adopted at different rates among different people. Consumers are classified in categories based on the likelihood that they will adopt the innovation. These categories are called: innovators, early adopters, early majority, late majority and laggards.

Innovators and early adopters, representing by definition just 16% of the population, are characterized by their willingness to adopt new products. Laggards on the other hand are the 16% of the population who are very slow in adopting the innovation. In between early majority and late majority are the 68% of the population who adopt innovations at a somewhat slower speed.

There exists a so-called “critical mass” early in the diffusion process, in which 10-20% of the participants in the social system have adopted an innovation. The “critical mass” is the amount of people needed to accept the innovation for a diffusion process to occur. As soon as the “critical mass” is reached, the speed at which the innovation is adopted increases until the group of adopters exceeds the group of non-adopters (Valente, 1995).

6.3.1 Prerequisites for successful adoption

One of the primary problems in developing new products and services is that over 80% fail within the first couple of years (Mowen, 1995). A number of principles have been suggested as necessary for the success of new products, services and ideas (Rogers, 1983):

- Relative advantage. The innovation should offer relative advantage over other alternatives to consumers. The consumer must believe that using the product will provide a benefit other products can not offer.

- Compatibility. The innovation should be compatible with consumers’ lifestyles. It should fit into an existing set of beliefs.

- Complexity. The innovation should be low in complexity. An innovation that is easy to use has an advantage over

other products. This strategy involves less effort from consumers; the perceived risk involved is also lower.

- Trialability. Consumers are more likely to adopt an innovation if it is easy to experiment with it, prior to making a commitment whether to use it or not. Trial-size samples are often used by marketers as a way of making consumers try the innovation without any risk involved.

- Observability. Innovations that are easily observable have a greater chance to spread since it is more likely that other potential adopters will be aware of their existence (Solomon, Bamossy and Askegaard, 2002).

These principles will be further elaborated on in relation to the answers gained from the in-depth interviews.

Not all people have the same prerequisites for adopting novelties and new behaviours. Research has shown that people who tend to have a favourable attitude towards innovations tend to have higher incomes and higher levels of education, possess greater social mobility and a more favourable attitude toward risk-taking (Gatignon and Robertson, 1993). For this reason, they are more willing to try new things.

6.4 Empirical Data

6.4.1 Consumer sample

The empirical data consist of a total of 21 interviews. Of these interviews, three in-depth interviews are considered to be pilot interviews and 13 in-depth interviews were carried out with consumers who are used to downloading music. Five telephone interviews with representatives from the music industry were made. In order to illuminate the research question, we considered it appropriate to interview two segments of consumers. The hypothesis was that in these two groups, behaviour and opinions would differ. The two groups of respondents were:

- Young men, students, 15-25 years

- Men, middle-age 35-45 years, variation in educational level

When recruiting respondents, the requirements were: music interest, knowledge about downloading music, and personal experience of downloading music within the last six-months.

With the exception of the pilot interviews, a choice was made to recruit male respondents only. This was based on an assumption that men are more inclined to try out new technology as such. Downloading music in this study is treated as a new technology and should consequently be practised mainly by men[91].

Our in-depth interviews were carried out mainly in the Stockholm area, but a few interviews were also made in other parts of Sweden. In the interviews made in Stockholm, the ambition was to mix the choice of respondents so that consumers in the sample would have as diversified backgrounds as possible concerning socio-demographic factors such as household situation, living standard, education and residential area.

6.4.2 Choice of location

Since the aim was to conduct the interviews in a natural environment, the choice of location for the in-depth interviews was a milieu in which the respondents would feel secure as well as comfortable. In most of the cases, this meant that the interviews took place in the respondents' own homes. Some interviews were conducted in more public-oriented locations.

In order to reach young male respondents, the location for the interviews of the second group of the sample fell on Heron City, Kungens Kurva in Skärholmen, a suburb southwest of Stockholm, known for its multi-ethnic mix of people. Heron International during the first decade of the 21st century is developing a new generation of experience-centres throughout Europe. Heron City in Skärholmen is part of that business venture.

Heron City “is of epoch-making importance concerning leisure- and lifestyle activities of highest quality in establishments that combine

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[91] This assumption is not based on actual facts, but on subjective reasoning.

European lifestyle with exotic influences from Hollywood. Included in the concept of Heron City is that each centre is going to be a unique establishment, which according to local influences will create a unique milieu rich in culture offering a wide assortment for all families" (Heron City's own web-page).

The other group, middle-aged male respondents were reached via word-of-mouth. The principle guiding this specific kind of selection is often referred to as snowball- or chain sampling. This is an approach for locating information-rich respondents or critical cases (Patton, 1990).

These interviews were made during the period July - September 2002.

6.4.3 Family situation

Prerequisites and the behaviour of downloading music are heavily dependent on the family situation. The need for the service is context specific i.e. dependent on the configuration of the home; the location of the computer. Downloading is also dependent on how much total time the respondent has for music in general and time in front of the computer in particular. When other family members are competing for time in front of the computer, access can be hard to obtain.

6.4.4 Telephone interviews with representatives from the music distributors

In order to get a thorough understanding of downloading music from a wider perspective, we have supplemented the consumer interviews with interviews with representatives from the music distributors. We expected to gain information from these interviews concerning:

- whether there was previous research done concerning downloading of music
- predictions from the music distributors about future development

- actions taken by the music distributors in order to react and adapt to downloading of music as a potential threat.

6.4.5 Sample of representatives from music distributors

The representatives of music distributors with whom the telephone interviews were made were selected in two different ways.

Concerning the music distributors, the selection was based on the size of the company. We wanted information from the most well-known and established music distributors since we expected them to be opinion leaders in this particular area. To supplement these interviews, a decision was made to supplement these interviews with the views of opinion leaders from the music industry. The following were interviewed: by telephone in September 2002.

- BMG Music Publishing
- Universal Publishing
- Sony Music Publishing
- IFPI, International Federation of the Phonographic Industry
- STIM, the Swedish Performing Rights Society

6.4.6 Views of music distributors and opinion leaders

In this descriptive part of the study, focus is placed on representatives from the music distributors. The complexity of the business becomes more evident as music is already a digital product suitable for electronic distribution (Vinnova, 2001).

The main issue concerns copyright legalisation. STIM, the Swedish Performing Rights Society, is the Swedish representative of an international system established to safeguard the financial rights of composers and lyricists under copyright law (STIMs homepage, Sept-02). The attitude from music distributors toward the opportunities provided by the new technology is mainly positive. The problem arises of how to protect copyrights.

In the interviews different concepts are often mixed. In this project the point of departure was an exploration of downloading in general, but for these representatives, downloading is only one aspect of a more complex problem. The music distributors have to represent and consider a range of different issues:

- Piracy reproduction
- Internet radio
- Production music e.g. downloading of jingles to mobile telephones
- Legally downloading music by P2P licensed programs
- Illegally downloading music by P2P unlicensed programs, also named “piracy”

In this project piracy reproduction was excluded. Internet radio seems to be basically under control. It is a new music-market, worldwide in scope, but the official radio-stations have to follow the legislation. Internet radio will not be further considered in this study. Production-music covers mainly downloading of jingles. This market seems to be perfectly under control. Representatives working with this kind of music praise the Internet regarding it as an excellent tool for logistical purposes. The music distributors are owners of the rights, and the market seems to be well organized and not too complex. Musicians sell the rights to music distributors who pay for these and use them in accordance with their agreement. Those companies can sell them on, for example to mobile telephone users. Regarding downloading we will describe it below in further detail.

According to representatives from the music distributors, downloading of music has been in existence for about six years. From 1996 it has featured more or less prominently in public debate. The music distributors basically consider downloading to constitute a threat. The general feeling toward this threat is anxiety.

Based on interviews with representatives, our impression is that the debate has almost entirely avoided discussing downloading music by P2P unlicensed programs. The subject is under discussion, with some sense of fear – but still not an issue to be actively tackled. The

music distributors have not been successful enough to prevent the occurrence of downloading over the Internet.

The music distributors co-operate on a national and international level. The most recognised association is IFPI, International Federation of the Phonographic Industry.

IFPI claims to have changed its focus lately from being more passive, only working with information campaigns, to taking on a more aggressive role. It is aggressive in the sense that IFPI do not want to publicise how they operate. IFPI chases illegal operators more actively and has intensive international co-operation, which is regarded as a prerequisite for any success against piracy downloading. The process is difficult to manage effectively as operators learn about their methods. The weaknesses in the system are successfully exploited by competitive operators as they have learnt about IFPI's methods. World-wide legal proceedings take inordinate time, but companies on the other hand are able to act flexibly. For example Kazaa.com has recently relocated from Holland to Australia.

Operators offering downloading of music in legal ways show discouraging results. Pressplay and Musicnet in USA have not been success stories. They all face the same problems with tough competition from other operators who offer the service for free.

The competition is hard. In order to be successful in the anti-piracy battle, it is necessary for music distributors to co-operate. The approach taken so far by Swedish music distributors is rather defensive. They have not met the new threat in the same way as in other parts of the world such as in Southern Europe for example. The legislation concerning copyright is complex, and enormously restricted by different agreements.

Efforts in Sweden at present are concentrated on attacking operators who distribute the music, rather than aiming at individual consumers. In the US another model has been used, aiming to track individual users. It can be a tricky issue to target users and see them as scapegoats. The fact that the computer is exposed while downloading music from someone else through a P2P program can in fact make the user an illegal distributor of music.

The production-companies have tried copy-protection on CD records, but those attempts have shown other weaknesses, such as not being playable except on special CD players.

“It is difficult in many ways; I hope we will be able to handle the technologies.” (BMG representative, Sept. 2002)

Parallel to the more aggressive war against unlicensed operators, there are information campaigns going on. The consumer has to become aware about the effects of her/ his behaviour. For example videos are used in schools to focus on who is affected. Another goal concerns the problem of a whole generation that takes for granted that music should be free of charge.

6.4.7 Winners and losers

When interviewed, representatives from the music distributors were reluctant to talk about the ways in which the industry was being affected by downloading. The general viewpoint from music distributors was that statistics and reports too easily became subjective and biased information.

The loser is identified as everyone with copyright. Those that suffer the most are probably the smaller production-companies as well as new artists. The costs involved in launching a new artist together with the long, hard and expensive process before achieving a break-through is enormous. The investment and risk involved in order to gain revenue might influence some groups of artists more than others. Hip-hop artists are considered to be among the major losers as a consequence of illegal downloading.

The winner in this game according to representatives of the music distributors are consumers. Young men interested in music aged between 15-25 years, having more time than money, are considered to gain most from downloading. They often have an attitude of: “whatever I do makes no difference”. The music distributors want to meet this attitude with arguments explicitly showing that illegal downloading does make a difference – to someone. Internet-operators are also considered to be winners. Companies providing Broadband earn on the demand for increased broadband. The heavy traffic caused by downloading music is an important driving force in expanding capacity.

6.4.8 Opportunities and threats

In the consumer part of this study, strengths and weaknesses of music downloading are analysed. An attempt to summarize the present situation from the music distributors' point of view could be in terms of opportunities and threats.

6.4.8.1 Opportunities with downloading

Perfect co-operation; in an ideal world production companies together with music artists successfully co-operate in order to create solutions that fit consumers' demands. This could be new ways of distributing the music under a common interest: legally licensed music. Today new opportunities are offered such as personalised radio, Internet radio, subscribing to favourite songs etc. Downloading of music via Vitaminic is an example of new forms of music distribution. These are some examples of what music distributors could release as legally licensed music.

Effective lobbying; when promoting new artists, it is important to be explicit about the costs involved. By highlighting the different development stages that a "coming star" has to go through, music distributors could bring about new and changed attitudes among consumers. It is common among young people to have an attitude that it is only the big, multinational companies who suffer from illegal downloading. This misconception must be changed in order to gain loyalty to the artist as a person.

Mobile services; if the aim is to retain consumers' interest in licensed music, music distributors must meet the demand from users of mobile services that fit their present lifestyles. An offensive way of meeting new types of demand is to offer creative solutions such as personalised radio, a personal jukebox, and subscription over a period of time etc.

Added value, new solutions; in order to compete with downloaded music; traditional purchases should offer added value. Suggestions mentioned are new material or formats, direct links to Internet that give the consumer access to other services etc.

6.4.8.2 Threats with downloading

A lost generation; there is a huge risk of a lost generation in the sense that young consumers will never go back to a system they perceive as antiquated. This will damage the value chain from a longer perspective. If music distributors continue to meet music downloading with a defensive, protective attitude, new forms of distribution will constitute a potential threat in the future.

Competition between different players; competition between music distributors paralyses them from addressing a common issue. This might lead to future disadvantages. As time passes consumers get used to new forms of music distribution and thus become another "lost generation". A defensive attitude prevents the players from developing new creative solutions, and opens up the market to other competitors.

Legal jungle; legislation is developed to protect the artist's copyright on any artistic work. As these regulations are becoming more complex, their practical use is diminishing. Paradoxically what was created to support artists has become an obstacle.

6.5 Analysis

By proceeding from consumer attitudes concerning downloading of music, the aim is to analyse in what way competition will be affected. The competition that we refer to is competition between traditional purchasing and downloading of music[92]. In order to do this we need a theory explaining the process of adoption. So why then is it interesting at all to proceed from a diffusion perspective? We are convinced that by studying this as a diffusion phenomenon, we will gain a deeper understanding of the principles that are necessary for diffusion to occur. Based on this an attempt is made to sketch a scenario that describes the future competitive environment that music distributors will face in a few years.

The analysis of the empirical data was done using the principles suggested by Rogers (1983) as necessary for the successful adoption of innovations. These principles: relative advantage, compatibility, complexity, trialability and observability are

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[92] By downloading music, here we refer to both legal and illegal downloading.

considered important if an innovation is going to spread as behaviour in a social system (See 3.1 Theoretical framework). These principles have served as a starting point in our analysis for the consumer interviews. The results from the consumer interviews are summarized below in terms of these principles.

6.5.1 Relative advantage

When consumers compared downloading music with traditional music consumption, they experienced various advantages with the former behaviour, i.e. downloading of music.

Accessibility; downloading music provides consumers with a service they can use anywhere and at anytime. This is perceived as an advantage since consumers do not have to be restricted to the traditional music store's opening hours. Hence they gain in flexibility both in time and space. Music becomes available at any time throughout a twenty-four hour day. Many consumers seem to download just for fun. Sometimes they save the music on the hard drive on the PC or on a CD. Often the purpose of downloading is only to get pleasure for the moment. The possibility of "moving the music around" and making personal selections seems to provide an initial thrill when consumers have adopted downloading of music. This implies flexible use of the music. Music becomes available on the premises of the consumer.

Free of charge[93]; today most of the services offered can be used for free, this is a radical difference compared to traditional purchases where consumers sometimes have to pay for a whole CD in order to listen to a few songs that they like. Almost all the respondents consider the price of a CD to be too high at present. It was common that the respondents mention price spontaneously in the interviews. Some consumers compare downloading with samples and vouchers. Downloading makes it possible to listen to a song without buying it.

"I am used to buying imported records, they cost around SEK200. I have not bought records for quite a while, but if you go to a record

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[93] We consider downloading music to be free of charge irrespective of the initial costs consumers have to pay for the technology, broadband connections required in order to download music etc.

store the CDs are extremely expensive." (Rodrigo, 25 years old, from Chile, store employee)

Mass-customisation; by using the downloading service, it becomes possible to mass-customize music that fits individual consumer preferences. Slow or fast, modern or old – the music can be mixed according to personal preference without consideration of how the music distributors wish to "package" the music. Consumers praise the almost incredible supply of hits from all different époques, genres and languages. This is unbeatable – no traditional music store can offer the same assortment. Mass-customisation of music has been considered one possibility that the Internet can provide consumers with (Pine, Peppers and Rogers, 1999).

"I download also for the children, but that depends on their age. I have downloaded preschool disco, it is completely tailor-made music." (Anders, 40 years old, consultant)

"It is fun to get hold of songs I could not find otherwise, things that are old or odd." (Anders, 40 years old, consultant)

"I can find old songs on the net that are impossible to find otherwise." (Petter, 35 years old, bachelor in systems engineering)

"You can find the song you want, just that particular song, in less then a minute." (Rodrigo, 25 years old, from Chile, store employee)

But there are disadvantages from downloading music as well.

Quality; the quality that the downloaded music has is often inferior to music that is bought in a traditional store. As a consequence downloaded music is often consumed instantly, in front of the computer. A quite common experience among these consumers is that downloaded music is nothing they give away as a present.

"Last year I bought something like 20 records. This year I haven't bought any, except as presents. When I buy records it is often as a present. You can download a record and give it away, but I think it is nicer to give away an original record." (Rodrigo, 25 years old, from Chile, store employee)

One-dimensional experience; the experience when buying a record in a traditional store involves more than only the act of music

consumption; consumers frequently mention the importance of the physical aspect in which both the cover and the lyrics are important for the total experience. Buying the “real thing” adds a dimension to the consumption experience not perceived when downloading.

“Very few people I know have stopped buying records. They think they will replace the purchases when they start downloading and when they buy a CD burner, but they don’t. They keep buying records. Downloaded music is simply not fun.” (Samera, 40 years old, from Eritrea, computer programmer)

”Downloaded music is boring, it is a feeling I have, it feels a little bit cheap to have them. I have less knowledge about covers and lyrics.” (Jonas, 37 years old, finance trader)

Downloaded music is treated in a fairly "slovenly" manner by these consumers. Often the downloaded music is not compressed on a CD. It is common that it is not even categorized; it is simply saved on the hard drive for later retrieval.

There are advantages in purchasing from a traditional store as well.

Uniform, high performance; when purchasing CDs in a traditional store high quality is guaranteed. All songs are included on the CD. A CD holds the same quality, irrespective of which store it was bought from.

Additional information; buying a CD in a traditional store also includes lyrics, cover and supplementary information about the artist.

The joy of consumption (homo ludens); there is a value in the consumption act from the actual purchase that takes place in a traditional store, including interaction with other people, the layout of the store etc.

Collection of originals; for many consumers buying the “real thing” implies a collecting status. In the same way as having liquor in a glass-cupboard for many consumers, it is valuable to keep a collection with correct covers.

Safety and security; the risk of data-virus makes some consumers uncomfortable. Other consumers have ethical considerations

implying a feeling of being disloyal to musicians when downloading music.

6.5.2 Compatibility

Downloading music for these respondents fits very well into their present lifestyles. Hence downloading music seems to be compatible with their overall set of beliefs. The consumers included in this study are technologically advanced. This implies access to, for example, modern hard- and software, broadband connections, CD-burners, speakers and so forth. Apart from this, many of the consumers share a special semiotic code by casually using concepts such as “ADSL”, “MP3 format”, “rip a CD”, “bit-rate” etc. Sometimes it was difficult to differentiate between consumers who were using concepts they fully comprehended and the jargon used by some consumers in order to be perceived as professional people.

By being familiar with the process of downloading music, completely new opportunities become available. Facilitated by digital technology, consumers are able to utilize music in a flexible way hence making it possible for them to listen to music in a personalized manner. Music can be sampled according to individual preferences, as it is possible to consume directly from the hard drive.

“It becomes possible to get it the way I want it and not the way others have decided.” (Anders, 40 years old, consultant)

Based on the contacts with non-adopters at Heron City, it seems that not using downloaded music was often a consequence of computer-illiteracy. This group of consumers not only rejected the possibility of downloading, they could even be characterized as hostile to the technology as such.

This was expressed by the following comments: “the technology is not for us” by three young men, 20-25 years, who had never been downloading music. A young beauty therapist, 25 years old, made a similar statement: “I do not like computers; I do not know anything about them” as a reason for why she had not been downloading music. Among the older consumers who were adopters of downloading of music, an explicit interest in technology and corresponding computer-literacy was often evident. A division

between those who use technology and those who avoid technology is clear.

An interesting paradox was that even “heavy” users downloading music needed to buy traditional CDs occasionally. The demands for the separate music consumption experiences are motivated by different needs. Downloading music is a consumption experience similar to a “fast-food meal”. Buying a traditional CD is for some consumers considered to be an investment, even part of a collection. The difference lies in the emotional feeling of ownership.

Another frequent reason for not downloading music was that some people, even though they had access to all the latest technology lacked motivation to change behaviour. This was often due to a perceived scarcity of time, but equally often due to a lack of interest in music. This was particularly evident for the consumers with children. A family situation where both time and space are considered to be scarce resources, implies that priorities change, so that a former interest in music might decline in importance. Priorities might also change under other circumstances.

Equally important as an interest in music, is an interest in digital technology in order to download music.

“It is nice to mix songs in the computer. When I was younger I used to work as a disc jockey and I like the combination of music and technology.” (Per, 39 years old, technology consultant)

It was evident that the consumers were not fully aware of whether downloading music is legal or illegal. Ethical and moral considerations were part of their reasoning when deciding the location for downloading. Some consumers were not willing to do it at their work-places. They felt disloyal towards their employers. Another reason for not downloading at the work-place might be the fact that the procedure uses a lot of the network capacity. A third reason for not downloading at the work-place is that the legal status for many of the file-sharing programs is not clear. If downloading music is going to occur at the work-place without risk, it has to be done correctly, which implies payment. Administrative routines concerning the use of such services are naturally not regulated at most work-places.

One of the respondents was not interested in participating since he was afraid that downloading music was an illegal act, and he did not want to participate in anything that could be regarded as dubious. Overall, almost all of the consumers had an interest in the use of the results from the interviews. Many of them also expressed an anxiety about what the results would be used for, indicating that downloading is somewhat of a controversial issue.

6.5.3 Complexity

Consumer-friendly software makes it possible to download music in a relatively easy way. Thus the perceived risk that complications will occur when downloading is quite low. Consumers who are curious about how downloading music works can try it by using e.g. Kazaa.com or Audiogalaxy.com.

For consumers that download music, the complexity is low, i.e. they perceive downloading music to be simple, fast and convenient. They consider downloading music to be easily accessible.

“It is extremely easy to download, and it is convenient.” (Anders, 38 years old, management consultant)

However easy it might be to download music, the perception from non-adopters in this study is that downloading is a technically complicated procedure.

The perceived complexity is thus high for consumers that have not yet tried downloading music, irrespective of how mature they are in technological use. Another reason for perceived high complexity in downloading music concerns the lack of knowledge regarding the consequences of downloading. The risks inherent in opening their own computer as well as the network can include undesired exposure to viruses and e.g. pornographic sites.

6.5.4 Trialability

The fact that downloading music is often free of charge makes it easy to try without cost. The possibility of trying out the behaviour without perceived high risk should facilitate the occurrence of a diffusion process.

In order for consumers to download music a certain technological status is required. Besides a PC and Internet access, broadband connections are also needed. Existing software makes it quite easy to download. In order to try downloading music, broadband can be considered a prerequisite. Without broadband connection, downloading is a time-consuming task and for some consumers not worthwhile doing. Downloading music does not require access to a CD burner, even though some consumers value this.

For some of the consumers in the study, there seem to be a potential risk involved when downloading music. This risk refers to the situation when consumers are actively involved with P2P file-sharing. In this situation their own PC may be exposed to intruders.

For the consumers that practised downloading in this study, technology was not seen as a major obstacle to trying the service.

“A person, who does not download music now, must be a person that has no contact at all with computers.” (Samera, 40 years old, from Eritrea, computer programmer)

But there were those who considered technology as such to be an obstacle to trying out downloading.

”My computer is too bad; it is not worth doing it.” (Jonas, 37 years old, finance trader)

Some consumers considered access to technology to be an indicator of status that not all people are privileged to have.

Another obstacle for consumers preventing them from downloading music concerns trust and insecurity of payments. Some consumers are reluctant to pay with their credit card over the Internet. This has implications for legal downloading of music, where consumers get charged for using the service. For some consumers, insecurity regarding payment over the Internet is perceived as an obstacle to legal downloading of music, and for this reason they decide not to download.

6.5.5 Observability

Innovations that are easily observable are more likely to spread since it is more likely that other potential adopters will be aware of their existence (Solomon, Bamossy and Askegaard, 2002). Even though it is easy to demonstrate how to download music, it is not a behaviour that consumers see other people do explicitly. For a person to observe the behaviour she/he has to actively ask for a demonstration in order to see how it works. Once demonstrated, downloading is perceived as a simple procedure. We discovered that among many couples living together, one of the spouses was not aware of how to download music.

“Louise does not know how to download. She is not interested.” (Per, 39 years old, technology consultant)

This circumstance made us consider downloading music to be a kind of behaviour that is not easily observable by others.

According to diffusion theories “opinion leaders” play a crucial role in the diffusion of an innovation. According to statements from several consumers, they regard themselves as "autodidact”, in the sense that they have learnt downloading by themselves. Someone may have inspired them, but mainly they have worked on the principle of “learning by doing”. The person who has inspired these consumers could be identified as an “opinion leader” with a strong interest in music and or technology. The information is often spread around at the work-place, where it is a common topic of conversation. It is more common in technology oriented work places.

It was common that the respondents became aware of downloading music while surfing on the Internet. Often the first contact was made when consumers were exposed to banners. These banners were linked to file-sharing programs e.g. Kazaa.com or Audiogalaxy.com. There are other examples of consumers driven by curiosity, looking for information concerning a certain artist or song. This browsing eventually led them to file-sharing programs.

6.5.6 Difficulties in recruiting respondents

Various reasons made it difficult for us to recruit respondents. These reasons were related to issues such as:

Illegal/ moral considerations; some respondents were uncomfortable over participating in the study due to insecurity over whether downloading was considered to be legal or illegal. Some of the respondents who downloaded in the work-place expressed a feeling of disloyalty toward the employer.

Hostility towards technology; refers more to an attitude in general toward technology. Despite the fact that Sweden has a homogenous diffusion of technology and that the majority of Swedish consumers are well aware of how to use a computer, there are exceptions. There were young men and women who declared an almost hostile attitude towards technology. For them technology had low priority in their present life-situations. We found both men and women in this group, and younger as well as older persons.

Ignorance of how to use a computer; in this group we found people who shyly admitted that they knew nothing at all about technology. We had a feeling they could not wait to get rid of "us". It may also have been that they felt a bit awkward not having the knowledge of how to use the Internet and how to practise downloading.

Scarcity of needed technology; some consumers do not have the necessary technology needed to download music. Broadband is for many consumers a prerequisite for downloading. This applies more to younger persons as opposed to older persons.

Un-prioritised consumption; refers to consumers who were otherwise rich in "resources" such as knowledge, money, technology etc. but still not downloading. The reason for this was a perceived scarcity of time.

6.6 Conclusions

The purpose of the report is to provide an increased understanding concerning the experiences consumers have of downloading music compared to traditional consumption of music.

This qualitative study is based on 16 consumer interviews, the aim of which is to gain a better understanding of consumers' attitudes towards downloading music. Five additional interviews were conducted in order to describe viewpoints of some representatives from music distributors towards downloading music.

We have used diffusion theories as a starting point for understanding the adoption process of downloading music among consumers. Downloading of music is in this respect treated as an innovation. If an innovation is successful, it spreads through the population. First, only a few people adopt it, but in time it spreads through the whole social system.

In order to illuminate the research question we considered it appropriate to interview two segments of consumers, young and middle-aged men.

From the results of the analysis of the prerequisites for a diffusion process to take place, we have created a scenario. This scenario is intended to sketch the competition environment that may exist within a few years. Understanding consumer’s attitudes towards this new way of consuming music constitutes the foundation for creating the scenario. The results also highlight some obstacles to the diffusion of P2P downloading music at least in the near future. The presentation starts with the obstacles.

We also proceed from a number of principles defined by Rogers (1962, 1971, 1983) for successful adoption of innovations. The logic behind the theory is as follows: if an innovation has a relative advantage compared to other alternatives, if it is compatible with existing lifestyle among consumers, if it is easy to use, try and observe it has a better chance of being successful.

Turning this reasoning around, we focus on the obstacles consumers’ experience when downloading music. The conclusions

are presented in terms of five more general themes that have emerged when summarizing these obstacles.

There are various obstacles that prevent consumers from downloading music:

6.6.1.1 Time is a scarce resource in daily reality

For many middle-aged consumers, time is perceived as a scarce resource. Since downloading music initially requires that some time be invested in order to learn the new behaviour, it is not given priority. Time has an alternative cost, and when this alternative cost is higher than the utility gained from downloading, the behaviour is not adopted. It can be hard for consumers to take the extra time needed in order to learn how to download. This might seem paradoxical since downloading music has the power to save a lot of time for users compared to the time needed when purchasing from a traditional store.

Another obstacle to adoption is inadequate equipment such as broadband connections, PC hard and software. Some consumers have access to technology only from work; where regulations for using the service may be an obstacle.

6.6.1.2 Music consumption involves different types of experiences

The quality of downloaded music at present is not always considered to be good enough to replace traditional purchases. Downloaded music is often not appreciated in the same way as traditionally purchased music. The distinction is based on tactile and visual as well as psychological experiences. Downloaded music does not include the original cover, lyrics or other information, neither is it a result of making a careful choice. A similar phenomenon is a fast food meal and a gourmet dinner in which both the material and psychological experiences differ.

6.6.1.3 Shopping is fun

Downloading music is behaviour that does not necessarily compete with traditional purchases of CDs. For some consumers going to a traditional store, buying a real CD is a positive consumption

experience. The ambience a record store gives is also part of the consumption experience.

For consumers who value collecting music, downloading music does not constitute a substitute. The act of collecting has to be separated from the consumption activity of music; it involves also the material artefact of the consumption experience.

6.6.1.4 Fear of cyberspace and lack of trust in contemporary technology

An obstacle to downloading music is the feeling of fear many consumers have concerning technology in general and downloading music in particular. This is explicitly expressed by people who have never tried downloading. Technology can empower certain consumers with new opportunities, yet other consumers are in a more disadvantageous position lacking knowledge and confidence to use the technology. For those who are confident in using the technology for personal use, it is common to use jargon indicating a certain degree of knowledge about computers. Technology inspired expressions and phrases can be powerful enough to exclude potential users.

The fear of using technology can be directed towards real threats such as data viruses, insecure payments, and exposure to pornographic content etc. Equally often the fear is part of a feeling of distrust towards technology in general or a feeling of being powerless in relationship to the technology.

6.6.1.5 Anonymity when consuming music

Downloading music is rather anonymous behaviour. Since downloading often takes place in solitude in front of the computer screen, diffusion of the behaviour is prevented. Compared with traditional music consumption, downloading is not associated with fellowship and the joy of sharing a mutual experience. Since downloading is such a solitary experience it takes time to spread among consumers. Therefore it does not promote diffusion among users.

6.6.2 Competition scenario

Based on the knowledge we have acquired about downloading music we have created a hypothetical scenario.

At present there are numerous obstacles that prevent consumers from downloading music. The obstacles are found both on the functional level and emotional level. Functional and emotional obstacles restrict the diffusion of music downloading. Even though we argue that the diffusion curve is valid, the obstacles slow down the speed at which diffusion occurs. If and when downloading is going to reach critical mass is dependent on how these obstacles are overcome.

Obstacles on the functional level are e.g. downloaded music is of inferior quality. Limited access to broadband and appropriate hard and software prevent some consumer groups from taking advantage of the opportunity. Insecurity, computer virus and dubious routines for payment also restrict usage. However, it is only a matter of time before these functional obstacles disappear. Among the emotional obstacles, some consumers have a general fear of technology and cyberspace. In time this threshold will also be lowered.

What we have found to be far more important are the emotional values connected to traditional, physical purchases. This can include collecting behaviour, gift-giving etc. We have not found any indications from our empirical data of any reduction in downloading behaviour over time. In order to obtain the emotional values when consuming music, consumers prefer to combine purchases from a traditional record store with downloading.

After studying downloading music we can not see any indications of why the diffusion process would fail[94]. However diffusion can occur at a faster or a slower rate. If diffusion occurs at a fast rate, music distributors will be forced to address music downloading. If diffusion occurs at a slow rate, it might be possible for music distributors to meet this threat by relying on existing emotional bonds that some consumer groups have towards traditional music consumption. These emotional bonds could be covers, lyrics, store

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[94] See Rogers (1962, 1971, 1983) Diffusion Curve, Figure 1.

atmosphere etc. This rather defensive approach from the music distributors aims at withholding present values.

However over a longer period, such as 10-15 years, we believe that diffusion will have reached the majority of Swedish consumers. It will then be difficult for music distributors to attract consumers with the same values they are currently offering. Music distributors have to meet the very real threat that downloading presents in an offensive manner.

6.6.3 Further research

This report has two different aims. One is to understand experiences consumers have from downloading music. The other aim is to describe the situation that music distributors are facing when confronted by illegal downloading. In order to understand the music distributors' response to downloading, it could be fruitful to do a more comprehensive analysis of the strengths and weaknesses (SWOT-analysis) that downloading could imply for music distributors.

Empirical data about so-called non-adopters, who for various reasons have decided to stop downloading music, could also provide valuable insights. This exploratory study could be supplemented by a quantitative study in order to estimate the relative weight of the different aspects described above.

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Appendix

Table 6.1 Composition of the households and principles guiding the sample.

Characteristics of respondent	Practical mode of procedure	Principle of sampling
Pelle, 35 years old, single household, shipping agent	In-depth interview in the interviewer's home	Purposeful sampling
Anders, 40 years old, married, two children, consultant	In-depth interview in the interviewer's home	Purposeful sampling
Jonas, 37 years old, cohabitation, one child, finance trader	In-depth interview in the respondent's home	Purposeful sampling
Magnus, 22 years old, living in his parents' home, student	In-depth interview in the interviewer's home	Purposeful sampling
Petter, 35 years old, married, one child, bachelor in systems engineering	In-depth interview in the respondent's home	Purposeful sampling
Cormack, 29 years old, married, three children, teacher	In-depth interview in the interviewer's home	Purposeful sampling
Anders, 38 years old, cohabitation, management consultant	In-depth interview in the respondent's home	Purposeful sampling
Per, 39 years old, married, two children, technology consultant	Telephone interview	Purposeful sampling
Jarry, 43 years old, unknown family status, computer support	In-depth interview at work-place	Purposeful sampling

Table 6.1 Cont.

Characteristics of respondent	Practical mode of procedure	Principle of sampling
Dick, 19 years old, single household, petrol station employee	In-depth interview at Heron City	Maximum variation sampling
Rodrigo, 25 years old, from Chile, single household, store employee	In-depth interview at Heron City	Maximum variation sampling
Tommy, 25 years old, single household, university student	In-depth interview at Heron City	Maximum variation sampling
Samera, 40 years old, from Eritrea, married, one child, computer programmer	In-depth interview at Heron City	Maximum variation sampling
Pilot interviews		
Jöns, 38 years old, married, one child, copywriter	Informal in-depth interview at summer boarding house	Convenience sampling
Petra, teenager, living in her parents' home, school girl	Informal in-depth interview at summer boarding house	Convenience sampling
Sandra, living in her parents' home, school girl	Informal in-depth interview at summer boarding house	Convenience sampling

Checklist for the in-depth interviews with music consumers

The prerequisites for recruiting respondents:

- man, 15-25 years old alternatively 35-45 years old
- an active interest in music
- downloaded music on the Internet during the last six months

1. When was the last time you downloaded music? Which occasion? Why?
2. How often do you download music on the Internet? Which occasions? Why?
3. Would you like to do it more often? Why?
4. Was it difficult?
5. How did you find out about downloading music? Who taught you? Why?
6. Can you describe the person who taught you? Who she/ he is? What kind of person (extrovert, computer nerd, music/ computer freak…)?
7. Do you copy music for other people?
8. Have you taught anyone else to download? Who? Describe that person.
9. Do you still buy music from traditional stores? Where do you get the main part of your music consumption (downloading/ traditional stores)?
10. How many records do you buy a year?
11. What are the advantages of downloading music (rank)? What are the disadvantages (rank)?

12. Compare downloading music with traditional purchases of music. What are the biggest advantages? What are the biggest disadvantages?

13. If you only consider traditional purchases, which is the greatest advantage/ disadvantage?

14. Are you computer-literate?

15. Have you access to a CD burner? Is that a prerequisite?

16. Is it complicated to download music? Which are the biggest obstacles for personal use:

17. Technological obstacles

18. Learning difficulties

19. Moral considerations

20. Time restrictions

21. Something else

22. How do you handle downloaded music?

23. Do you perceive a difference in quality when downloading music compared to traditional purchases?

24. Do you feel technologically advanced when downloading music?

25. If you were at a party and saw a person who is downloading music and one who is not, in what way would you describe the two characters? Do they have anything in common? Why/ why not? How do you think other people perceive them?

26. What do you think about the future, will you download more music? Why?

27. Who benefits from this new phenomenon (music distributors, artists or consumers)? Who suffers from this

new phenomenon? Is the question interesting? Why/why not? Are consumers becoming stronger by P2P downloading than as traditional music consumers?

28. What do you think about the price level of records at present? Are they worth the price?

29. What is your main reason for downloading music?

30. Is there something you would like to add to the interview that has not been covered?

Questions to music distributors' representatives

Name:

Function:

1. What is the view that x has towards downloading music? What is the trade's attitude toward the phenomenon of downloading music in general? How large is the percentage that refers to downloading music?

2. Which players are winners and losers from downloading music?

3. What will future development look like in five years?

4. Which consumer segments are downloading music? Why? Are there any changes?

5. Are there any trade associations looking after the questions at issue? In what way?

6. Do you know about any research within the area? Do you have any figures on developments?

7. What do you think about the moral and legal aspects of downloading music?

8. Some believe that downloading music will increase interest in music and thereby increase total record sales. What is your opinion?

7 Konkurrenspolitik i informationsåldern[95]

(*Swedish translation of Chapter 1*)

Vi lever idag i en informationsålder. Så även marknaderna. Informationsåldern påverkar alla branscher på ett eller annat sätt. Den huvudsakliga förändringen förefaller vara att marknadernas funktionssätt, snarare än dess syfte, ändras. Konkurrensverket möter dessa frågeställningar i stort sett alla sina ärenden, vare sig det handlar om dagligvaruhandeln, finanssektorn, byggindustrin eller kommunikationer. På senare år har traditionell konkurrens-analys kritiserats och anklagats för att inte på ett relevant sätt kunna analysera marknader stadda i snabb förändring. Denna utveckling är av intresse inte bara för Konkurrensverket utan också för övriga parter som är berörda av konkurrensfrågor på ett eller annat sätt.

De viktigaste förändringarna på marknader exponerade för den typ av dynamisk konkurrens där tillgång till information spelar en avgörande roll definieras något olika av olika forskare. Följande tre huvuddrag föreslås emellertid ofta (Evans och Schmalensee 2001; OECD 2002; Office of Fair Trading (OFT) 2002):

- *Betydande investeringar i FoU.* Intellektuell egendom är en nyckelkomponent i konkurrensen som skyddas med hjälp av patent eller copyright-regler, eller hålls dold. En förutsättning för framgångsrika innovationer är nytänkande och innovativa medarbetare. Arbetskraftskostnaderna drivs därför upp och är högre i dessa branscher och representerar en fokusering på humankapital.

- *Starka nätverkseffekter.* Nätverkseffekterna kan vara direkta eller indirekta. En direkt nätverkseffekt innebär att värdet av varan eller tjänsten för konsumenterna ökar ju fler användare som väljer att ansluta sig. Klassiska exempel är telefoner och faxmaskiner. Indirekta nätverkseffekter uppstår när utbudet av kompletterande varor ökar med antalet användare. Ett exempel är operativsystem för

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95 Översättning av kapitel 1, Competition Policy in the Information Age, av Karl Lundvall och Kristian Viidas.

persondatorer. Ju mer spritt ett system är desto fler applikationer utvecklas som kan användas i systemet, vilket är till nytta för alla användare.

- *Höga fasta kostnader.* Utvecklingen av mjukvara till persondatorer kan innebära betydande investeringar. Mångfaldigandet och distributionen kostar väsentligt mindre. De flesta dynamiska marknader, såsom den för mjukvara, är således föremål för kraftigt fallande styckkostnader (dvs. stora skalfördelar) då investeringskostnaden kan slås ut på en större volym,. Detta innebär ofta att marknaden ”tippar” mot en enskild aktör som blir marknadsledare. Dessa marknader är därmed mer koncentrerade än andra. Den inledande konkurrensen som leder fram till att marknaden ”tippar” till fördel för ett eller ett fåtal företag är hård med aggressiva marknadsförings- och prissättningsstrategier. Stora investeringar som saknar alternativa värden (*eng.* sunk costs) spelar en central roll för konkurrensen och kan fungera avskräckande för potentiella konkurrenter.

OFT och OECD föreslår var och en för sig ytterligare två utmärkande drag av dessa marknader:

- *Kompatibilitet och standardisering spelar en nyckelroll för konkurrensen.* På marknader med starka nätverkseffekter är gemensamma standarder nödvändiga för att företag skall kunna erbjuda produkter som kan fungera tillsammans med andra företags tjänster och produkter. Tiden innan en gemensam standard har blivit dominerande är känslig ur konkurrenssynpunkt. Konsumenterna riskerar också att köpa produkter som inom kort blir förlegade. I ett sådant läge sker konkurrensen snarare om själva marknaden än om marknadsandelar. När en gemensam standard väl har etablerats mognar marknaden och efterfrågan kan förväntas öka i och med att konsumenterna löper mindre risk att standarden snart blir övergiven. Konkurrensen skiftar då från en kamp mellan standarder till en kamp mellan olika produktalternativ med olika innehåll och egenskaper inom de tekniska gränser som standarden sätter.

- *Teknisk komplexitet och snabba förändringar.* Produkter som representerar ett betydande informationsinnehåll är som regel väldigt svåra att förstå sig på för utomstående, inklusive konkurrensmyndigheter. Till detta kommer att produkter och marknader förändras vilket gör förutsägelser om framtiden osäkra. Att definiera relevanta produktmarknader eller, vilket är ännu svårare, att bedöma effektiva åtaganden för att mildra konkurrensbegränsade effekter av förvärv, blir således en komplicerad uppgift.

Evans och Schmalensee föreslår ytterligare två typiska drag av den dynamiska konkurrensen:

- *Innovationer är en serie tävlingar om att vinna eller försvinna.* Dessa branscher kännetecknas av höga fasta kostnader och nätverkseffekter vilket gör att konkurrensen ofta leder till att ett enskilt företag blir dominerande. Konkurrensen kan väntas vara som mest intensiv i ett inledningsskede med svag lönsamhet, omfattande marknadsföring och relativt låga priser. Det centrala konkurrensmedlet är innovationer. När konsumenterna slutligen har utsett en branschvinnare försvinner konkurrenterna eller blir marginaliserade.

- *Mycket lönsamma branschledare.* Vinnaren av tävlingen om innovationerna kan under en tid se fram emot vinstnivåer som är mycket höga i relation till den ursprungliga investeringen. Men även om vinsterna är höga för vinnaren så speglar detta endast den förväntade avkastningen, givet sannolikheten att misslyckas med investeringen. För förlorarna däremot utgör de gjorda investeringarna förluster. Detta är huvuddraget i Schumpeters argument (Schumpeter 1939), där möjligheten till monopolvinster är den huvudsakliga drivkraften för innovationer och investeringar i FoU.

Det kan konstateras att bilden av dynamiska marknader, trots vissa skillnader, är relativt samstämmig. Något som desto oftare debatteras är vad det innebär för utformningen av en effektiv konkurrenspolitik. De som förordar att de konkurrensvårdande myndigheterna skall avstå från att ingripa motiverar detta med att högteknologiska dynamiska branscher har en inneboende förmåga att kurera sig själva. Höga vinster kommer alltid att sporra till

nyetableringar och nya innovationer, och därmed stimulera den tekniska utvecklingen. Om myndigheterna intervenerade mot dominerande företag med höga vinster skulle drivkraften för att satsa på FoU dramatiskt reduceras vilket skulle hämma tillväxt och tekniskt framåtskridande. Ett annat argument mot ingripanden är en generell misstro mot konkurrensmyndigheternas förmåga att fatta välgrundade beslut inom en rimlig tidshorisont.

Andra bedömare accepterar visserligen ingripanden i princip, men efterlyser försiktighet och ett flexibelt angreppssätt. Det pekas på att de standardverktyg som används i konkurrensanalyser sällan är lämpliga för dynamiska marknader. Mer hänsyn måste tas till de specifika omständigheter som gäller i enskilda fall. Ett exempel på svårigheterna är att bevisa förekomsten av underprissättning (*eng.* predatory pricing). Eftersom marginalkostnaderna är låga, i vissa fall t.o.m. noll, och de fasta kostnaderna mycket höga, kan en traditionell analys av underprissättning bli missvisande. Låga priser, eller t.o.m. ett nollpris, kan vara den enda rimliga strategin för ett företag som verkar på en marknad där det gäller att vinna eller försvinna. På samma sätt utgör vinstnivån inom en bransch sannolikt ett trubbigt mått på konkurrensen där det dominerade företaget har utkristalliserats efter en tävling om innovationer. Vidare bör en konkurrensanalys av kopplingsförbehåll (*eng.* tying, bundling) noga överväga om sådana strategier är en förutsättning för att täcka kostnader för bl.a. utveckling, att hålla ett servicenät, och att genomföra en rationell produktintegration.

Med viss hänsyn tagen till dessa synpunkter bedömde både OECD i sin rundabordsdiskussion i juni 2002 samt OFT (2002) i en nyligen presenterad rapport att konkurrenslagen och då främst kartell-bekämpningen har en viktig uppgift att fylla även på hög-teknologiska marknader. Såväl erfarenheter från OECD:s medlemstater som teoretiska studier pekar på att företag i dessa branscher har starka incitament att agera konkurrenssnedvridande, t.ex. genom att på olika sätt utestänga konkurrenter, och att beteendet ofta är framgångsrikt. En slutsats är emellertid att dessa problem i regel kan omhändertas inom ramen för traditionell konkurrenslagstiftning. Lagstiftningen i sig behöver således inte ändras. Den stora utmaningen är istället att kunna tillämpa regel-verket på högteknologiska och komplexa branscher som genomgår snabb teknisk utveckling. Detta ställer höga krav på institutioner, advokatbyråer och domstolar att förstå under vilka villkor konkurrensen sker på högteknologiska marknader.

Konkurrensverket anser att det finns ett behov av noggrann övervakning och tillämpning av konkurrensreglerna på dynamiska marknader. Den nuvarande konkurrenslagstiftningen är relevant, men vid dess tillämpning måste hänsyn tas till de förändrade förutsättningarna på marknaden. Det är därför viktigt att fortsätta att följa utvecklingen på dessa marknader, att finansiera forskning om hur konkurrensanalyser skall genomföras och att stimulera en öppen och seriös debatt om dessa frågor.

Denna rapport är ett sätt att försöka leva upp till dessa mål. Konkurrensverket har tidigare presenterat två rapporter om Internethandel och andra aspekter på den nya ekonomin (Konkurrensverket 2001, 2002). I denna utgåva presenterar forskare inom olika discipliner uppsatser baserade på egen forskning på området. Syftet har varit att dels stimulera forskningen på området, dels att uppmuntra till en allmän diskussion. Till skillnad från de tidigare rapporterna är denna utgåva författad på engelska. Detta för att förbättra spridningen av rapporten samt att förenkla för författarna att söka publicering av sina bidrag i akademiska tidsskrifter och böcker. Projektet har letts av Karl Lundvall under perioden maj 2002 till juni 2003. Utkast av uppsatserna presenterades på ett seminarium den 15 oktober 2002 där professor Stephen Davies vid University of East Anglia och Adrian Majumdar vid OFT var opponenter. Deras bidrag har varit mycket värdefulla. De slutsatser som presenteras i uppsatsen är författarnas egna och överensstämmer inte nödvändigtvis med Konkurrensverkets uppfattning.

7.1 Bidragen

I kapitel 2 bidrar Linda Wårell och Mats Nilsson till debatten om hur marknader skall avgränsas i högteknologiska branscher. De argumenterar för att traditionella metoder, baserade på priser och/eller kvantiteter, för att avgränsa marknader inte alltid ger de korrekta svaren då företagen konkurrerar med snabb produktutveckling, såsom förändringar av produkternas funktionalitet, design och tekniska lösningar. Författarna genomför en fallstudie av ett hypotetiskt förvärv på den nordiska marknaden för mobiltelefoner. Fallet analyseras både med traditionell konkurrensanalys och med ett föreslaget index för pris och funktionalitet. Författarnas slutsats är att indexet, kompletterat med en traditionell förvärvsanalys, bidrar till att förutsäga varthän den framtida produktutvecklingen är på väg. Slutsatsen är att diverse produktegenskaper

spelar en viktig roll på den nordiska mobiltelefonmarknaden och att rivaliteten mellan producenterna har en positiv inverkan på innovationstrycket på marknaden. Det skulle därför vara hämmande för konkurrensen och den tekniska utvecklingen om förvärvet blev av. Det kan alltså finnas skäl att stoppa förvärv även på sådana marknader i syfte att upprätthålla ett starkt innovationstryck.

Studien utgår ifrån Pleatsikas och Teece (2001) resonemang att den traditionella konkurrensanalysen typiskt sett leder till för snäva marknadsavgränsningar eftersom de inte tar hänsyn dynamiken på högteknologiska marknader. I uppsatsen konstateras dock att Pleatsikas och Teece alternativa metoder är svåra att använda i praktiken. Svårigheten ligger i det potentiellt felaktiga antagandet att den historiska utvecklingen kan visa vart utvecklingen är på väg. I fallstudien är denna kritik relevant, trots att det finns vissa tecken som pekar på fortsatt snabb innovationstakt. Huvudfrågan är hur man skall utvärdera välfärdseffekterna av en potentiell fusion mellan två stora aktörer på en marknad, såsom den nordiska, för mobiltelefoner. Kommer sammanslagningen av resurserna från två FoU-avdelningar att resultera i fler innovationer till nytta för konsumenterna jämfört med om förvärvet inte skedde? Eller, kommer sammanslagningen leda till färre innovationer eftersom färre produkter och egenskaper testas på marknaden? Författarna tycks luta åt den senare tolkningen, i motsats till Pleatsikas och Teece.

I kapitel 3 studerar Henrik Glimstedt en relaterad fråga, nämligen de potentiella negativa och positiva effekterna av nära samarbeten mellan konkurrenter rörande standardisering och delning av patent. Eftersom de flesta företag på dynamiska marknader är beroende av varandras gränssnitt och insatsvaror, samtidigt som gemensamma standarder har visat sig nödvändiga för att det skall vara möjligt att finnas på marknaden, har villkoren för denna typ av samarbeten varit av avgörande betydelse för den långsiktiga utvecklingen. En allt vanligare metod för att åstadkomma öppna gemensamma standarder är initiativ som lanseras och utvecklas av privata standardiseringskonsortier. Glimstedt framhåller att detta reser frågor om dessa strukturer innehåller nationella eller internationella konkurrensbegränsade element som hämmar den långsiktiga utvecklingen.

I kapitlet argumenteras för att doktrinen om oumbärliga resurser (*eng.* essential facilities) är ett mer användbart angreppssätt för

dessa marknader än teorierna om tippning och inlåsningseffekter**.** Centralt i analysen är distinktionen mellan arkitektoniska och modulära innovationer. Arkitektoniska innovationer hänförs till ett system av sammanhängande delar eller moduler. En bil är ett exempel på en arkitektonisk innovation som består av ett flertal moduler såsom motor och växellåda. Modulära innovationer kan därmed innebära en förbättring av funktionaliteten utan att förändra den övergripande arkitekturen. En biogasmotor som är utvecklad för bilar är således ett exempel på en modulär innovation.

Avgränsningen mellan dessa typer av innovationer är viktiga för att analysera utvecklingen av datorsystem och informationstekniska nätverk. I kapitlet presenteras en fallstudie av de nyckelpatent som användes vid framtagandet av GSM-standarden. Den empiriska analysen visar att européerna var långt efter sina amerikanska konkurrenter gällande digital mobilteleteknik vid tidpunkten då standarden fastställdes på den europeiska marknaden. Glimstedt tolkar detta som en stark indikation på att förekomsten av ett övergripande dominerande system (GSM-systemet) resulterade i ett högt innovationstryck på modulnivå. Standardiseringen hindrade således inte en fortsatt utveckling. Istället ökade antalet betydande GSM-patent efter det att standarden hade fastställts i början av 1990-talet. Med Europas *New Approach* förefaller UMTS-systemet vara ännu mer öppet för innovationer på modulnivå.

En annan slutsats är att konkurrens mellan standarder ersätts med konkurrens inom standarder. Bidragande till denna utveckling är den linje som antagits av EU och som kan betraktas som framgångsrik eftersom man tillåtit en dominerande standard men fortfarande upprätthållit konkurrensen på modulnivå.

I kapitel 4 analyserar Fredrik Andersson olika aspekter på elektronisk handel mellan företag. Fokus ligger på leverantörsmarknader, hur strukturen kan komma att förändras och troliga konsekvenser för tillämpning av konkurrensreglerna. Flera av dessa marknader har genomgått en stark tillväxt under senare år och kan förväntas växa också i framtiden. Betydande besparingar för de inblandade företagen uppstår som ett resultat av förbättringar av de interna administrativa rutinerna för planering, schemaläggning och produktion.

I vissa fall har användningen av elektroniska handelsplatser gjort marknaderna mer konkurrensutsatta, inte minst auktionsmarknader

där relativt enkla och standardiserade varor och tjänster tillhandahålls. På andra marknader med mer komplexa produkter som kräver ett närmare förhållande till tillverkarna och därmed en större grad av samarbete, är det svårt att avgöra om konkurrensen har ökat. Det finns inget tydligt tecken på om e-handel förändrar förhållandet mellan konkurrens och samarbete.

En viktig uppgift för konkurrensmyndigheter är enligt Andersson att undersöka om elektroniska marknadsplatser underlättar samordning, implicit eller explicit, jämfört med tidigare marknadslösningar. Olagligt kartellsamarbete underlättas sannolikt i och med den förbättrade möjligheten till informationsutbyte och möjligheten att dölja information. Andersson understryker att denna effekt är starkare i de fall koncentrationen är hög antingen på köp- eller säljsidan på en marknad. Det kan därför vara motiverat att ge de konkurrensvårdande myndigheterna tillträde till informationsflödet på dessa elektroniska marknadsplatser. Det kan även finnas anledning att begränsa det informationsutbyte mellan företag till en nivå som är absolut nödvändigt för att själva handeln skall fungera.

En annan viktig uppgift för konkurrensmyndigheter är att undersöka om vissa företag vägras tillträde till elektroniska marknadsplatser, vilket skulle kunna utgöra en allvarlig konkurrensbegränsning. Detta kan ta sig till uttryck genom att särskilda krav ställs på medlemmarna i ett nätverk som är svåra för nyetablerade företag att uppfylla. Därmed kan kraven komma att fungera som en svår inträdesbarriär. Kontrollen över en e-handelsplats kan därmed vara liktydig med kontrollen över en nödvändig infrastruktur. Även om dylika konkurrensbegränsningar är utomordentligt allvarliga, är de sannolikt ännu inte särskilt vanliga, avslutar Andersson.

I kapitel 5 undersöker Stefan Hellmer en ny marknad som etablerats i och med informationsålderns inträde, nämligen musikdistribution över Internet. Utvecklingen av ny teknik såsom MP3-formatet och gratis tillgång till nödvändig mjukvara, p2p, har gjort att marginalkostnaden för att distribuera ett stycke eller ett helt album är nära noll. Dessutom påverkar inte en musikälskares lyssning på ett musikstycke över nätet möjligheten för andra att njuta av samma stycke, dvs. det finns ingen rivaliserande konsumtion. Dessa attribut gör att musik som distribueras över Internet strikt teoretiskt är en kollektiv nyttighet, för vilken konsumtionen är omöjlig att kontrollera. Således borde ingen marknad existera eftersom ingen

privat aktör vill erbjuda en vara gratis. Innebär detta att musikindustrin är på väg att kollapsa?

Hellmers svar är nej. För det första förutsätter en total kollaps att alla musikkonsumenter skulle byta till p2p-mjukvara och MP3-teknik. För det andra måste konsumenternas preferenser för förinspelade CD-album helt försvinna. Ingen av dessa förutsättningar kommer av allt att döma att uppfyllas inom den närmaste framtiden. Nedladdning fungerar således snarare som ett komplement än som ett substitut till kommersiella distributionskanaler. Den kommersiella marknaden för förinspelad musik kommer alltså att bestå även under kommande år.

Däremot kommer marknaden för förinspelad musik med all sannolikhet att förändras. Trots att försäljningen av CD-skivor har minskat under senare år, både i volym och värde, är det inget i materialet som säger att det har att göra med användningen av MP3 och p2p. Hellmers undersökning av sina studenter visar att användandet av MP3 är utbrett vilket bekräftar tidigare studier. Mer än 60 procent av universitetsstudenterna laddar ned en betydande mängd musik, och det faktum att beteendet sprider sig mellan åldersgrupper kommer att leda till att betydelsen antas öka under kommande år. De flesta köper också färre CD-skivor som en följd av MP3- och p2p-användning. Vidare uttryckte en relativt hög andel av respondenterna en vilja att antingen vänta en tid efter det att CD:n kommit ut på marknaden, eller att betala ett visst belopp för varje nedladdning, om detta innebar att förfarandet blev lagligt.

Distribution med hjälp av MP3 och p2p är effektivare än genom traditionella kanaler. Hellmer drar därför slutsatsen att den bästa strategin för musikindustrin är att anpassa sig och utnyttja den nya tekniken. Exemplet visar tydligt vilket dilemma som konkurrensvårdande myndigheter ställs inför. Är exempelvis skydd mot digital kopiering av CD-skivor bra eller dåligt för konkurrensen? För att kunna svara på denna fråga måste den möjliga förlusten för upphovsmännen vägas mot den möjliga kostnaden som en begränsning av innovationsprocessen för musikdistribution skulle innebära för konsumenterna.

I det sista kapitlet, kapitel 6, undersöker Maria Frostling-Henningsson och Anna Jakobsson svenska konsumenters attityder gentemot nedladdning av musik över Internet. Studien baseras på

16 djupintervjuer. Kompletterande intervjuer genomfördes av musikdistributörer.

Den teoretiska utgångspunkten är diffusions-teorin (*eng.* the theory of diffusion). Framgångsrika innovationer sprids snabbt och får en allmän användning. Nedladdning av musik tolkas av författarna som en innovation. Framgången beror på den relativa fördel som innovationen ger och på dess kompatibilitet, komplexitet, testbarhet och observerbarhet.

Ett antal slutsatser kunde dras från intervjuerna:

- *Tiden är en knapp resurs.* Nedladdningen kräver tid liksom att lära sig hur man gör. Detta är en avhållande faktor för konsumenterna, vilket kan verka motsägelsefullt eftersom nedladdningen har potential att spara tid.

- *Musikkonsumtion innehåller olika typer av upplevelser.* Konsumenter anser alltjämnt att nedladdning inte är ett perfekt substitut till förinspelade CD-skivor på grund av små kvalitetsskillnader och de extra värden som medföljer en CD såsom originalförpackning och texter.

- *Att köpa är roligt.* Att köpa har ett värde i sig som man går miste om vid nedladdning av musik.

- *Rädsla för cyberspace.* Det är ett betydande steg för många att våga ladda ned musik från nätet eftersom de hyser en generell misstro mot tekniken i sig själv.

- *Anonymitet vid musikkonsumtionen.* Nedladdning och spelning av musik är något man ofta gör ensam. Utrymmet för spridning är därmed begränsat.

Med hjälp av intervjuerna av konsumenterna och av musik-branschen skapar Frostling-Henningsson och Jakobsson ett hypotetiskt konkurrensscenario för marknaden för musik-distribution. De bedömer att problemen med nedladdning som nämnts ovan kommer att avta med tiden i takt med att konsumenterna blir mer medvetna och tekniken bättre. Över en längre period, kanske 10-15 år, tror författarna att spridningen har nått en majoritet av de svenska musiklyssnarna. Trots detta kommer säkerligen konsumenterna även i framtiden att efterfråga musik

köpt i affär, t.ex. när musik köps som gåvor. Ett fullständigt skift från fysisk till virtuell distribution av musik är således inte att vänta. Musikdistributörerna kan komma att svara på utvecklingen genom att alltmer betona emotionella band till traditionell musikkonsumtion, såsom exklusiva förpackningar, texter och upplevelser vid själva inköpsstället.

Sammantaget presenterar dessa bidrag en mångfacetterad bild av marknader i informationsåldern. Konkurrensmyndigheternas uppgift är att inkorporera de viktigaste attributen hos dessa marknader i sina bedömningar och att tillämpa konkurrenslagen på ett verkligt konkurrensfrämjande sätt. Det är uppenbart att flera marknader har en stark tillväxtpotential – men också stora möjligheter för aktörer att göra stora vinster genom att hindra en effektiv konkurrens. Den stora utmaningen för konkurrens-myndigheterna är att agera så att incitamenten för innovationer bevaras och samtidigt med största möjliga kraft avskräcka företag från att begränsa en effektiv konkurrens.

Diskussionen om hur denna utmaning skall hanteras i framtiden kommer med all säkerhet att pågå länge. Det är vår förhoppning att denna rapport kan tjäna som ett bidrag till denna diskussion.

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