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# Micropayments As a Form of Market-Based Intellectual Property Protection

by

Karl Sun

S.M. Electrical Engineering  
S.B. Electrical Engineering  
Massachusetts Institute of Technology, 1993

*Submitted to the Department of  
Electrical Engineering and Computer Science  
and the Technology and Policy Program  
in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Technology and Policy*

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### ABSTRACT

Open, public digital networks like the Internet are a logical medium for buying, selling, and transferring information goods and services. How will we pay for these goods? In particular, will new micropayment systems emerge on the Internet, and what impact will they have on the information goods market? The growth of the on-line market for low-value information goods is slowed by the lack of a payment mechanism efficient enough to handle low-value transactions, and by the absence of intellectual property protection on the network. I argue that micropayment systems can and may provide a solution to both of these problems.

I first examine whether there is a demand for micropayments by analyzing the growth of the on-line information market and current payment methods. I conclude that although micropayments may be a desirable payment form for some information providers, it is unclear whether micropayments will be viable on this basis alone. However, I argue that there is a current need for micropayment systems as part of a new approach to intellectual property protection. This new approach to intellectual property protection relies on new technologies – including micropayments – and market forces to compensate authors for their works, rather than relying on intellectual property rights rooted in the law. I conclude that the basic goals of intellectual property law are better served by this market-based approach to intellectual property protection than through broadening the scope of intellectual property rights.

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## INTRODUCTION

Information technologies and networks are becoming more and more pervasive and are quickly changing the ways in which people interact with each other. The Internet, in particular, has become an invaluable communications medium, and it continues to grow at a rapid rate. Information technologies are also labeled an engine of economic growth in our economy, and a boon to both information producers and information consumers alike. Consider, for example, this position set forth by the U.S. government with respect to the National Information Infrastructure (NII):

The NII . . . . can spur economic growth. . . . New job opportunities can be created in the processing, organizing, packaging and dissemination of the information and entertainment products flowing through the NII.

The NII can provide benefits to authors and consumers by reducing the time between creation and dissemination. It will open additional markets for authors. . . . it will provide a wider variety and greater number of choices for consumers . . . <sup>1</sup>

Indeed, the Internet's rapid growth has generated a large amount of interest in its potential as a medium for commerce. This thesis examines one aspect of the Internet's commercial potential – that as a medium for the producing, buying, and selling of *low-cost information goods*. In particular, this thesis asks: will new low cost payment schemes emerge to support this market? [hat are the obstacles to the development of such a market? And how will these concerns be

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<sup>1</sup> Information Infrastructure Task Force, *INTELLECTUAL PROPERTY AND THE NATIONAL INFORMATION INFRASTRUCTURE* 9 – 10 (1995) [hereinafter NII WHITE PAPER].

addressed?]) And what impact would such *micropayment* systems have on intellectual property protection in the networked environment? The thesis argues that costly payment systems and the lack of intellectual property protection are two significant barriers to the emergence of a robust on-line information goods market, and that new low-cost may be part of the solution.

Chapter 2 traces the changing character of money in our society, and identifies the different functions that money serves. It also identifies the needs that will spur the growth of new payment forms like micropayments, and traces the growth of credit cards and charge cards as a new form of money. Chapter 2 also lays out two obstacles that currently impede the development of a robust on-line information market: the need for a more efficient payment system, and the lack of an effective way to enforce intellectual property rights.

Chapter 3 examines various micropayment protocols that have been proposed or that are under development. Chapter 3 first analyzes how credit and charge cards provide trust and security in the network environment, and uses this model as a basis to analyze the trust and security in micropayment protocols. Chapter 3 finds that the various micropayment protocols can be grouped into two major categories, one based on ensuring a very high degree of trust and security, and one focused more purely on efficiency.

Chapter 4 surveys the on-line market for low-cost information goods. First, based on growth predictions for this market, Chapter 4 attempts to estimate whether there is enough revenue to be earned in this market to warrant new payment schemes. It asserts that, although the estimates are unclear, micropayment operators might be able to earn reasonable revenues in the on-line low-value information goods market. Chapter 4 next examines this market from the point of view of on-line information providers, including the different revenue models and pricing strategies available to on-line information producers. It concludes that many information providers may be forced to rely on micropayments as a source of income.

Chapters 5 and 6 examine the likely interaction between micropayments and intellectual property law. Chapter 5 first lays out the basic principles of copyright law, and then explains the difficulties of applying these principles to the digital environment. Chapter 5 surveys some recent legislative proposals to amend how intellectual property rights are applied in the digital environment, and closes with the observation that both supporters and opponents of enhanced

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intellectual property rights consider the fair use doctrine to be a key factor in striking the proper balance between broader rights and public access to information.

Chapter 6 argues that the availability of micropayments undermines the basic rationale for the fair use doctrine, and that courts are likely to find fewer instances of fair use if micropayments become widespread. Chapter 6 argues, however, that micropayments can be used in conjunction with other technologies to foster an alternative approach to intellectual property protection. This new approach focuses less on *legal rights* of ownership and more on protecting the interests of authors through the characteristics of the on-line information *market*, and makes more sense in the digital environment because it focuses more on the *use* of information rather than on the outmoded concept of *copying*. Chapter 7 concludes this thesis by arguing that such a market-based approach to intellectual property protection strikes a more appropriate balance between the competing goals of copyright than does expanding the scope intellectual property rights.

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## EVOLVING FORMS OF MONEY AND EVOLVING MARKETS

What is money, and what functions does it serve? On the surface, these questions seem very simple indeed -- after all, we each use money every day and money affects almost every aspect of our lives. Over the course of time, however, money has taken many different forms and performed several different functions. The history of these different forms and uses of money has been closely related to the organization of society itself. Today, one anthropologist writes that “[m]oney constitutes the focal point of modern world culture” and defines relationships in ways that supersede even familial, religious, and political ties.<sup>2</sup> Although one might take issue with such an extreme view, it is hard to dispute that money does indeed play a central role in any modern market economy. As we stand now on the edge of a revolution in the form that money takes -- a shift from paper notes and coins to digital money -- it is important to identify what characteristics of money are important today, how these desired characteristics shape the form of money, and how (or whether) these new forms of money will influence the way we transact with each other.

### 2.1 A Brief History of Money

The earliest type of money grew directly out of, while still functioning within, the barter exchange system. *Commodity money*, such as cacao (chocolate) beans for the Aztecs, bricks of tea in Mongolia, and blocks of salt in various areas of the world, was often simply a commodity

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<sup>2</sup> JACK WEATHERFORD, *THE HISTORY OF MONEY* 228 (1997).

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that was prized within a particular locale or culture.<sup>3</sup> Valuable commodities were readily accepted as payment by everyone in the community, and one could therefore count on being able to exchanging it for other goods. The standardized nature of the commodity good also meant that other goods could be valued in terms of the commodity. For example, the Aztecs measured the value of goods in terms of cacao beans. Commodity money was also useful because it was a valuable good unto itself: cacao beans could be ground up into a highly prized drink, tea could be brewed, and salt could be used to season and preserve food. Although commodity money has largely disappeared today, it still exists in places where normal markets are disrupted and “real” money has lost its purchasing power. Modern examples of commodity money include chocolate brought by American soldiers into Europe during World War II and tobacco inside of prisons.

One of the first great revolutions in money was the invention of manmade coins. Commodity money did not facilitate trade across long distances because commodity goods often had little or no worth outside of the immediate community, and because the goods were bulky and might spoil in transport. On the other hand, although precious metals such as gold had long been used to store value efficiently, exchanging precious metals for goods required some degree of expertise in discerning the purity of metals and in weighing objects. In addition, because precious metals were very scarce and valuable, an ingot of gold might represent an entire shipload or storehouse of goods, making precious metals impractical as a medium for everyday transactions. Thus, merchants (and, of course, kings) were the only class of people that could trade in ingots of gold or talents of silver. The invention of smaller size and lower value coins, however, dramatically expanded commerce. Standardized coins set the stage for retail marketplaces by enabling many more people to engage in commerce efficiently. This first revolution in money thus gave rise to open markets and established shipping and trade as the major wealth creating enterprises.<sup>4</sup>

The development of banking brought a second revolution in money that, like the invention of coined money, made transactions easier and changed the character of the marketplace. Private banking developed at the beginning of the Renaissance era and signaled the

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<sup>3</sup> *See id.* at 17 - 21.

<sup>4</sup> *See id.* at 31 - 32.

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reemergence in the West of a market economy which had all but disappeared for roughly one thousand years during the Dark Ages. The first private banks were Italian banking families, who made credit available to all types of merchants.<sup>5</sup> These bankers loaned money to merchants in exchange for paper notes that specified where, when, and in what currency the debt was to be repaid. The debt notes were much easier to transport and much less costly to safeguard than the heavy and unwieldy physical coins, and themselves circulated as a form of money among the bankers and merchants. The paper certificates also had two other effects: first, they increased the amount of money that was in circulation by separating money, to a degree, from the underlying gold or silver, and second, they created a monetary system in which currencies from different countries were easily exchanged with other currencies. Over time, the idea of paper money took hold. Thus, instead of being limited to intrinsically valuable tokens such as gold, silver, or copper coins, money took the form of paper notes that had no inherent value but were convertible upon demand into inherently valuable forms of money like gold.

However, paper money that was convertible on demand into gold created many of the same restrictions on the economy as had intrinsically valuable forms of money. In particular, the government's supply of gold limited how much currency it could issue and how much money it could spend. During the late 1960s in the United States, the gold standard became too great a constraint on a government dedicated both to fighting a war abroad and to spending money on various domestic programs. In 1971, President Nixon severed the historical link between the U.S. dollar and the value of gold. As a result, the U.S. dollar today is no longer backed by any inherently valuable commodity, but only by trust -- trust in the stability of the federal government, and faith that people will accept U.S. dollars as payment for goods and services.

Money tends to evolve in form and character along with changes in the marketplace. Significant changes in the character of money have occurred when such changes allowed the commercial market to expand in scope, or when the new types of money fostered efficiency by allowing market participants to act more freely in carrying out transactions. Coined money replaced commodity money because coins were a more efficient way to store value and to conduct transactions. Banking and paper money developed in response to the needs of the

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<sup>5</sup> See *id.* at 72 - 74.



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reemerging market economy in Europe following the Dark Ages. And in the middle of the twentieth century, a belief that the gold standard imposed an artificial and arbitrary limit on the government and the economy led government leaders to sever the link between money and gold.

## 2.2 Three Major Functions of Money

Throughout its history, money has served three basic functions. First, money has been important as a *means of storing value*. Early commodity money, for example, consisted of goods that had some durability and some practical use. Cacao beans or bricks of tea could be turned into beverages, and jewels could be used for adornment. Coins minted from precious metals were also a direct store of value. The first uses of paper money, however, signaled a shift away from using money as a direct store of value. Paper money became a *token* of value: though the notes could be exchanged for gold or silver, the paper itself was cheap and worthless. Newer forms of money like credit cards do away with even the requirement for token money; instead, their main characteristic is their purchasing power. Most money today does not exist as pieces of paper but rather as notations in the records of financial institutions, or as forms of *notational money*.<sup>6</sup> Because almost all forms of money today – whether token or notational – merely represent value rather than functioning as a direct store of value, this first function of money does not seem to be a driving force for new forms of money.<sup>7</sup>

Second, money functions as a *standard of value*. Money is the thing against which the relative value of different goods is measured. When money had intrinsic value, the value of goods was measured relative to the value of the commodity that served as money. Now that

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<sup>6</sup> See Congressional Budget Office, EMERGING ELECTRONIC METHODS FOR MAKING RETAIL PAYMENTS 2 (1996) [hereinafter CBO Report].

<sup>7</sup> The difference between electronic token money and electronic notational money may be significant with respect to privacy. Proponents of electronic token money systems argue that, unlike electronic notational money systems, electronic token money systems do not require – and do not allow – merchants or financial intermediaries (such as banks) to keep records of each and every consumer transaction. Therefore, electronic token money protects privacy whereas electronic notational systems jeopardize personal privacy. The debate over privacy and electronic money is largely beyond the scope of this thesis. One good source setting out the arguments of two opposing experts on this issue is located at *Is Ecash a Government Killer?*, <[www.hotwired.com/braintennis/archive/index.html](http://www.hotwired.com/braintennis/archive/index.html)> (Mar. 10 – 19, 1997).

money has lost its intrinsic value, the value of goods is still measured in terms of “dollars,” but the “dollar” itself is an abstract quantity measured in terms of other currencies or its purchasing power. Money -- whether it is traditional paper notes or new digital cash -- will be created in terms of existing currencies such as dollars, yen, or marks, and not vice versa. Thus, although money will always, by definition, serve as a standard of value, this function also plays little or no role in the development of new forms of money.

Third, money functions as a *medium of exchange*. Money replaced the old barter system, in which two goods were directly exchanged for each other, with two separate transactions: first, the sale of one good for money, and second, the purchase of a different good with money. Money introduced flexibility into the primitive market system because it allowed the two transactions to occur at different times, in different places, and between different individuals. Money has continually evolved to facilitate transactions, and this feature is the one that continues to spur the evolution of money today. The ability of coins to simplify transactions and make the marketplace accessible to a wider class of people, the growth of banks in the early Renaissance that increased the capital available to merchants, the U.S. abandonment of the artificially restrictive gold standard -- all of these transformations in money have been associated with efforts to find creative and efficient uses of money to create even more wealth. It is likely that these goals -- and the economic rewards to those who can achieve them -- will continue to shape the evolution of money in the digital age.

## 2.3 New Forms of Money

Notwithstanding the current talk and speculation regarding the future of electronic money, it is important to realize that in today's economy money is already largely electronic. As mentioned earlier, most money is stored as electronic notations in bank accounts. In large financial transactions, money is transferred directly from one bank to another electronically over secure electronic networks.<sup>8</sup> Even at the consumer level, although cash transactions account for

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<sup>8</sup> See *Large-Dollar Payment Flows From New York*, FED. RESERVE BANK OF NEW YORK Q. REV., Winter 1987 - 88, at 6, 6 - 10 (describing the FedWire and Clearing House Interbank Payment System (CHIPS) networks for settling inter-bank transactions).

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somewhere between 50 percent and 75 percent of all purchases by number, they constitute only about 20 percent of expenditures by value – a drop of roughly one-half between the years 1984 and 1995. Over the same time period, credit card purchases increased from approximately 7 percent to 13 percent of total consumer expenditures.<sup>9</sup>

### **2.3.1 Desired Characteristics of New Forms of Payment**

If market needs determine the characteristics of new forms of money, what are the needs in the digital world which could be better served by a new payment system? And what advantages do new technologies such as digital networks and cryptography provide that make new electronic forms of money desirable?

#### **2.3.1.1 Trust and Security**

Any new payment system must provide a satisfactory level of *trust* among all individuals involved.<sup>10</sup> In the simplest terms, the payment system must limit the parties' exposure to economic risk. For example, buyers want assurances that they will receive goods that they buy at the price agreed upon by the parties, and sellers want assurances of payment. Moreover, both parties want to be assured that they are adequately protected if the transaction is not properly completed or is fraudulent.

#### **2.3.1.2 Efficiency**

As mentioned previously, *efficiency* has been one of the driving forces behind the evolution of money and will exert an important influence on the development of new types of electronic money. Efficiency is a broad concept. For consumers, a payment form may be efficient if it provides greater convenience in conducting existing types of transactions, or if it allows them to make purchases they otherwise could not make. For merchants, efficiency may

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<sup>9</sup> See CBO Report, *supra* note 6, at 17 - 18.

<sup>10</sup> For a thorough treatment of trust in the digital environment, see Joseph M. Reagle Jr., *Trust in a Cryptographic Economy and Digital Security Deposits: Protocols and Policies* (1996) (unpublished S.M. thesis, Massachusetts Institute of Technology).

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mean lower costs of doing business or the ability to increase sales. For issuers of new forms of money, a new payment scheme may be efficient if they are able to make a profit on the payment scheme.<sup>11</sup>

## 2.4 Payment Cards: An Example of a Successful Payment Scheme

The most important development in new payment systems over the past several decades has been the explosive growth in payment cards. Payment cards consist of *charge cards*, such as the original American Express cards, which require cardholders to pay off their balance in full each billing period, and *credit cards*, such as cards issued by Visa and MasterCard, which allow cardholders to run up a balance on their cards up to an authorized credit limit. Payment cards were not introduced until after World War II, and the two largest modern credit card associations, Visa and MasterCard, were not born until the 1960s. By 1996, however, there were over 289 million payment cards in circulation, accounting for \$1.7 *trillion* in charges worldwide. In the U.S. alone, consumers charged approximately \$800 *billion* in goods to their credit and charge cards in 1996.<sup>12</sup> In contrast, total cash transactions in the U.S. total approximately \$455 billion annually.

### 2.4.1 Reasons for the Growth of Payment Cards

There are a number of reasons for the massive growth in payment cards. The first factor is simply *credit*. Before World War II, only rich people had access to credit of any kind. Credit cards now give consumers access to easy credit and allow them to make purchases they would otherwise be unable to afford or unwilling to pay for upfront. Credit cards effectively allow consumers to *create* money when they use the cards, because the merchant gets credited for a

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<sup>11</sup> Many people also consider *privacy* to be an important feature of new digital payment systems. However, it is unclear what level of privacy is desirable, whether users of new electronic money will demand anonymous forms of electronic money, or whether more privacy unduly compromises the security of electronic money systems. See, e.g., *Is Ecash a Government Killer?*, *supra* note 7. An examination of the need for privacy -- including anonymity -- in electronic payment systems is beyond the scope of this thesis.

<sup>12</sup> See *Down for the Count*, CREDIT CARD MGMT., May 1997, at 46, 46 - 47.

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sale and the consumer takes home a good but does not have to pay anything out of pocket.<sup>13</sup> Consumers seem to have enjoyed this access to credit -- aside from home mortgages and car loans, credit cards are the largest source of consumer credit, and in 1991 credit card debt constituted over 25 percent of *total* consumer credit.<sup>14</sup> Between 1985 and 1995, *revolving* consumer debt -- which is dominated by credit card debt -- more than tripled, reaching \$350 billion in 1995.<sup>15</sup>

Another reason for the growth in payment cards is the *convenience* that they provide. Buyers with payment cards can shop without carrying a large quantity of cash and need not worry about stores that do not accept non-local personal checks. Charge cards provide the most obvious example of the convenience value of payment cards; their only benefit is to allow consumers to defer payment on purchases to one payment at the end of every month. Most credit cards also give cardholders a grace period in which they can pay off their balance in full without incurring interest charges and thus allow consumers to use the credit card just like a charge card. Merchants benefit from the convenience afforded to consumers by payment cards because more convenience translates into more sales.

Payment cards also *reduce the risks of transacting* to both buyers and sellers and therefore expand the scope of transactions that are possible. For example, hotels and restaurants can eliminate the risk created by customers who make reservations but do not show up by requiring that customers guarantee their reservations with a credit card. Customers who are dissatisfied with the quality of the goods they receive often have recourse against the merchant due to the relationships among the customer, the entity issuing the card, the card association (if any), and the merchant. Consequently, payment cards have greatly expanded entire industries, such as the catalog order industry. Before payment cards became prevalent, catalog customers had to mail in an order form with a personal check and wait for the check to clear before the merchant would ship the goods, making catalog purchases slow and inconvenient. Today, catalog customers can phone in an order with a payment card number, receive instant approval,

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<sup>13</sup> See WEATHERFORD, *supra* note 2, at 227 - 28.

<sup>14</sup> See DAVID S. EVANS & RICHARD L. SCHMALENSSEE, *THE ECONOMICS OF THE PAYMENT CARD INDUSTRY* 3 (1993).

<sup>15</sup> See CBO Report, *supra* note 6, at 18.

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and receive shipment by the next day. Moviegoers can now even order movie tickets over the phone with their payment card and bypass the long-lines that are typical at a movie theater on a Friday or Saturday evening.

Payment cards have flourished as a form of payment because they provide both the trust relationships and efficiency that new forms of money must possess. The contractual relationships established between the cardholder, the banks, and the merchants establish the trust that is needed for commercial transactions. Payment cards also enhance the efficiency of the market by promoting transactions that probably would not be completed using other forms of money such as cash or checks. In return, payment card issuers charge merchants and consumers a fee for providing these valuable services.

#### **2.4.2 The Future of Payment Cards**

Payment card growth has historically been limited by several factors: first, the number of people to whom credit is extended; second, how much those with credit spend; and third, what goods and services can be paid for with payment cards. Obviously, credit card companies have been reluctant to extend credit to people who are poor credit risks because the companies lose money if cardholders default on their debt. On the other hand, credit card issuers earn approximately 75% of their revenues through interest charges on outstanding balances.<sup>16</sup> Card issuers also charge merchants a fee for every transaction completed with a credit card, known as an interchange fee. Thus, card issuers would like to expand the use of payment cards as much as possible.

During the 1990s, increasing competition in the credit card industry has prompted credit card issuers to grow at all costs or to risk being forced out of the business.<sup>17</sup> As a result, card issuers have attempted to expand payment card use through techniques such as creating secured credit cards (for those consumers with poor credit histories) and promotional efforts to increase

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<sup>16</sup> See EVANS & SCHMALENSSEE, *supra* note 14, at 55; *Down for the Count*, *supra* note 12, at 47.

<sup>17</sup> See GEORGE RITZER, *EXPRESSING AMERICA* 42, 50 (1994). One industry analyst states: "In this business only two things count . . . the cost of money and economies of scale. The more cards you have out there, the lower the unit cost of processing each card." *Id.* at 42.

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cardholder use (such as American Express's pledge to donate money to charities for each charge, or cards co-sponsored by airline companies which grant the cardholder frequent flyer miles for using the card).

In addition, card issuers are also working to expand the goods and services that can be purchased with payment cards. For example, many supermarkets now accept credit cards -- a practice that was unheard of only a decade ago.<sup>18</sup> Recently, card companies have even started to expand into industries that involve very small purchases but that conduct a large volume of business, such as the fast food industry. Fast food restaurants such as Arby's and Burger King have already started accepting credit cards, sometimes for purchases as small as a single soft drink.<sup>19</sup>

Given the push by card companies to expand into new areas, credit cards may compete with new forms of money that are currently the subject of much interest, such as smart cards and electronic money. The ultimate results of the interaction between these systems will depend on the specific market served and the relative security and efficiency that the different payment systems offer.

## **2.5 The On-line Market for Information Goods**

New forms of money have historically been spurred on by the needs of an emerging market. Will a developing commercial market on the Internet drive the development of new kinds of electronic money today? This section provides a summary of the argument contained in this thesis. First, an important area of potential growth in electronic commerce involves the transfer and sale of information goods and services. However, at least two obstacles impede the development of such a market. First, the payment mechanisms that are currently available for on-line purchases -- namely payment cards -- do not allow a market in low-cost information goods to develop. Second, concerns about the lack of intellectual property protection for digital

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<sup>18</sup> See *id.* at 48 - 49. Between April 1991 and August 1992 alone, the number of supermarkets accepting credit cards increased by 600%.

<sup>19</sup> See *id.*

goods has also slowed the growth of this market. New digital payment systems, however, can dramatically lower transaction costs by making it possible to conduct transactions completely over public networks. In addition, such new payment systems might also provide the incentives needed to induce content providers to create new content without expanding the scope of intellectual property rights in a way that restricts broad dissemination of information to the public.

### **2.5.1 The Internet as a Medium for Commerce**

The rapid growth of the World Wide Web since 1993 has given businesses the desire and the ability to conduct certain aspects of their existing business over the Internet. For example, the Web is an attractive medium for advertisers because of its multimedia capability, and it also offers businesses a visually attractive 24-hour per day, year-round presence to reach customers globally. As a result, many retailers have set up “digital storefronts” to display their goods or to provide information that is targeted at their customer base. These digital stores often augment existing sales methods by both luring potential customers into the retailer’s physical stores or by generating more business for catalog sales.<sup>20</sup>

More and more businesses are also using the Web directly as a sales tool. For example, one can now buy goods such as books, wine, or flowers over the Internet. Typically, these sales involve the use of a credit card. First, the buyer either sends her credit card number or some pre-registered identification number that establishes her credit card information to the vendor on-line. Once the merchant receives this information, he initiates a credit card charge and ships the goods just as if the customer had placed a catalog order using the telephone.

Although businesses can use the Internet to increase conventional catalog-like sales of tangible goods, the Internet’s most powerful commercial use in the future is likely to be as a fast

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<sup>20</sup> See generally Bruce H. Clark, *Welcome to My Parlor*, *MARKETING MGMT.*, Winter 1997, at 10 (describing various business models used by companies on the Web).



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and inexpensive way to move *information goods*.<sup>21</sup> Sellers of physical can increase the visibility of their products or target a certain customer base through the Internet, but physical goods must ultimately be sold in person or delivered through the mail, both of which add significant handling and transportation costs. Internet commerce involving physical goods thus cannot reduce costs in such a way as to alter the fundamental character of the catalog order. In contrast, *information goods* -- including items such as computer software, news, medical records, pornography or any other type of information traditionally delivered in hardcopy -- can be transferred entirely over a digital network. Internet commerce involving information goods supports every phase of the commercial transaction, from advertising and marketing of the goods all the way through the sale, payment, and delivery to the consumer. Digital technologies thus create the potential to dramatically reduce costs and reshape the information market, including such elements as who provides the goods, what kinds of goods can be sold, and how the goods are sold and delivered.

Two main obstacles, however, have slowed the emergence of a robust on-line information goods market. First, there is no payment scheme that allows information producers to sell information in very small quantities, and second, there is no easy way to protect intellectual property rights on the network.<sup>22</sup>

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<sup>21</sup> See, e.g., Denise Caruso, *Maybe It's Time to See the Internet as a What's-In-It-For-Me Pipeline*, N.Y. TIMES, Oct. 21, 1996, at D5; Jeff Ubois, *Real Transactions, Ephemeral Goods*, DIGITAL MEDIA, Nov. 29, 1996, at 3.

<sup>22</sup> Some observers of the Internet are concerned that the growing commercialization of the Internet will destroy the desirable characteristics of the network. These critics fear that large media conglomerates may become the main information suppliers and that the network will become a medium for mass distribution of information rather than for supporting a diverse array of independent content providers. They argue that the Internet should be preserved as a forum for peer to peer *interaction* and point-to-point *communication*, rather than a medium for point to multipoint *dissemination* and *distribution*, and that policies regarding the Internet should realize and promote its democratic potential.

These critiques are largely beyond the scope of this thesis. However, I note that the ultimate character of the on-line market -- including what types of information goods may be sold on the network, and who the information providers will be -- may be determined by which types of micropayment protocols, if any, become viable. See *infra* Section 3.4.

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### 2.5.2 The Need for New Payment Schemes

The payment schemes that are currently available for on-line purchases only allow relatively valuable information goods to be bought and sold over the network. Although the cost of *distributing* digital information goods over the network is very low, there is no similar low cost way to *pay* for the goods. In particular, two individuals on a public network who do not know and have no reason to trust each other must currently rely on payment cards to carry out a transaction. Payment card transactions guarantee the merchant that he will be paid for his goods, and assure the buyer that she has a record of the transaction and that she can stop payment (according to the terms of the credit card agreement) if the merchant does not deliver satisfactory goods. By applying digital technologies that authenticate the payment card bearer and the merchant to each other and that protect sensitive payment card information from being intercepted as it is sent over the network, the current payment card system can be adapted to provide secure on-line payment card transactions.<sup>23</sup> The major credit card associations have in fact been working to develop just such technological protocols.

However, the high fees historically charged by card issuers make payment card transactions impractical for small transactions involving low-value information goods. For example, banks charge merchants a fee for credit card transactions based mainly on two factors: the total volume (“total volume”) of charges in a year and the average transaction size (“average ticket”).<sup>24</sup> Lower total volume and a lower average ticket mean a higher fee charged to the merchant. Thus, although there is no per se minimum ticket requirement, in practice the credit card fee structure precludes most small transactions, especially for low-volume sellers.

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<sup>23</sup> See CBO Report, *supra* note 6, at 26 - 28.

<sup>24</sup> Phone conversation with Sean Robinson, Merchant Services, USTrust, Aug. 8, 1997.

For example, banks typically charge merchants a fixed discount rate  $\phi$  of anywhere from 2 to 4 percent, depending on the merchant's total charge volume. However, as a merchant's average ticket decreases, banks charge a higher and higher  $\phi$ , and may also impose a per transaction fee  $\kappa$ . Banks charge a per transaction fee to merchants with a low average ticket because the credit card associations, in turn, charge the banks a fee on every transaction and thus the costs of settling many small transactions is higher than the cost of settling a few large transactions.<sup>25</sup> Banks will typically offer a merchant a set of  $[\kappa, \phi]$  pairs that are acceptable. Table 1 shows an estimate of the fees charged by a local Boston bank to a merchant with total charge volume of \$10,000 monthly and an average ticket of \$1.

**Table 1 : Credit Card Transaction Fees**

$\kappa$	$\phi$
--	29.6 %
15¢	11.0 %
20¢	8.8 %
35¢	5.5 %

Source: US Trust Merchant Services Department, Aug. 8, 1997

I therefore hypothesize that the market for low-value information goods is blocked by the lack of a payment technique that imposes low enough fees to handle such transactions.<sup>26</sup>

<sup>25</sup> *See id.*

<sup>26</sup> Payment by other methods, such as demand instruments like checks, is undesirable for a number of reasons: there may not be enough funds on deposit to cover payment, checks take a long time to clear before the seller actually receives payment, and the cost of processing the check makes it impractical for small transactions.

This thesis asks whether new payment schemes directed toward the market in low cost information goods are necessary or viable. Thus, this thesis focuses on *micropayments* -- small payments associated with low value commercial transactions, or *microtransactions* -- rather than on digital payment systems or digital money in general. Unfortunately, there is no clear definition of what constitutes a micropayment. Some people have defined microtransactions as any transaction under a specified dollar amount, but there seems to be substantial disagreement over whether a micropayment is a payment under \$10, under 10¢, or on the order of fractions of a penny.<sup>27</sup> This thesis uses the term “micropayment” to refer to *payment systems that process transactions over a public network, and that provide both the security and efficiency needed to facilitate on-line transactions of low cost information goods and services.*

### **2.5.3 The Need for Intellectual Property Protection**

Another barrier to the development of a robust on-line market for information goods is the difficulty of protecting intellectual property on the network. The very features of digital networks that make them ideal for distributing information -- fast and inexpensive communication that can reach everyone on the network -- also make them ideal tools for making and distributing unauthorized copies of information goods. Thus, once an information provider makes a work available on the network, its value may drop to zero unless the owner can restrict the ability of others to make further copies or distributions. These concerns make owners of information goods reluctant to make valuable information available on the network, and have also prompted calls for clearer and increased copyright protection on the Internet. Chapters 5 and 6 address intellectual property rights and enforcement on the network in more detail, and include the suggestion that micropayments can help reduce these concerns about intellectual property rights on the network.

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<sup>27</sup> See, e.g., Tom Steinert-Threlkeld, *The Buck Starts Here*, WIRED, Aug. 1996, at 132, 133 - 35; Jupiter Communications, INTERNET PAYMENTS REPORT (1997) [hereinafter INTERNET PAYMENTS REPORT].

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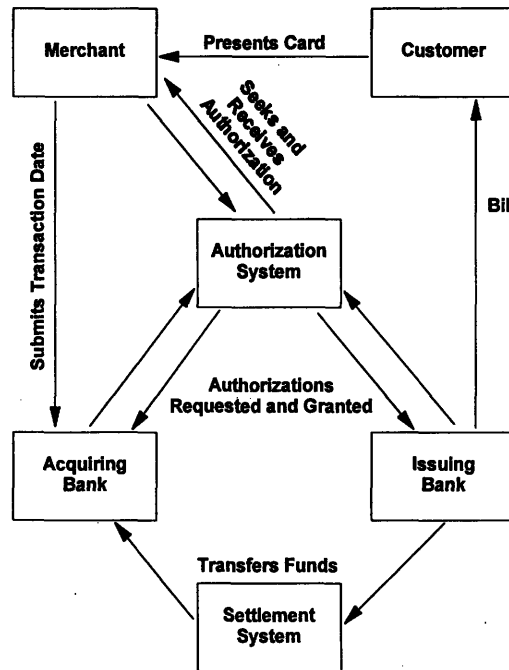
- 3 -

## ANALYSIS OF MICROPAYMENT PROTOCOLS

Chapter 2 surveyed the historical evolution of money, and suggested that new micropayment systems may be needed to facilitate the development of an on-line market for information goods. It also suggested that any new micropayment system would have to satisfy both consumers' and information sellers' needs for trust, security, and efficiency. This chapter first takes a more in-depth look at how payment cards establish trust, allocate risk, and increase efficiency. The relationships established in the payment card context are then used as a basis for examining how several different micropayment protocols currently under development or being tested provide trust and security, and how this affects their efficiency. I find that the various micropayment protocols can be classified into two categories, one set that seeks to guarantee the integrity of individual transactions, and another set that focuses solely on efficiency. These two different approaches to micropayments seem to be designed for different classes of potential information goods in the evolving on-line marketplace, and the success of each will depend on the ultimate character of the on-line information goods market.

### **3.1 Trust and Security in Credit and Charge Card Payments**

Figure 1 shows the steps involved in a credit card payment. There are four major parties to a credit card transaction: the cardholder (CH), the merchant (M), the issuing bank that issued the credit card (IB), and the merchant's bank (MB). In addition, IB and MB are linked through a credit card association (CCA) such as Visa International or MasterCard, which also acts to authorize the individual transactions. The credit card association can be considered a fifth party in this web of relationships.



SOURCE: Congressional Budget Office.

**Figure 1 : Credit Card Payment System**

CH initiates a credit card transaction when he presents a card to M for payment. The merchant forwards the credit card number and the amount of the charge to CCA for authorization. If the credit card number is valid and the amount of the purchase is within CH's credit line, CCA authorizes the transaction and returns an authorization code to M. M delivers the goods or performs services for CH, and then presents the charge record, including the authorization code, to MB for payment. MB credits M's account, minus a fee known as the *merchant discount*, and presents the charge record to IB for payment. IB in turn pays MB the amount on the charge record, minus an *interchange fee* that IB keeps, and sends a bill including the charge record to CH for payment.

The trust that is needed to make this seemingly complicated transaction work is established by a chain of contractual relations between the parties. A contract between M and MB obligates M to accept the credit card as payment for goods or services, and obligates MB to credit M's account when M presents a valid charge record. This assurance allows M to go forward and deliver goods or services to CH, whom he otherwise has no reason to trust. The obligation of IB to pay MB, including the terms of the interchange fee, is governed by the by-

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laws of the credit card association. Finally, a contract between CH and IB governs the usage terms of the credit card, including CH's duty to pay when IB presents a bill with a valid charge record.<sup>28</sup>

A combination of contractual relations among the various entities and state and federal regulations provide cardholders with a level of security in credit card transactions. Federal law gives CH 60 days from the date a bill is mailed to notify IB that CH wishes to contest a charge on the bill.<sup>29</sup> Under the terms of the credit card agreements, if the charge is unsubstantiated IB "charges back" the disputed amount from MB and relieves CH from the duty to pay the disputed amount. MB in turn charges back this amount against M's account. In these charge-back situations, M generally bears the burden of proving that CH initiated a valid credit card transaction. M typically protects itself from credit card fraud by making sure that a customer's signature matches the signature on the card or by requesting some form of identification; absent such proof, however, M usually bears the risk of non-payment by CH.<sup>30</sup>

Private charge cards, such as American Express cards, work in a slightly different way than credit cards. In particular, a single entity – such as the American Express Corporation -- enters into contracts with both merchants and cardholders, and also performs the authorizing functions itself. Thus, there are only three parties in the transaction. However, trust and security are provided through a similar – though simplified – set of contractual relationships between the merchant, cardholder, and card issuing entity.

### **3.2 SET and Secure On-line Payment Card Transactions**

In February 1996, Visa and MasterCard announced that they would jointly support a single standard, dubbed the Secure Electronic Transactions (SET) protocol, to provide secure credit card transactions over the Internet. Visa and MasterCard first announced their plans to

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<sup>28</sup> See Henry H. Perritt, Jr., *Legal and Technological Infrastructures for Electronic Payment Systems*, 22 RUTGERS COMPUTER & TECH. L.J. 1, 20 – 28 (1996).

<sup>29</sup> See 15 U.S.C. § 1666(a) (1994).

<sup>30</sup> See Perritt, *supra* note 28, at 28 – 29 & n.136.

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cooperate on a standard in June, 1995, but they then each introduced competing specifications in the fall of the same year. The February 1996 announcement reaffirmed that there would likely be a single standard for on-line credit card payments, which was further corroborated when American Express joined the alliance within the same month.

The goal of SET is to provide a secure way to conduct existing credit card transactions over an insecure public network like the Internet. In other words, the SET protocol itself takes place on the Internet, but is designed to operate *on top of* the existing credit card infrastructure. Figure 2 shows a high-level schematic of the relation between SET and the existing credit card network.

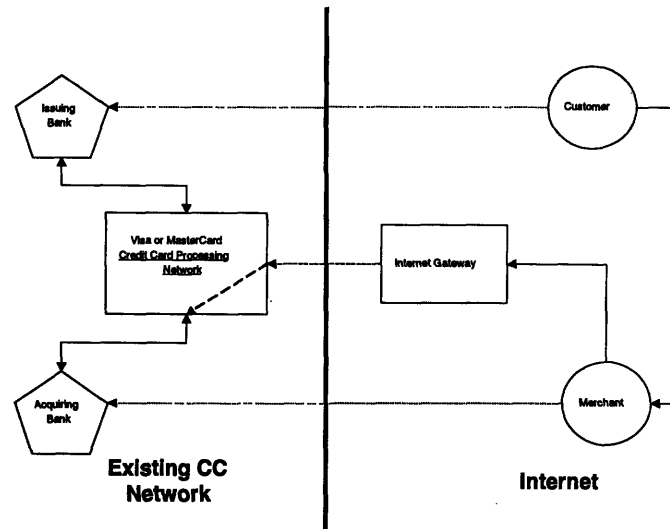
There are several risks created by on-line credit card payments, compared to existing face-to-face or telephone order payment card transactions. For example, the anonymous nature of the network increases the risk that a consumer presenting a payment card is actually not the valid cardholder or that someone who claims to be a merchant may not actually be authorized to process payment card transactions. In addition, questionable merchants may misuse a consumer's credit card number, or a third party may be able to steal a list of valid payment card numbers from a merchant's computer. The public nature of the network also heightens the risk that information transmitted over the network can be intercepted or altered. SET therefore uses digital signatures and a certificate system to authenticate merchants and cardholders, and message encryption to ensure confidentiality and integrity of information transmitted over the network. Each of these functions utilizes asymmetric (or "public key") cryptography.<sup>31</sup> In addition, the payment gateway also has a public-private key pair so that consumers always send sensitive credit card information encrypted in such a way that merchants never have access to the underlying account number. As a result, merchants cannot reuse consumers' payment card numbers, and no payment card information is stored on merchants' computers where they can be stolen by third parties.<sup>32</sup>

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<sup>31</sup> For a brief description of public key cryptography, certificate systems, and digital signatures, see A. Michael Froomkin, *The Metaphor Is the Key: Cryptography, the Clipper Chip, and the Constitution*, 143 U. PA. L. REV. 709, 890 – 97 (1995).

<sup>32</sup> See SET Secure Electronic Transaction Specification Book 1: Business Description (version 1.0, May 31, 1997), available at <<http://www.visa.com>>.





Source: Reagle & Leida (1995)

**Figure 2 : Relation of SET to Payment Card Processing System**

SET can be broken down into several discrete steps. CH initiates a credit card transaction by asking to see M's credentials (i). M digitally signs a response and appends his merchant certificate, which is signed by a reputable MB, CCA, or some other reputable certificate authority (ii). Once CH verifies M's certificate and verifies M's signature on the response, CH digitally signs an order form and sends it, along with his own certificate, to M (iii). As part of the message forwarded to M, CH includes his payment card account information encrypted in such a way so that only the payment gateway can decrypt it. M then verifies CH's certificate, and forwards the payment information to the Internet payment gateway for processing (iv). The Internet payment gateway decrypts the payment information, and sends CH's account number through to the existing payment processing network, and returns a purchase response to

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M (v). Finally, M sends the purchase response back to CH (vi) and delivers the purchased goods.<sup>33</sup>

### **3.3 Efficiency of Micropayment Protocols**

There are at least three ways that micropayments might offer lower costs than on-line payment card transactions: first, by using a public network like the Internet to conduct transactions, rather than relying on a dedicated private financial network; second, by aggregating many small transactions before invoking a more costly payment card transaction; and third, by reducing its reliance on computationally expensive cryptography for security.

#### **3.3.1 Public Network**

On-line payment card transactions, such as those following the SET protocol, rely on the existing payment card processing networks and therefore incur all the costs of conventional payment card transactions. Thus, although SET relies on a public network like the Internet for communications between consumers and merchants, and between merchants and the payment gateway, the SET protocol ultimately invokes the existing credit card or charge card processing infrastructure to complete each transaction. As a result, any costs incurred by the SET protocol itself are added to the costs of using a dedicated, private financial network to settle accounts between the various banks that are part of the credit card network.

Micropayment protocols, on the other hand, rely on a public network for each stage of payment processing. An open, interoperable network like the Internet provides substantial economies of scale, and therefore micropayments can be more efficient than on-line payment card processing because they lower fixed networking costs.

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<sup>33</sup> See *id.* at 55 – 62.

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### 3.3.2 Aggregation

Micropayments also allow the high cost of processing payment card transactions to be distributed over a large number of smaller micropurchases. Many micropayment systems require consumers to first establish an account with the micropayment operator. Often the consumer will open the account by transferring money through a payment card transaction, and will also periodically have to replenish the account through another payment card transaction or some other conventional transaction (such as an ATM transfer). However, micropayment protocols do not incur the costly fees associated with payment card transactions on each micropurchase; instead, micropayments allow consumers to *aggregate* numerous small value transactions before invoking a payment card transaction.

### 3.3.3 Costs of Cryptography

Some micropayment protocols further reduce costs by using less sophisticated cryptography for security than that employed in on-line payment card transactions. In an on-line payment card transaction, the consumer's sensitive payment card information (e.g. a credit card number) must be carefully protected. This is crucial because stolen or misused credit card numbers can be used in a wide variety of transactions and pose a very high risk of loss.

Researchers have developed a family of protocols, known as *iKP*, for securing payment card transactions on the Internet.<sup>34</sup> The individual members of this protocol family differ in the number of parties to the payment card transaction who hold public-private key pairs. In the simplest form, *IKP*, only the payment server has a public-private key pair. A consumer encrypts her payment card number using the server's public key and passes this encrypted information along with purchasing information to the merchant, who then forwards this set of information to the payment server. In the *3KP* protocol, the consumer, merchant, and payment server each hold public-private key pairs. Increasing the use of public key cryptography increases the security of the protocol because each of the parties can verify the identity of, and send information securely

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<sup>34</sup> See Joseph Reagle Jr. & Brett Leida, *Electronic Commerce Protocols and Competitive Strategies: Credit Card Transactions over the Internet* 10 – 12 (1995), available at <<http://web.mit.edu/reagle/www/home.html>>.

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to, each other party. Thus, as research progressed *3KP* protocols emerged as the version of *iKP* favored for Internet payment card transactions. SET, for example, is a *3KP* protocol.

Although public key cryptography is extremely secure and can be made effectively unbreakable, it is also rather computationally expensive. There are other forms of cryptography that might be used to secure a message. For example, a one-way *hash function* operates on a message to create a hash value. One cannot work backwards from the hash value to derive the original message, even if one knows the hash function. In addition, very few messages hash to the same hash value. Therefore, the hash value of a message can be used as a signature to verify that the message is authentic. Lightweight cryptography using hash functions is roughly 100 times faster than verifying a digital signature based on public key cryptography, and 10,000 times faster than creating a digital signature. A typical computer workstation<sup>35</sup> can digitally sign 2 messages per second, verify 200 digital signatures per second, and perform 20,000 hash functions per second.<sup>36</sup>

### 3.4 Micropayment Protocols Compared

As we have seen, on-line payment card processing protocols like SET rely on public key cryptography to safeguard conventional payment card transactions over the Internet. These protocols focus first and foremost on security. Efficiency is not as important a concern as security because the costs imposed by SET will be added to existing payment card processing costs, which dwarf the additional cost added by SET's public key operations.

In contrast, one category of micropayment protocols uses a public network for all communications related to a transaction, and uses public key cryptography to provide security and trust. By relying significantly on public key cryptography, these protocols strike the balance between the need for security and the need for low transaction costs in favor of greater security. I therefore refer to these protocols as *security-oriented* micropayment protocols.

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<sup>35</sup> These figures are for a typical workstation available in 1996.

<sup>36</sup> See Ronald L. Rivest & Adi Shamir, *Payword and MicroMint: Two simple micropayment schemes 1* (1996), available at <<http://theory.lcs.mit.edu/~rivest>>.

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Another category of micropayment protocols strikes the balance between security and cost differently by relying on a minimal degree of public key cryptography. These protocols assume that efficiency -- measured by minimizing computation and communication costs -- is the most important feature of a micropayment system. These protocols satisfy the need for security by using hash algorithms, and by assuming that no one will break the protocol because the cost of breaking the protocol in any one transaction will exceed the economic value of that transaction. I refer to these protocols as *efficiency-oriented* micropayment protocols.

### 3.4.1 Security-Oriented Micropayment Protocols

Several micropayment protocols create trust and security for on-line merchants and consumers through the same types of relationships and technologies used for on-line payment card transactions. Although these security-oriented micropayment systems lower costs by sending all messages over the public network and through aggregation, these micropayment systems -- like credit card processing protocols -- use a significant amount of public key cryptography to ensure that each and every microtransaction is secure and is completed properly.

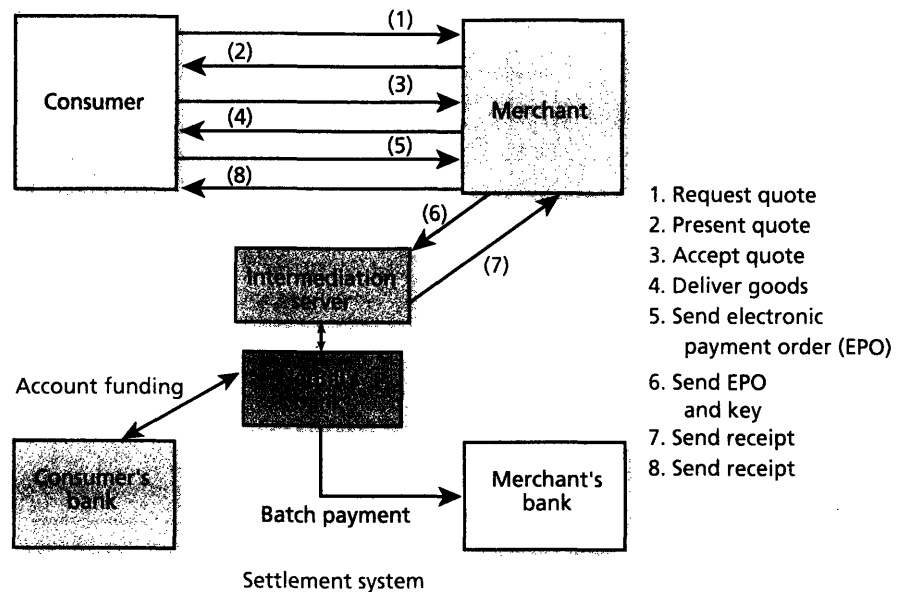
#### 3.4.1.1 NetBill

Consider first the NetBill micropayment system developed by researchers at Carnegie Mellon University. Figure 3 shows the various steps in a NetBill micropayment transaction.<sup>37</sup>

To initiate a transaction, a consumer requests a price quote from the merchant and the merchant authenticates the consumer based on the consumer's public-key certificate (1). Next, the merchant quotes a price to the consumer, and the consumer authenticates the merchant based on the merchant's public-key certificate (2). These steps are analogous to how the cardholder (CH) and merchant (M) verify each other's identity in the payment card example above in Section 3.2.

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<sup>37</sup> See Marvin A. Sirbu & J.D. Tygar, *The NetBill Overview*, available at <<http://www.ini.cmu.edu/netbill/pubs>>.



Source: Sirbu, IEEE Spectrum (1997)

**Figure 3 : NetBill Transaction Protocol**

Assuming that the consumer accepts the quoted price (3), the merchant delivers the digital goods in an encrypted form to consumer (4). At this stage, however, the digital goods cannot be read by the consumer because he does not have the key needed to decrypt the files.

In the next step (5), the consumer forwards a payment order to the merchant. The merchant appends the decryption key needed to read the goods to the payment order, signs the payment order, and forwards it to the NetBill server (6). The NetBill server then verifies that the consumer has sufficient funds in his account to purchase the goods, debits the consumer's account and credits the merchant's account, and sends a receipt that includes the decryption key back to the merchant (7). The merchant then forwards this receipt to the consumer (8), who is now able to use the decryption key to decrypt the goods he purchased.

Steps (5) through (8) in the NetBill protocol are very similar to how payment information is processed under SET. In step (5) the consumer sends some information in the clear to the merchant, and other information (such as the consumer's NetBill account number) encrypted so

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that it is only readable by the NetBill server.<sup>38</sup> This procedure is exactly analogous to the way in which CH sends payment information to M in step (iii) of the SET protocol. Steps (6) and (7) under NetBill's protocol are just like steps (iv) and (v) under SET, in which the NetBill server or the Internet payment gateway verify the purchase information, process the transaction, and send a record of the transaction back to the merchant.

There are, of course, some differences between the two payment protocols. For example, in a NetBill transaction the merchant delivers encrypted information goods to the consumer in the middle of the transaction (4), and then forwards the key needed to decrypt these goods in the final step (8). Under SET and the underlying credit card infrastructure, delivery of the goods takes place in one step, after the payment has been completed. Thus, NetBill actually requires more steps than does SET. Under NetBill, consumers can receive goods if, and only if, they have paid for them, even if a network failure interrupts a payment transaction. For example, if a failure occurs before step (7) (in which the NetBill server actually debits the consumer's account), then the consumer has not paid for the goods and also does not hold the decryption key she needs to decrypt the information goods. On the other hand, if the network failure occurs after the NetBill server has debited the consumer's account but before the merchant has forwarded the decryption key to the consumer, the consumer can contact the NetBill server directly – which maintains a record of the transaction – to receive the decryption key. Thus, the consumer has paid for the goods and is also able to decrypt the goods, despite the network failure. Under SET and other micropayment protocols, in contrast, an inopportune network failure might lead to a situation in which a consumer pays for a good but never receives it.

Because NetBill follows a message sequence very similar to that of SET and requires roughly the same number of public key operations, NetBill's efficiency over a payment card transaction comes from its ability to aggregate numerous small transactions into one credit card payment. In addition, unlike a pure aggregation system, where a merchant must wait for *each* consumer's balance to reach some limit before charging the purchases to a payment card, a merchant is able to access revenue from his sales sooner using NetBill because he can transfer

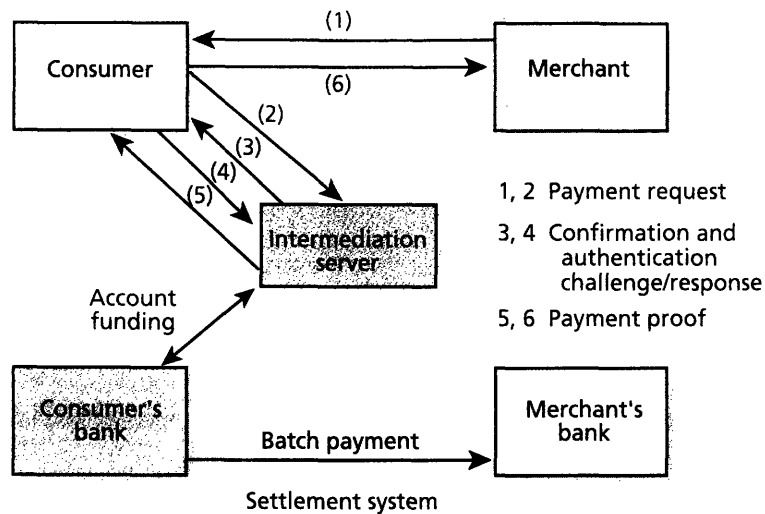
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<sup>38</sup> See Benjamin Cox, J.D. Tygar & Marvin Sirbu, *NetBill Security and Transaction Protocol*, available at <<http://www.ini.cmu.edu/netbill/pubs.html>>.

funds from his NetBill account as soon as the aggregate purchases from *all* of his customers reaches some minimum threshold.

### 3.4.1.2 GC Tech GlobeID

Another leading micropayment system, developed by GC Tech SA in France and marketed under the name GlobeID, requires fewer cryptographic operations than the NetBill protocol but still resembles SET's messaging system. Figure 4 shows the various steps in a transaction under GC Tech's micropayment protocol.



Source: Sirbu, IEEE Spectrum (1997)

**Figure 4 : GC Tech Transaction Protocol**

The GC Tech protocol begins when a merchant, in response to a consumer's request to purchase a good, sends a digitally signed payment request to the consumer (1). The consumer makes sure the terms of the transaction are correct and passes the payment request to the GC Tech server



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(2).<sup>39</sup> The GC Tech server then tries to authenticate the consumer by posing an authentication challenge (3) to the consumer, who must answer with the proper authentication response (4). If the answer is correct, the GC Tech server debits the consumer's account and credits the merchant's account, and then signs a receipt which it returns to the consumer (5). The consumer forwards this receipt on to the merchant (6), who is now assured of payment and can deliver the goods to the consumer.

Unlike the NetBill protocol, in which the merchant communicates with the NetBill server, under the GC Tech protocol the consumer communicates with the GC Tech server. By combining this feature with the authentication challenge (3) and response (4) steps, the GC Tech protocol reduces the number of public-private key pairs that are needed. Under the GC Tech system, the merchant and the server use public-private key pairs, but the consumer only needs to have a PIN number to identify herself. Like NetBill, the GC Tech system allows merchants to transfer funds accumulated from many purchases in a single batch transaction, and thus both decreases the merchant's costs and makes funds more readily available.

### 3.4.2 Efficiency-Oriented Micropayment Protocols

Efficiency-oriented micropayment protocols seek to reduce processing costs even below the costs of security-oriented micropayment protocols. This drive to lower costs reflects the fact that the processing costs determine the minimum transaction size that micropayment protocols can support, which – in turn -- determine the character of the on-line information market.<sup>40</sup> Security-oriented protocols currently must charge a fee of at least 1¢ per transaction, imposing a minimum transaction size of roughly 5¢. If the minimum transaction size could be reduced to a

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<sup>39</sup> Under both SET and NetBill protocols the merchant, rather than the consumer, communicates with the Internet payment gateway or NetBill server, respectively.

<sup>40</sup> See, e.g., Mark S. Manasse, *The Millicent Protocols for Electronic Commerce*, available at <<http://www.millicent.digital.com/html/papers>>.

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fraction of a penny instead of 5¢, the ways in which information is used, the types of information goods that are offered, and the manner in which they are priced might be very different.<sup>41</sup>

Efficiency-oriented micropayment systems lower processing costs by using a minimal degree of expensive encryption, decreasing the amount of communication needed to process payments, and decentralizing processing requirements so that there is no central bottleneck. The tradeoff for this higher efficiency is that efficiency-oriented micropayment protocols are less secure. However, efficiency-oriented protocols will presumably be used for inexpensive transactions and therefore it will not be worthwhile for anyone to attack the protocol.

### 3.4.2.1 *Millicent*

The most well known efficiency-oriented protocol is probably Millicent, developed by researchers at DEC. The Millicent protocol is based on a kind of currency known as *scrip* and on the use of *brokers*.

*Scrip* is digital cash that is valid for only one specific merchant; thus, each merchant issues his own scrip, and a consumer who wants to transact with a specific merchant must use that merchant's scrip. Because the merchant is the only party that needs to be able to prove that scrip is valid, scrip can be generated and validated by using hash functions and a shared secret between the merchant and the consumer.<sup>42</sup>

Because there are likely to be a large number of merchants, however, it would be highly inefficient if every consumer had to contact each merchant with whom she desired to transact.

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<sup>41</sup> *See id.* It is also interesting to note that this minimum transaction size is likely to decrease over time, as computing performance increases and prices drop accordingly. *See id.* Therefore, even if a smaller minimum transaction size is ultimately desirable, the need for efficiency-oriented micropayments may depend on the character and speed of growth in the on-line information market.

<sup>42</sup> Basically, the consumer appends the secret to the scrip and computes a hash value; she then sends the scrip and the hash value to the merchant. The merchant also appends his secret to the scrip and computes a hash value. If the hash signatures match, then the merchant can be confident that the customer owns the scrip because she must have had the secret in order to have generated the correct hash value. For more details on the Millicent protocol, see Steve Glassman, et. al., *The Millicent Protocol for Inexpensive Electronic Commerce*, available at <<http://www.millicent.digital.com/html/papers>>.

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*Brokers* address this problem by acting as intermediaries between merchants and consumers. Brokers hold scrip from a number of merchants, and consumers go to a broker to obtain scrip from a specific merchant. It is anticipated that consumers will buy scrip from brokers by using more costly security-oriented micropayments.

A Millicent transaction is less costly to process than a transaction from a security-oriented micropayment protocol because Millicent relies mostly on hash functions instead of public key cryptography. In addition, because scrip validation is performed at the individual merchant level and there can be many brokers, there is no central processing bottleneck to validate or obtain scrip.

#### **3.4.2.2 PayWord**

PayWord<sup>43</sup> is an efficiency-oriented micropayment protocol that also relies heavily on hash functions and in which payment processing computations are mainly the responsibility of merchants and consumers. However, it tries to improve on Millicent by reducing the need for on-line communications that involve brokers. Because consumers browsing on the Web will constantly encounter new merchants, brokers may become a bottleneck if consumers must contact brokers in real-time whenever they need new merchant scrip. Therefore, under PayWord, brokers issue certificates to consumers that authorize consumers to create their own coins using hash functions, and that assure merchants that they (the brokers) will redeem the coins. The certificates are issued to consumers off-line, and merchants only need to contact brokers when they want to redeem coins.

#### **3.4.2.3 MicroMint**

MicroMint is a protocol that provides even higher computational efficiency and reasonable security. MicroMint uses no public key cryptography at all, but rather relies on economies of scale associated with “minting” digital coins that are represented by *hash function collisions*. A hash function collision occurs when two strings  $x_1$  and  $x_2$  produce the same hash value. Hash collisions occur rarely, but generating hash collisions exhibits economies of scale

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<sup>43</sup> See Rivest & Shamir, *supra* note 36.

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because collisions become more frequent as the set of hash values being used to generate collisions expands. In MicroMint, coins are represented by a set of strings  $x_1, \dots, x_i$  that have the same hash value. MicroMint brokers generate a very large number of hash values (and hash collisions) in advance of releasing a batch of coins, and it is uneconomical for would-be counterfeiters to duplicate the brokers' efforts.<sup>44</sup>

Each time a consumer purchases a good, she gives the merchant the right number of previously unspent coins. The merchant can easily verify whether the coins are valid by seeing if the strings do indeed generate a hash collision. In its simplest form, however, MicroMint does not allow merchants to tell whether these coins have been spent until the merchant returns the coins to MicroMint for redemption. It may be the case that merchants will not be paid by MicroMint for previously spent coins. However, MicroMint assumes that consumers will not reuse coins because they do not have a large amount to gain from this kind of fraud, and that large-scale cheating can be detected.<sup>45</sup> Thus, MicroMint is tailored to information merchants who seek to sell very low-cost information goods; it is designed to be efficient enough so that merchants can sell individual Web pages, and it may not be secure enough to be used with more valuable goods.

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<sup>44</sup> For a detailed description of MicroMint, see *id.*

<sup>45</sup> See *id.* at 12.

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- 4 -

## ASSESSING THE NEED FOR MICROPAYMENTS

Chapter 2 suggested that a new payment system is necessary in order for the Internet to flourish as an on-line market for low-cost information goods. This chapter explores that argument in more detail. First, this chapter surveys some estimates of the growth of commerce on the Internet and, based on these figures, estimates the amount of total revenue that operators of micropayments might expect to earn by charging a fee for their services. Next, bearing in mind both the similarities between many micropayment protocols and the credit card or charge card relationships noted in Chapter 2 and the ongoing expansion of credit cards into new industries, this chapter considers whether the credit card industry could lower its costs to enter the market for micropayments. I argue that, even if the cost of processing credit card transactions could be lowered to compete with micropayments, card issuers will not be interested in this market because of the relatively insubstantial profits to be made as compared to current credit card operations. Next, this chapter explores revenue models and pricing strategies other than micropayments that are available to information providers, such as advertising, subscriptions, and aggregating small transactions, and considers whether these approaches are superior to micropayments. I conclude that, for at least some information providers and certain types of goods, micropayments are the only viable pricing strategy, but that there are nevertheless serious questions as to whether there is a viable market for micropayments.

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## 4.1 The Internet Market In General

Many market research firms assert that there will be an explosion in the volume of commerce conducted over the Internet by the year 2000.<sup>46</sup> For example, one research company estimates that between 1995 and 2000 the overall value of sales on the Internet will grow from approximately \$1 billion to over \$117 billion.<sup>47</sup> However, this figure includes both business and consumer markets, which are expected to grow at very different rates. In particular, although consumer purchases occupy the lion's share of the current market,<sup>48</sup> this phenomenon is likely to reverse quickly. In general, more commerce takes place among businesses than between businesses and consumers, and thus on-line business-to-business commerce is likely to dwarf consumer purchases by the year 2000.<sup>49</sup> These business-to-business transactions will increasingly move existing customer and supplier interactions on-line for better service and efficiency, but do not implicate new payment forms such as micropayments.

Consumer-based Internet sales will not grow as quickly as corporate sales, but they too are expected to increase significantly by 2000. Several Internet market research firms have offer similar growth estimates for the consumer Internet market, predicting that this market will reach \$7 billion in annual revenues by 2000 compared with roughly \$500 million in 1996.<sup>50</sup>

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<sup>46</sup> See, e.g., Jennifer Kingson Bloom, *Net Commerce, Chip Cards To Gain Fast, Study Predicts*, AM. BANKER, Jan. 29, 1997; David Stipp, *The Birth of Digital Commerce*, FORTUNE, Dec. 9, 1996, at 159.

<sup>47</sup> See Stipp, *supra* note 46, at 159.

<sup>48</sup> The Yankee Group estimates the consumer and corporate Internet commerce markets at \$730 million and \$120 million in 1996, respectively. See *Open Market in Business Commerce*, MULTIMEDIA DAILY, Dec. 9, 1996.

<sup>49</sup> See *id.* (citing The Yankee Group's estimate that corporate market will reach \$134 billion and the consumer market \$10 billion in 2000); cf. Stipp, *supra* note 47, at 159 (estimating that the consumer market will reach \$6.6 billion in 2000 but that the overall consumer and business market will reach \$117 billion in 2000).

<sup>50</sup> For example, Forrester Research predicts that this market will grow from \$518 million in 1996 to \$6.6 billion by 2000, while Jupiter Communications predicts a \$7.3 billion market in 2000. See Jennifer Kingson Bloom, *Net Commerce, Chip Cards To Gain Fast, Study Predicts*, Am. Banker, Jan. 29, 1997 (Jupiter Communications); Stipp, *supra* note 49 (Forrester). The Yankee Group, another market research organization, places the current consumer market at \$730 million and expects this figure to grow to \$10 billion by 2000. See *Open Market in Business Commerce*, *supra* note 48. By comparison, the 1996 retail catalog-sales market was approximately \$75 billion.

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Unfortunately, such broad estimates of the consumer Internet market do not yield an accurate estimate of the size of the market for *information* goods -- much less for microtransactions -- because they include sales of both information goods and physical goods.

## 4.2 The Market for Microtransactions

A few studies attempt to predict the growth of the market for low value information goods. A report by one Internet market research firm estimates that the number of U.S. households connected to the Internet will grow from just under ten million in 1995 to 35 million by 2000 and 50 million by 2002.<sup>51</sup> These households will also make more and more purchases over the Internet: while the average on-line household makes nine purchases per year currently, this number is expected to increase to 32 in 1998 and 120 per year by 2000, spurred largely by the availability of low cost information goods on the Web.<sup>52</sup> In addition, although over 90% of current consumer Internet transactions are made with credit cards, this figure could fall to one-third by 2000.<sup>53</sup>

The report maintains that, although credit cards will remain the payment of choice for transactions larger than \$10, new payment schemes such as micropayments will dominate the emerging sub-\$10 market. This sub-\$10 on-line market is expected to grow from \$2 million in 1995 and \$12 million in 1996 to \$1.7 billion by the year 2000.<sup>54</sup> The report further predicts that in the year 2000 these revenues are expected to be divided among some 1.7 billion transactions, averaging out to roughly \$1 per transaction.<sup>55</sup>

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<sup>51</sup> See David Bank, *What Clicks?*, WALL ST. J., Mar. 20, 1997, at R1, R4.

<sup>52</sup> See Bloom, *supra* note 50.

<sup>53</sup> See *On-line Commerce To Rely Heavily On E-Cash, Smart Cards*, NEWSBYTES, Jan. 17, 1997 (describing Jupiter Communications' Internet Payments Report).

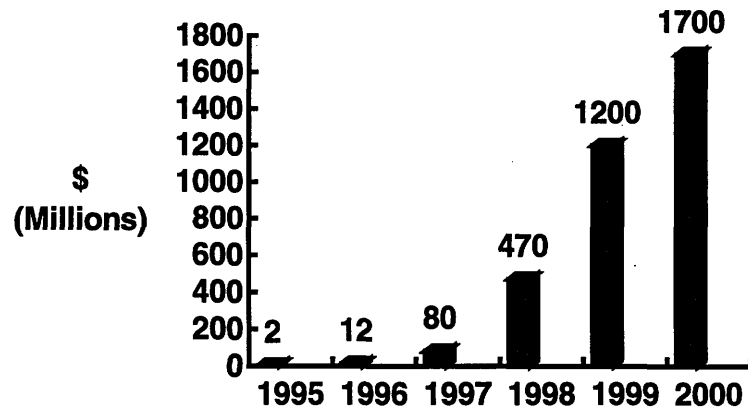
<sup>54</sup> See INTERNET PAYMENTS REPORT, *supra* note 27, at 17 - 18 (1997).

<sup>55</sup> See *id.* at 13 - 14.

### 4.3 Potential Fee Revenues For Micropayment Providers

The market predictions offered above are probably rather speculative, and should not be trusted to any great degree. Nevertheless, they do provide a starting point from which to try and understand whether operating micropayment systems is a profitable enterprise.

#### 4.3.1 Market Value and Volume



Source: Jupiter Communications, Internet Payments Report (1997)

**Figure 5 : Projected Dollar Volume Growth for Sub-\$10 Market**

Figure 5 depicts market data and predictions regarding the growth of the sub-\$10 market on the Internet between 1995 and 2000. Because this market may grow slower than expected, however, I generate a more conservative estimate for total fees in this market using the projected market size in 1998 in addition to the estimate based on predicted market volume in 2000. In other words, in addition to calculating potential revenues based on a \$1.7 billion market, I also calculate revenues using an estimated market of \$470 million. This more conservative estimate assumes that the market growth will have the same general shape as predicted, but will lag the market research predictions by two years.



The estimated market of \$1.7 billion in 2000 is based on a guess of 1.7 billion transactions at an average of \$1 per transaction.<sup>56</sup> However, the total *number* of transactions -- as well as the aggregate dollar value -- will affect total fee revenue if micropayment operators charge a fee per transaction as well as a fee based solely on the dollar value of the transaction.<sup>57</sup> Therefore, for each of the two market size predictions, I generate different total fee estimates by holding the total dollar volume constant but by varying the number of transactions and the average transaction size. In particular, I generate fee estimates assuming average transactions of 25¢ per transaction and 10¢ per transaction. Table 2 lists the dollar volumes and number of transactions used to estimate the total fees in this market.

**Table 2 : Estimated Number of Transactions (Billions)**

		<i>Market Size</i>	
		<i>\$ 470 M</i>	<i>\$ 1700 M</i>
<i>Average</i>	<i>\$1.00</i>	0.47	1.7
<i>Transaction</i>	<i>\$0.25</i>	1.88	6.8
<i>Size</i>	<i>\$0.10</i>	4.7	17

#### 4.3.2 Fee Structure: $\kappa + (\phi \times m)$

I first assume that operators of micropayments will secure their revenues through some sort of a fee that is based on the number and size of transactions, similar to the merchant discount imposed by payment card issuers. Note that these revenue estimates do not depend on whether the micropayment operator charges this fee to the merchant after the merchant-consumer transaction (as in credit card transactions), or whether the operator charges the fee up-front to consumers (as when a consumer purchases \$1000 in traveler's checks for \$1015, paying a 1.5 percent fee).

<sup>56</sup> See INTERNET PAYMENTS REPORT, *supra* note 27.

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A fee based on transaction volume can be represented by two elements. First, there can be a fixed charge per transaction. I denote this fixed element of the fee as  $\kappa$ . Second, there can be a variable charge per transaction that is proportional to the value of the transaction. I denote this percentage fee as  $\phi$ . The per transaction fee  $f_i$  is thus

$$f_i = \kappa + (\phi \times m_i)$$

where  $m_i$  denotes the size of an individual transaction. Total revenue available to micropayment operators,  $R$ , is equal to the total fee  $F$  charged on all transactions:

$$R = F = \sum_i f_i.$$

Note that if  $\kappa = 0$ , the fee per transaction is simply a percentage  $\phi$  of the amount of the transaction, and total fees in the entire market would be obtained by applying the same percentage  $\phi$  to the aggregate size of the microtransaction market. On the other hand, if  $\phi = 0$ , then there is a flat fee per transaction and total fees depend only on the number of transactions in the market.

Assuming that a robust microtransaction market would, by definition, consist of numerous small transactions, micropayment operators would probably find it desirable to impose a non-zero fixed fee  $\kappa$ . Such a fixed fee more accurately reflects the costs incurred by micropayment operators because costs are more closely related to processing each transaction than to the value of any transaction.<sup>58</sup> More importantly, the fixed fee  $\kappa$  may allow the operator to earn larger fee revenues in a market characterized by very small transactions. Alternatively, micropayment operators could charge a high percentage fee  $\phi$  to earn comparable revenues.

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<sup>57</sup> See *infra* Section 4.3.2.

<sup>58</sup> For example, processing, memory, and communication costs are all incurred on a per transaction basis without regard to the amount of the transaction. Unlike credit card issuers, micropayment operators are not likely to be engaged in extending credit, where the value of the transaction (i.e. the credit extended to the purchaser) constitutes an important part of costs.

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Table , reprinted here from Chapter 2, shows the  $[\kappa, \phi]$  values offered by a typical merchant bank to a merchant for *credit card* transactions. These numbers are based on an average ticket size of \$1 and a monthly charge volume of \$10,000, and should be compared to a normal merchant discount in the range of 2 to 4 percent (i.e.  $\kappa = 0$ ;  $2\% \leq \phi \leq 4\%$ ) for large ticket merchants. With average tickets lower than \$1, one could expect  $\kappa$  or  $\phi$  (or both) to be even higher -- assuming that the bank would even agree to set up such an account for the merchant.<sup>59</sup>

**Table 1 : Credit Card Transaction Fees**

$\kappa$	$\phi$
--	29.6 %
15¢	11.0 %
20¢	8.8 %
35¢	5.5 %

Source: US Trust Merchant Services Department, Aug. 8, 1997

### 4.3.3 Estimate of Total Fees

In Chapter 3, I showed that micropayment operators have lower costs and are likely to charge lower  $\kappa$  and  $\phi$  than the typical credit card merchant discount. I therefore assume that the values of  $\kappa$  and  $\phi$  shown above approximate an upper bound on fees that micropayment issuers

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<sup>59</sup> The salesperson to whom I spoke stated that although there is no minimum ticket requirement for any single transaction, he did not think average ticket sizes under \$1 would be profitable to either the bank or the merchant.

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can charge merchants and consumers. Given that some micropayment protocols claim to support transactions on the order of fractions of a penny,<sup>60</sup> I assume that  $\kappa$  is bounded by the range:

$$\$0.001 \leq \kappa \leq \$0.20.$$

However, the size of an average transaction can impose an even lower limit on  $\kappa$ . For example, if the average transaction is \$0.10,  $\kappa$  is absolutely bounded by the average transaction size (\$0.10) and in practice can probably be no larger than \$0.05. Even at  $\kappa = \$0.05$ , the fixed portion of the fee would already impose a 50 percent fee on the average transaction.

Similarly, although  $\phi$  is usually in the range from 2 to 4 percent for credit cards, Table 1 shows that  $\phi$  can approach 30 percent as the average transaction size approaches \$1. I therefore assume that  $\phi$  is bounded within the range:

$$2\% \leq \phi \leq 30\% ,$$

and furthermore that 30 percent of the dollar volume of the market approximates an *absolute* upper bound on potential revenues.

#### 4.3.3.1 High Estimate

Table 3 shows range of estimated total fees assuming that the market grows as quickly as predicted by market researchers. The fees shown in this table are based on a market size of \$1.7 billion. The first row assumes 1.7 billion transactions, based on an average of \$1 per transaction, and the second and third rows assume 6.8 billion and 17 billion transactions, based on \$0.25 per transaction and \$0.10 per transaction, respectively.

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<sup>60</sup> See Manasse, *supra* note 40.

**Table 3 : Total Fees -- High Estimate (\$ Millions)**

	$\kappa$ :	\$0.001	\$0.02	\$0.02	\$0.05
	$\phi$ :	2%	5%	10%	10%
Number of Transactions	1.7 billion	\$35.7	\$119	\$204	\$255
	6.8 billion	\$40.8	\$221	\$306	\$510
	17 billion	\$51	\$425	\$510	\$1020

Looking down each column, we can see the role that  $\kappa$ , the fixed portion of the fee, plays in total fee revenue. As expected, the fixed portion of the fee is a more important part of overall fees when  $\kappa$  is large. For example, in the first column we see that potential revenues only increase some \$15 million as the number of transactions increases ten-fold from 1.7 billion to 17 billion for  $\kappa = \$0.001$ . For  $\kappa = \$0.05$ , however, there is an increase in total fees of hundreds of millions of dollars for the same increase in transaction volume.

Comparing columns 2 and 3, we see that by holding  $\kappa$  constant at  $\kappa = \$0.02$ , a 5 percent increase in  $\phi$  yields an extra \$85 million in total fees. However, this \$85 million constitutes a larger *percentage* increase in total fee revenue when there are fewer transactions (row 1) than when there are more transactions (row 3). This makes sense because  $\kappa$  accounts for a larger portion of the total fee when there are a large number of transactions. Similarly, the value of  $\phi$  is more important when the average transaction is large than when the average transaction is small.<sup>61</sup> However, note that even at the largest transaction size (\$1 per transaction) and a relatively small fixed fee of  $\kappa = \$0.02$  (2¢ per transaction),  $\phi$  still accounts for less than half of

<sup>61</sup> This characteristic is consistent with credit card fee pricing, described in Chapter 2.

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overall potential revenues. Thus, it seems likely that micropayment operators will impose a non-zero  $\kappa$  as part of any fee structure.

Table 3 seems to suggest that, assuming a \$1.7 billion market, an average transaction size of \$0.10, and relatively high fees [ $\kappa$ ,  $\varphi$ ] = [\$0.05, 10%], revenues on the order of \$1 billion are possible. However, some further analysis suggests that this number, shown in italics in the lower right corner of Table 1, is probably unrealistic. In particular, at \$0.10 per transaction, a fixed fee of  $\kappa = \$0.05$  coupled with a percentage fee of  $\varphi = 10\%$  effectively imposes a 60 percent fee on the average transaction. Such a fee exceeds the absolute upper bound which we estimated above to be 30 percent of the total market size, and therefore should probably be discarded.

A more reasonable interpretation of Table 3 is that, assuming the market for low cost information goods grows quickly and that micropayment operators are able to secure a rather large fee on microtransactions, this market can yield up to \$510 million in fees. Such revenues are rather significant and, if such a market really develops, might drive the growth of micropayments. However, this figure still corresponds to a rather high average fee of 30 percent on each transaction and constitutes the absolute upper bound on fees we hypothesized above. Note that the estimates shown in column 2 ( $\kappa = \$0.02$ ,  $\varphi = 5\%$ ) are calculated using  $\kappa$  and  $\varphi$  taken from NetBill, a leading micropayment system.<sup>62</sup>

On the other hand, even if the high market prediction is correct, a micropayment system charging very low fees such as those represented in column 1 ( $\kappa = 0.1\text{¢}$ ,  $\varphi = 2\%$ ) can only generate revenues on the order of \$35 million to \$50 million from transaction fees. Under these conditions, micropayment operators might have to rely on other sources of revenue, perhaps by licensing special server equipment or other proprietary technology.<sup>63</sup>

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<sup>62</sup> See John Chung-I Chuang & Marvin A. Sirbu, *The Bundling and Unbundling of Information Goods: Economic Incentives for the Network Delivery of Academic Journal Articles* 19 (1997), available at <<http://www.ini.cmu.edu/netbill/pubs.html>>.

<sup>63</sup> See INTERNET PAYMENTS REPORT, *supra* note 27, at 3.

### 4.3.3.2 Low Estimate

Table 4 sets forth similar estimates as above, except that these figures are based on the more conservative projection of a \$470 million annual market.

**Table 4 : Total Fees -- Low Estimate (\$ Millions)**

	κ :	\$0.001	\$0.02	\$0.02	\$0.05
	φ :	2%	5%	10%	10%
<i>Number of Transactions</i>	<i>0.47 billion</i>	\$9.87	\$32.9	\$56.4	\$70.5
	<i>1.88 billion</i>	\$11.3	\$61.1	\$84.6	\$141
	<i>4.7 billion</i>	\$14.1	\$118	\$141	\$282

Table 4 shows that, if the market grows slowly, micropayment operators may not be able to earn much direct revenue through fees. In particular, micropayment systems charging the small fees shown in column 1 might only be able to generate revenues in a range between \$10 million and \$14 million, even if they controlled the whole micropayment market. A higher fee arrangement, like that charged by NetBill, could generate revenues ranging from \$33 million to \$118 million (column 2). Even higher fee structures, amounting to an effective 30 percent charge on all transactions, could bring as much as \$141 million annually.

## 4.4 Credit Card Industry Revenues Compared

In Chapter 3, I showed that credit cards provide many of the features -- such as trust and convenience -- that micropayment users will also demand. In addition, Chapter 2 asserted that credit card issuers, prompted by a very competitive industry, are seeking to expand credit card operations to new goods and services in an effort to boost their profits. In particular, credit cards

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are now becoming accepted in places that traditionally have accepted only cash, such as parking garages, movie theaters, and fast food restaurants. Given this trend, will credit cards emerge as a payment form for low cost goods on the Internet market, where they are already the dominant form of payment for higher priced physical goods?<sup>64</sup>

#### **4.4.1 Why Credit Cards Will Not Dominate the Low-Value Information Goods Market**

Several considerations suggest that the answer to this question is no -- that credit cards will not emerge as the payment method of choice for truly low value information goods transactions.

As mentioned previously, the fees currently imposed by credit cards on small ticket transactions make this form of payment impractical for purchases under \$1. The trust relationships generated by a three-party or four-party payment card system are rather similar to the relationships formed under many micropayment protocols.<sup>65</sup> This similarity suggests that it might be possible to reduce credit card transaction costs to a level at which they could compete with micropayment systems even for small ticket transactions. However, the cost structure of the credit card industry and the approach taken by the industry toward Internet commerce both suggest that this is not likely to occur.

##### *4.4.1.1 Payment Card Industry Revenue Structure*

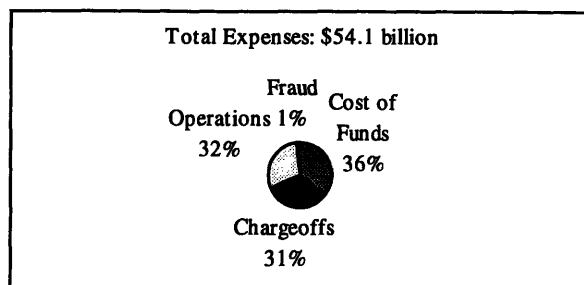
Figure 6 shows a breakdown of payment card industry costs in 1996.

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<sup>64</sup> In 1996, for example, credit cards accounted for approximately 90% of all on-line transactions in terms of both number of transactions and dollar volume. *See id.* at 24.

<sup>65</sup> *See supra* Chapter 3.





**Figure 6 : Credit Card Industry Expenses (1996)**

As can be seen, industry costs can be broken down into three major categories: the cost of funds, chargeoffs, and operations and marketing. The *cost of funds* is the cost of extending “credit” -- even temporarily, in the case of non-revolvers -- to cardholders. It denotes the expense incurred by banks when they borrow money in order to pay merchants before cardholders pay off their bills. This cost is related to interest rates and therefore not within the control of issuing banks, and generally makes up a little over one-third of total expenses. *Chargeoffs* are the losses suffered by payment card issuers when cardholders default on their payment card debt, often by declaring bankruptcy. Chargeoffs have been steadily increasing as a percentage of total expenses; in 1993 and 1994, chargeoffs constituted less than 25 percent of expenses, but by 1996 they approached one-third of all expenses.<sup>66</sup> Because the same cardholders who use a payment card for conventional purchases would also use the payment card for micropurchases, charges attributable to micropurchases are not free from the risks of default and the issuers’ fee structure on micropurchases must include the cost of chargeoffs. Thus, more than two-thirds of costs in the payment card industry are attributable to the nature of that industry, and there is little room for further cost reductions.

The steps that credit card issuers have taken to promote commerce on the Internet do not lower credit card transaction costs in ways that make them practical for small transactions. Payment card issuers have been engaged in collaborative efforts to make credit card transactions

<sup>66</sup> See *Down for the Count*, *supra* note 12, at 46 - 47; *Cards Get Clipped*, CREDIT CARD MGMT., May 1995, at 58; *The Earnings Balloon*, CREDIT CARD MGMT., May 1994, at 32.

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secure on the Internet,<sup>67</sup> but these efforts are designed to verify the identity of credit card users and to protect credit card numbers transmitted over the network so that credit card transactions can then be processed through the current payment infrastructure. The SET protocols are thus meant to operate *on top* of the existing credit card infrastructure, and are likely to *increase* -- not decrease -- transaction costs.<sup>68</sup>

#### **4.4.1.2 Low Revenues in the Market for Low Cost Information Goods**

Table 3 lists the total charge volume, total revenue, and total profits (after tax) in the bank card industry for the years 1994 through 1996. In 1996, payment card charge volume reached \$1.7 *trillion*, or 1000 times the size of the projected on-line market for sub-\$10 goods in the year 2000. In comparison, the new markets currently being targeted by the credit card industry are much larger than \$1.7 billion -- such as the fast-food industry (at \$94 billion annually)<sup>69</sup> or even the parking facilities industry (at \$30 billion annually).<sup>70</sup> Total payment card revenues also dwarf the amount of revenues that might be earned from a microtransaction market; in 1996, revenues in the payment card industry were almost \$60 billion, whereas our most optimistic projection for revenues in the on-line information goods market is just over \$500 million by the year 2000.

These figures suggest that there is little incentive for payment card issuers to alter their operations to service the relatively unprofitable low value information goods market; instead, payment card issuers are likely to continue to target larger, *macropayment* transactions that make up the vast majority of Internet commerce, by dollar volume.

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<sup>67</sup> See, e.g., <www.visa.com> (describing the Secure Electronic Transaction (SET) specification for making credit card payments over the Internet).

<sup>68</sup> See CBO Report, *supra* note 6, at 10 - 11.

<sup>69</sup> See *id.* at 19.

<sup>70</sup> See RITZER, *supra* note 17, at 49.

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#### 4.4.2 Aggregating Small Transactions for Credit Card Payment

There is one payment approach that can potentially utilize payment cards to settle microtransactions efficiently: information providers can aggregate a series of microtransactions from a consumer and charge the aggregate value of the goods to the consumer's payment card. Under this payment approach, information providers effectively create an accounting mechanism to keep track of how much each consumer has purchased and then to bundle the separate transactions into a single payment card transaction whenever the bundle reaches a threshold level or after a specified period of time. By aggregating many transactions, information merchants can avoid paying the fee on each transaction that makes payment cards prohibitively expensive for small transactions. First Virtual, one of the first providers of low cost payment alternatives on the Internet, uses such an approach.

However, there are also several drawbacks to the aggregation approach. First, aggregation is a form of bundling and suffers from many of the drawbacks presented by bundling, which is described in more detail in section 4.6.1. In particular, aggregation is more efficient only if there are many transactions to aggregate, and it is not clear how many information providers on the network will be able to establish ongoing relationships with their customers that result in a dependable series of transactions.

Second, even assuming that aggregation is feasible, it still imposes a waiting period in which proceeds from sales are unavailable to the information provider. Consider, for example, the first sale a merchant makes to a new consumer at  $t = 0$ . An information provider who aggregates microtransactions may have to wait a long period of time before the proceeds from this sale actually become available. First, and most importantly, the information provider must wait for a time  $t_1$  until the consumer engages in a series of other transactions such that her purchases, in the aggregate, reach a minimum threshold. Depending on the nature of the information provider's goods and on the purchase decisions of the consumer, this delay could potentially be quite long. In addition, even after the information provider charges the aggregate value of the purchases to the consumer's payment card, the information provider's merchant bank may impose a further waiting period  $t_2$  during which the funds are not available. The merchant bank may place a hold on the funds -- or at least require that the information provider maintain a certain level of funds in its merchant account -- because the acquiring bank is

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obligated, by contract, to settle cardholder initiated disputes by “charging back” disputed amounts against the merchant account.<sup>71</sup> The waiting period  $t_1$  is unique to merchants who aggregate consumer transactions; the waiting period  $t_2$  is common to all merchants who accept credit cards, but it may impose the largest hardship on small on-line information vendors who do not have a large sales volume nor an established history of sales.

Therefore, although aggregation allows information vendors to use the existing credit card infrastructure to conduct microtransactions, these two considerations show that aggregation is not an ideal solution for many types of information providers and transactions.

## **4.5 Pricing Strategies in the Information Goods Market**

Even if a robust market in low cost information goods develops on the network, the success of micropayments as a new form of payment will depend on what business models and pricing strategies Internet content providers adopt to sell or otherwise profit from their goods. Charging users directly for low cost information goods is an approach that, to date, not been widely adopted. Instead, most low-value information goods on the Internet are “free,” and providers of such goods and services providers derive the majority of their revenues from advertisements. Even if content providers choose to charge information consumers directly for information goods, there are other, more established strategies for pricing low cost goods -- such as through subscriptions or some other form of bundling -- that will compete with micropayment approaches.

### **4.5.1 Advertising**

One of the most appealing business models available to Web content providers is the advertising model. Under this approach, information providers make their content available for free on the network and earn revenues by charging advertisers a fee to include advertisements with the free content. On the Web, advertisements usually appear as a banner above the free

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<sup>71</sup> See BARKLEY CLARK & BARBARA CLARK, *THE LAW OF BANK DEPOSITS, COLLECTIONS AND CREDIT CARDS* 15-11 to 15-13, 15-36 to 15-37 (4th ed. 1995).

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content, and the ad provides a link that allows an information consumer to travel quickly and effortlessly to the advertiser's own Web site.

#### ***4.5.1.1 Advantages of the Advertising Model***

The advertising model is advantageous for several reasons. First, advertising is very easy to operate. Content providers only need to create a link from their site to the advertiser; they do not have to deal with individual visitors or manage individual payments or accounts. They also receive a regular, perhaps monthly, stream of revenue in the form of a check from the advertiser. And even if content providers must maintain usage statistics to negotiate advertising fees, software and services are readily available that allow content providers to perform these tasks.<sup>72</sup>

Second, and perhaps more importantly, content providers like the advertising model because they do not have to charge visitors to view their content. In theory, of course, consumers ultimately pay for the "free" content because advertisers incorporate their advertising costs into the price of the goods that consumers purchase, but the indirect nature of this cost makes the content appear to be free. This perception is very important to content providers because most consumers are accustomed to the Internet as a free communications medium that is used to exchange and share information, and are not accustomed to paying for information on the network. This "Internet culture" remains strong despite the trend toward commercialization of the Internet, and many users continue to object to any efforts to charge fees for content on the Internet.

#### ***4.5.1.2 Limitations of the Advertising Model***

Although advertising offers many benefits, it is likely that most content providers will not be able to take advantage of this revenue model. The reason is that there simply may not be enough advertising revenue to support all the content providers on the Internet.

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<sup>72</sup> For example, the Internet services company I/PRO runs a site auditing system that allows content providers to verify for advertisers the number of visits to their site. I/PRO also compiles

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On the supply side, advertisers are increasingly turning toward the Web as a medium to market their goods and are increasing their on-line spending accordingly. Advertisers spent \$72 million on the Web in the first half of 1996, but increased this figure to \$66 million in the third quarter of 1996 alone.<sup>73</sup> If we include advertising expenditures on other on-line services such as Prodigy and America On-line, total on-line advertising spending reached \$350 million in 1996.<sup>74</sup> Market analysts expect on-line advertising to exceed \$5 billion annually by 2000, compared to total projected advertising spending of \$88 billion in that year.<sup>75</sup>

On the other hand, however, advertising spending is concentrated on a very small number of Web sites. For example, although over 900 Web sites accepted ads last year, the top ten advertising sites took in approximately two-thirds of all advertising revenue, and the top twenty-five sites secured 85% of the total.<sup>76</sup> It is probable that many more sites solicited advertising with no success. Top advertising sites are, unsurprisingly, those sites that attract a very large volume of visitors, notably search engine sites.

Moreover, current statistics suggest that advertising revenue along will be sufficient to sustain only "directory-service" type sites that Internet consumers visit frequently as the first stop on their way to their final destinations.<sup>77</sup> Many other types of sites have significant support from advertisers but still lose large sums of money. For example, Wired Magazine's on-line counterpart, HotWired,<sup>78</sup> is losing \$3 million per quarter, and Time-Warner's Pathfinder<sup>79</sup> site lost \$8 million in 1995, *despite* receiving \$2 million in advertisement revenues. Even Starwave,

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information about the characteristics of users who visit each particular site. See <<http://www.ipro.com>>.

<sup>73</sup> See Clark, *supra* note 20, at 10.

<sup>74</sup> See Bank, *supra* note 51, at R4.

<sup>75</sup> See Clark, *supra* note 20.

<sup>76</sup> See *id.*; Bank, *supra* note 51, at R4.

<sup>77</sup> Such directory-service sites will not all be successful. Cf. Michelle V. Rafter, *1996 - 97 Review and Outlook: Internet Ups and Downs*, L.A. TIMES, Dec. 30, 1996, at D4 (chronicling the sale of the McKinley Group's search engine site to Excite, and noting that this was "the first consolidation in the overcrowded Web directory field and probably not the last").

<sup>78</sup> See <<http://www.hotwired.com>>.

<sup>79</sup> See <<http://www.pathfinder.com>>.

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which operates the immensely popular ESPN SportsZone site, does not receive enough advertising revenue to cover its costs, earning approximately \$7 million and incurring costs of approximately \$20 million last year.<sup>80</sup> Although these figures are taken from a new and growing market and may not necessarily reflect the long-term prospects of advertising as a revenue source, they do suggest that many information providers, especially small ones, will not be able to earn enough revenues through advertising to support their operations.

## **4.5.2 Subscriptions**

For Internet content providers who cannot survive through advertising alone, the logical alternative is to charge users directly for content. There are two main strategies that content providers might adopt to achieve this goal. First, a provider might charge users a single subscription fee to access a large set of goods, such as a digital art collection or an information service like a stock quotation service. Currently, if a provider's information goods are not worth very much individually, bundling many such goods into a package and selling a subscription may be the only way for the provider to sell his goods. Newspapers and magazines are the paradigmatic example of this approach; newspapers bundle individual stories and features, each worth very little individually, into a package and charge users for the entire collection of goods. Alternatively, a provider might charge users for each good – or each use – separately via some form of micropayment system.

### **4.5.2.1 Subscriptions Defined**

First, note that the definitions of a *subscription* and a *micropayment* are not necessarily mutually exclusive. A subscription typically refers to a pricing technique whereby several goods or services, spread out over time, are bundled together and sold as a single package. In Chapter 2, I defined micropayments as payment systems that are designed to work over public networks and that provide both security and efficiency features to allow microtransactions. As the length of a subscription becomes shorter, however, a subscription may be purchased via a micropayment. For example, Aunt Millie might charge a fee to access all her desert recipes for

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<sup>80</sup> See Clark, *supra* note 20.

one day. This transaction might be both a one day subscription and a microtransaction. Indeed, the ESPN SportsZone site has initiated a similar pricing structure by offering users the opportunity to buy a daily pass to access feature stories and other premium content.<sup>81</sup> For the sake of clarity, this thesis uses the term *subscriptions* to refer to conventional subscriptions that do not implicate micropayments.

#### ***4.5.2.2 Advantages of the Subscription Model***

There are several reasons why, given a choice, on-line content providers would prefer to charge consumers of their information a subscription fee rather than directly for each microtransaction. Subscription fees are easy to collect and provide a dependable stream of revenue. In addition, Internet content providers such as Web newspapers and magazines may have counterparts in the print world that already operate based on subscriptions, so that both the provider and his consumers are accustomed to such a payment arrangement. Two economists have also asserted that information producers on the Internet can maximize profits by selling their goods as a bundled subscription, rather than selling goods individually through micropayments.<sup>82</sup>

#### ***4.5.2.3 Disadvantages of the Subscription Model***

Information providers who try to charge visitors to their sites a subscription fee face their own set of problems, however. First, visitors who are accustomed to free content may rebel and stop visiting a site if subscription rates are non-trivial. When the Wall Street Journal began to charge on-line users a \$29 to \$49 annual subscription fee in September 1996, only 30,000 out of 650,000 visitors who had registered for the free trial period stayed on as paying subscribers.<sup>83</sup> A large subscription price not only drives away potential customers, but such a dramatic decrease in readership is also likely to adversely affect the information provider's ability to attract *advertising* revenue because advertisers will not pay to be on sites that draw few visitors.

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<sup>81</sup> See <<http://espnnet.sportszone.com>>.

<sup>82</sup> See *infra* Section 4.4.1.

<sup>83</sup> See Clark, *supra* note 20.



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In addition, only those information providers that are able to establish a continuing relationship with their customers will be able successfully to charge subscription fees. Consumers are probably unwilling to pay an information provider significant subscription fees in advance unless they expect to return frequently to that particular information provider's site for more information goods or services. This requirement limits those who can charge subscriptions to a narrow class of information providers. In order for an information provider to establish a long-term relationship with customers and convince them to return, the provider must persuade customers that his information goods and services are superior to those offered by other providers and that they cannot easily amass the same quality information from other sources. This may be a difficult task, however, because of the wide array of information -- much of it free -- that is readily available on the network. With so many potential sources of information out on the network, consumers may be unwilling to lock themselves in to a single information provider by paying a large subscription fee. One exception to this general rule might be content providers who have some sort of monopoly power -- whether through intellectual property rights or otherwise -- over the information they offer. Another exception might involve information providers who offer information services with rapidly changing content. Because there is a continual influx of new content that draws consumers back, these information service providers may be able to profit from subscriptions. Successful examples might include news, sports, or financial information providers. Conversely, vendors who sell static information goods may find it difficult to succeed using the subscription model.

Second, information providers cannot capture certain types of transactions through subscriptions. In particular, subscriptions are ill-suited to capitalize on consumers' "impulse buying" behavior. Although a certain portion of the information goods market is made up of rational, deliberate purchase decisions by information consumers, another segment of the market consists of spur-of-the-moment buying decisions by consumers who have stumbled across something interesting yet unexpected while surfing the Web. It is possible that a large proportion

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of low value information goods transactions will involve impulse buys.<sup>84</sup> A pricing strategy based solely on subscriptions would be largely unable to tap this portion of the emerging market.

## 4.6 Micropayments

Unlike subscriptions, micropayments allow content providers to unbundle their goods and charge users incrementally for access to information and services. In many ways, micropayments are a poor revenue model for content providers trying to sell their goods: unlike advertising, content providers must ask Internet users to pay for information directly, and unlike subscriptions, micropayments may require users to adopt a payment scheme with which they are unfamiliar.

On the other hand, micropayments may be the *only* viable scheme to generate revenues for many information providers. Advertising may be able to support only a small set of large, well-known content providers, whereas profitable subscription sales will work only for content providers that sell “must-have” information services. Micropayments can capture impulse buying behavior by consumers, and may also be the only method for content providers to sell low-value information to non-repeat buyers. The future of micropayments may in some ways be intertwined with the nature of growth on the network itself: if the network evolves such that a market only develops for relatively valuable information goods, or if large content providers with a wide assortment of information goods and services become the dominant sellers of information, then it is more likely that advertising and bundling will be adequate to meet the needs of the market; on the other hand, if the network is to support small content providers who want to sell their own particularized goods, then micropayments may be a necessary form of payment.

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<sup>84</sup> See, e.g., Jane Hodges, *Small Fees Add Up Fast for Media Sites*, ADVERTISING AGE, Nov. 4, 1996, at 20 (quoting the opinion of David Creagh, electronic publishing manager at the Christian Science Monitor).

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#### 4.6.1 Economic Critiques of Micropayments as a Business Strategy

Recently, two economists have challenged the notion that micropayments will become a dominant payment form on the Internet.<sup>85</sup> Bakos and Brynjolfsson argue that monopolistic content providers can capture more consumer surplus by bundling information goods and selling them in one package than by charging for each good individually through micropayments. In other words, they argue that a content provider's optimal pricing strategy is to sell low-value information goods in a package – similar to a subscription – even if micropayments make it possible for the content provider to price each good individually.

Bakos and Brynjolfsson's reasoning is as follows. Suppose that there are three consumers Angie, Brian, and Cora; and that Producer sells three goods X, Y, and Z. Assume further that different consumers value goods differently, so that Angie values good X highly but goods Y and Z less highly, whereas Brian values Y highly but X and Z less so, and Cora values Z highly but X and Y less so. If Producer sells each good separately, he should set the price of each good independently of the price of other goods so that he maximizes his profit on that particular good. For example, if Angie values X at \$1 but Y and Z only at \$0.30 and \$0.20, respectively, Producer's profit maximizing price for good X is \$1: by charging \$1, Producer receives \$1 in revenue from Angie, but nothing from Brian or Cora, for total revenue of \$1. If Producer charges less, say \$0.20, so that he can sell good X to all three customers, he will receive only \$0.60 in total revenue (\$0.20 from each of Angie, Brian, and Cora).<sup>86</sup> Assuming that an analogous situation exists for goods Y and Z, Producer should price each good at \$1 and receive \$3 in total revenue.

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<sup>85</sup> See Yannis Bakos & Erik Brynjolfsson, *Bundling Information Goods: Pricing, Profits and Efficiency*, at 2, in *Proceedings of Conference on Internet Publishing and Beyond: Economics of Digital Information and Intellectual Property*, Jan. 1997 (forthcoming), available at <<http://www.gsm.uci.edu/~bakos/big96-12.pdf>>.

<sup>86</sup> This analysis assumes that the producer cannot engage in price discrimination when he sells each good separately. For example, the producer cannot sell good X to Angie for \$1, to Brian for \$0.30, and to Cora for \$0.20, thus raising his total revenue to \$1.50. Perfect price discrimination would be, by definition, the best pricing strategy for a producer. Our assumption that the producer cannot price discriminate is reasonable because producers often lack the information necessary to engage in price discrimination.

However, Angie, Brian, and Cora each would have been willing to spend another \$0.50 to buy the two goods they did not receive. These sales are simply lost through the individual pricing strategy. Producer can do better by selling X, Y, and Z as a bundle. If Producer charges \$1.50 for the bundle, then Angie, Brian, and Cora will each purchase all three items and Producer will receive total revenues of \$4.50, better than the \$3 Producer receives under the individual pricing scenario.

This idealized bundling model often breaks down in the real world, however, because physical goods have nonzero production costs. In the above example, we implicitly assumed that the cost of producing each good was zero. Now assume that it costs \$0.30 for Producer to make each good X, Y, or Z.<sup>87</sup> Producer will now decide not to bundle the goods because bundling decreases his profits. Producer can still only charge a maximum price of \$1.50 for the bundle because a higher bundle price drives away all three consumers. Producer's revenue through bundling therefore remains at \$4.50. However, now Producer incurs costs of \$0.90 per bundle, so that his total profit is only \$1.80, as shown below:

$$\text{Total Profit}_{\substack{\text{Bundle,} \\ \text{MC} \neq 0}} = \left( \$1.50 \frac{\text{revenue}}{\text{bundle}} - \$0.90 \frac{\text{cost}}{\text{bundle}} \right) \times (3 \text{ bundles}) = \$1.80.$$

If Producer priced the goods individually at \$1 each (and sells good X to Angie, good Y to Brian, and good Z to Cora) his total profit would be \$2.10:

$$\text{Total Profit}_{\substack{\text{No Bundle,} \\ \text{MC} \neq 0}} = \left( \$1 \frac{\text{revenue}}{\text{good}} - \$0.30 \frac{\text{cost}}{\text{good}} \right) \times (3 \text{ goods}) = \$2.10.$$

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<sup>87</sup> In other words, the marginal cost of each good X, Y, and Z is \$0.30.

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When marginal costs (MC) are nonzero, Producer's profit maximizing strategy is to exclude from the bundle any good whose value to consumers is less than Producer's marginal cost to create the good. In terms of our example, Producer does not want to sell good Z "a la carte" to Angie because Angie values it at only \$0.20 whereas Producer's marginal cost is \$0.30, and Producer would therefore suffer a loss by selling good Z individually to Angie. For the same reason, Producer does not want to include good Z in the bundle he sells to Angie, because to do so would effectively decrease the profit he makes on Angie's purchase of goods X and Y. The same reasoning should lead Producer to also exclude goods Y and X from the bundle because Brian and Cora, respectively, value them too little.<sup>88</sup> As a result, Producer should not bundle any goods but instead should sell each good separately.

Bakos and Brynjolfsson argue that bundling is the most efficient pricing strategy for Internet content vendors because the marginal cost of producing copies of digital information goods is zero.<sup>89</sup> As a result, they argue that there is no reason to exclude any consumer from any information good; each sale can only increase – never decrease – profits. In other words, the simplified, costless bundling scenario first described above holds true in the market for information goods. Bakos and Brynjolfsson therefore suggest that content providers should bundle their information goods instead of selling the goods separately using micropayments.

Bakos and Brynjolfsson further suggest that content providers with a limited range of goods unsuitable for bundling can and should nonetheless pursue a bundling strategy. In particular, they argue that single-good content providers should find it more profitable to bundle their goods with those of other content providers by merging with these other providers or by marketing their goods through a common broker or service.<sup>90</sup> They argue that on-line services such as America Online and Lexis/Nexis provide just such a bundling function and are examples of the dominant model for selling information goods on the Internet in the future. Indeed, they

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<sup>88</sup> Again, this outcome assumes that Producer cannot price discriminate and offer different bundles to the three consumers, that is, Producer cannot bundle X and Y and sell it to Angie, bundle X and Z and sell it to Brian, and bundle Y and Z and sell to Cora.

<sup>89</sup> See Bakos & Brynjolfsson, *supra* note 85, at 2, 11.

<sup>90</sup> See *id.* at 25.

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consider the existence of on-line services such as Lexis/Nexis and America Online to be evidence in support of their proposition.

#### 4.6.2 Bundling versus Micropayments in the Internet Market

There are several reasons, however, to question Bakos and Brynjolfsson's conclusion that bundling is the best strategy for information providers in the evolving market for information goods on the Internet. The effectiveness of traditional bundling as a pricing strategy depends on the extent to which each consumer's demands for the goods to be bundled are *negatively correlated*.<sup>91</sup> A consumer has a negatively correlated demand for bundled goods if he values some goods in the bundle highly and others lowly.<sup>92</sup> Successful bundling requires negatively correlated demands because if negative correlation does not exist – that is, if one group of consumers (“Group1”) values all the goods highly and another group values them all lowly (“Group2”) – then the producer can maximize profits by charging Group1 consumers a high price while foregoing sales to Group2 consumers.

The intuition behind bundling is this: traditional bundling is desirable when the total value Angie places on all the goods -- Angie's “willingness to pay” -- is equal or similar to the total value Brian and Cora place on the same package of goods. The producer can then set a price for the bundle just below this willingness to pay and induce all three customers to buy the bundle and hence all the goods. The wide disparity between the value that Angie and Brian might assign to specific goods *within* the bundle<sup>93</sup> is irrelevant to the producer as long as these disparities “average out” to roughly the same aggregate willingness to pay.

Bakos and Brynjolfsson show that, if there are many goods in the bundle, successful bundling does not even require that a consumer's demand for the goods be negatively correlated, but only that consumers' demands for each good in the bundle be independent of their demand

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<sup>91</sup> See ROBERT S. PINDYCK & DANIEL L. RUBINFELD, MICROECONOMICS 387 (3rd ed. 1995).

<sup>92</sup> In our bundling example, for instance, Angie, Brian, and Cora all have negatively correlated demands because they each value some goods highly and others lowly.

<sup>93</sup> In other words, Angie really wants X but is more or less indifferent as to Y and Z, whereas Brian really wants Y but is more or less indifferent as to X and Z.

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for other goods in the bundle. If the consumers' demands for individual goods are independent, the "law of averages" guarantees that as the number of goods increases, a consumer's valuation of the bundle grows closer and closer to the value every other consumer places on the bundle.<sup>94</sup> In other words, as the number of goods increases, each consumer's willingness to pay converges to every other consumer's willingness to pay, thus satisfying the conditions for information providers to bundle their goods profitably.

However, the relatively large bundle size required by Bakos and Brynjolfsson's bundling strategy may make this strategy suboptimal. As the bundle grows in size, the bundle price also increases to reflect the increase in consumers' willingness to pay for the additional items in the bundle. Consumers who go on-line to make a purchase may wish to consume only a single good at the moment, and may be unwilling to pay the large bundle price up-front because they do not want the other goods offered in the bundle at that time. This is the same phenomenon we explored earlier when discussing subscriptions as a pricing strategy. Consumers may not want to pay a large up-front fee and be "locked in" to a particular information provider. Only consumers who anticipate returning to the content provider to obtain the subsequent goods will buy the bundle; but these consumers and content providers are the same ones identified earlier for whom the subscription model may be successful. Bakos and Brynjolfsson's argument thus works for the same types of information providers who may find it profitable to charge for subscriptions – which is, after all, just a form of bundling – but may not apply to other segments of the market.

#### **4.6.3 Micropayments as a Desirable Pricing Strategy**

Another way to make the point that micropayments might be a desirable form of payment for information providers is to understand that Bakos and Brynjolfsson's analysis applies only to a small subset of potential content providers on the Internet. Only monopolists or producers who possess market power can engage in profitable bundling.<sup>95</sup> Bakos and Brynjolfsson in turn

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<sup>94</sup> See Bakos & Brynjolfsson, *supra* note 85, at 15.

<sup>95</sup> See PINDYCK & RUBINFELD, *supra* note 91, at 361 - 62 (describing bundling as one of many pricing strategies that monopolists can adopt to increase profits).

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assume that on-line information goods producers will be monopolists.<sup>96</sup> Some information providers will satisfy this criteria, such as, for example, publishers of academic journals. A published academic article is clearly distinct from unpublished articles, and the journal is the only “producer” of the good. Even other journals in the same discipline do not compete with the journal, because articles published in *Science* are not substitutes for articles published in *Nature*; each article is unique. Bakos and Brynjolfsson’s analysis may therefore be valid for markets such as the one for academic journal articles.<sup>97</sup>

However, there are at least two reasons why it is likely that few content providers on the Internet will have this kind of monopoly power. First, most information providers are likely to face competition from other providers who produce close substitute goods. For example, all on-line newspapers offer the same basic information -- news -- and are therefore not monopolists. The on-line New York Times must compete with the Wall Street Journal, the Boston Globe, the Christian Science Monitor, and dozens of other on-line newspapers. Different search engines compete with each other. And although Bob may control all the content on Bob’s Poetry Page, his poems will compete for readers against scores of other poems authored by other aspiring poets. If the Internet does give rise to hundreds of thousands of content producers -- as many people hope and predict -- then most submarkets of the information market will not be monopolistic but will rather display a high degree of *monopolistic competition*.<sup>98</sup> Producers in these competitive markets cannot bundle their goods to extract higher profits because competition forces them to sell at marginal cost.

Another reason that information providers may not hold monopolies over their content is due to the current difficulty of protecting intellectual property on the network. Without an

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<sup>96</sup> Bakos and Brynjolfsson assume that Internet content providers will have a monopoly because they will have the “technical, social and legal means to prevent unauthorized duplication” of their goods. See Bakos & Brynjolfsson, *supra* note 85, at 1 & n.1.

<sup>97</sup> *But see* Chuang & Sirbu, *supra* note 62 (arguing that *unbundling* the sale of academic journal articles can increase producer surplus and improve economic efficiency).

<sup>98</sup> Monopolistic competition exists in “[a] market in which firms compete by selling differentiated products that are highly substitutable for one another, and there is free entry and exit.” PINDYCK & RUBINFELD, *supra* note 91, at 673. Producers in such a market succeed by differentiating their product from those of other firms; examples include the market for toothpaste and laundry detergent. See *id.*



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effective way to generate revenues that offset development costs and create incentives for innovation, a robust market for on-line information goods may not even develop. Any goods that are made available under such circumstances are at risk for illegal copying, and content creators may be unable to translate the legal monopoly they own over their works through copyright laws into economic returns. Chapters 5 and 6 will next address the role of micropayments and intellectual property protection in more detail.

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## INTELLECTUAL PROPERTY PROTECTION IN THE DIGITAL ENVIRONMENT

One major obstacle that currently prevents open digital networks like the Internet from flourishing as a marketplace for information goods is the lack of meaningful and effective on-line intellectual property protection. For example, the U.S. government's major policy paper on this topic states:

[U]nless the framework for legitimate commerce is preserved and adequate protection for copyrighted works is ensured, the vast communications network will not reach its full potential as a true, global marketplace. Copyright protection is not an obstacle in the way of the success of the NII; it is an essential component.<sup>99</sup>

On the other hand, critics of this position argue that proposals to increase intellectual property protections will destroy the public domain of information and violate the public's long-established rights to use and access information.<sup>100</sup>

This chapter describes the legal framework of intellectual property protection that applies to digital information goods. First, it sets forth the basic principles and elements of U.S.

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<sup>99</sup> NII WHITE PAPER, *supra* note 1, at 16.

<sup>100</sup> See, e.g., James Love, *A Primer on the Proposed WIPO Treaty on Database Extraction Rights* (revised Nov. 10, 1996) <<http://www.essential.org/cpt/ip/cpt-dbcom.html>>; Pamela Samuelson, *The Copyright Grab*, WIREN (Jan. 1996), at 135, 135.

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copyright law. Next, it examines problems with using copyright law, which was designed for the print medium, to protect intellectual property in a digital network environment. This section also discusses several recent legislative proposals to adapt existing copyright law to the network environment, as well as efforts to extend intellectual property protection to factual databases that are not protected by current copyright law. This chapter concludes that, although none of the proposals to expand intellectual property laws has been adopted to date, both proponents and opponents of broader intellectual property rights believe that *legal rights* -- in the form of broader grants of copyright or broader interpretations of the fair use defense to copyright -- are the key to protecting economic interests or ensuring public access to works in the digital environment.

## 5.1 The Basic Law of Copyright

The U.S. Constitution authorizes Congress to create intellectual property rights, including copyright protection, in order “to Promote the Progress of Science and the useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.”<sup>101</sup> Copyright law thus seeks to draw a balance between granting creators of original works rights over their works -- and thereby giving authors incentives to create new works -- and promoting public access to a wide array of creative works. Copyright law tries to achieve this goal by granting authors certain exclusive rights over their creative works for a limited period of time.

In the first comprehensive Copyright Act, enacted in 1909, Congress made clear that the main impetus behind copyright protection is not to reward authors, but rather to confer the benefit of creative works upon the public by giving authors an economic incentive to create new works.<sup>102</sup> Similarly, the Supreme Court has consistently viewed the public dissemination of

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<sup>101</sup> U.S. CONST. art. I, § 8, cl. 8.

<sup>102</sup> In its report accompanying the 1909 Act, the House of Representatives stated:

The enactment of copyright legislation . . . is not based upon any natural right that the author has in his writings, . . . but upon the ground that the welfare of the public will be served and progress of science and useful arts will be promoted by securing to authors for limited periods the exclusive rights to their writings . . .

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knowledge as the first priority of copyright law, and the exclusive rights accorded to authors as the means to achieve this end.<sup>103</sup>

### 5.1.1 Requirements for Copyright Protection

The current copyright statute, enacted in 1976, sets forth which works receive copyright protection. Section 102(a) of the Act states:

“Copyright protection subsists . . . in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device.”<sup>104</sup>

Courts have interpreted the Act to require that a work be both “original” and “fixed” in order to merit protection.

#### 5.1.1.1 Originality

To meet the originality requirement, an author or performer must produce a work with *some* level of creative expression, though this expression does not have to be entirely original.<sup>105</sup> For example, mere factual information by itself is never copyrightable. A compilation of facts organized in a familiar way, such as a telephone directory of names and phone numbers organized alphabetically, is not copyrightable; but a different, more creative selection and arrangement of the facts may rise to a level of *creative expression* that is protected. In situations in which a work contains factual or unoriginal aspects as well as creative components, copyright

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H.R. Rep. No. 2222, 60th Cong., 2d Sess. 7 (1909).

<sup>103</sup> See, e.g., *Feist Publication, Inc. v. Rural Telephone Serv. Co.*, 499 U.S. 340, 349 - 50 (1991); *Mazer v. Stein*, 347 U.S. 201, 219 (1954).

<sup>104</sup> See 17 U.S.C. § 102(a) (1996).

<sup>105</sup> See *Feist*, 499 U.S. at 345.

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protection extends only to the “expressive” portion of a work; the underlying facts themselves remain outside the scope of copyright.<sup>106</sup>

#### **5.1.1.2 Fixation**

A work must also be “fixed” in a “tangible medium of expression” to receive copyright protection. The fixation requirement reflects a background understanding that, in order to protect a creative work, one needs to first create a piece of “property” and then protect such property against copying and distribution.<sup>107</sup> Accordingly, a work is “fixed” if it is “sufficiently permanent or stable to permit it to be perceived, reproduced, or otherwise communicated for a period of more than transitory duration.”<sup>108</sup>

When Congress enacted the copyright statute, however, it realized that future technological advances would change how works are stored and retrieved. Congress ensured that copyright protection would evolve along with technological advances by specifying that the tangible medium of expression could be one that is either “now known or later developed,” and by providing that the fixation requirement would be satisfied even if “the aid of a machine or device” is required to see, copy, or communicate the work.<sup>109</sup>

#### **5.1.2 The Exclusive Rights Conferred by Copyright Law**

Copyright owners are granted certain exclusive rights over their copyrighted works. These rights include the right to make copies of the work, the right to make “derivative works” based on the copyrighted work, the right to distribute the work, the right to publicly perform the work, and the right to publicly display the work.<sup>110</sup>

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<sup>106</sup> See *id.* at 347 - 51.

<sup>107</sup> See Raymond T. Nimmer & Patricia Ann Krauthaus, *Copyright on the Information Superhighway: Requiem for a Middleweight*, 6 STAN. L. & POL'Y REV. 25, 28 (1994).

<sup>108</sup> 17 U.S.C. § 101 (1994).

<sup>109</sup> See *id.* § 102(a).

<sup>110</sup> See *id.* § 106.

Notably, however, the copyright statute does *not* grant certain other rights to the owner, such as the right to *control access* to the work or the right to *use* the work. For example, the author of a work has no legal right to prevent others from reading the work, though of course she has the right to restrict the making of copies or distribution of the work. In a sense, granting a direct right to exclude the public from accessing the work seems antithetical to the fundamental goal of copyright -- broad dissemination of creative works to benefit the public.

Moreover, in the print world, a copyright owner's exclusive rights to make copies and distribute the work are generally sufficient to protect her economic interests. Thus, although people often browse through books in bookstores without compensating the author or publisher, this type of access is unlikely to harm the copyright holder's economic interests because the limited use and access has little or no impact on the number of books that are sold. Because making copies is expensive in the print world -- requiring both time and special equipment -- enforcement of the copyright is relatively easy. Thus, the copyright owner's control over generating copies and distribution is a good proxy for controlling access to the information goods.

### 5.1.3 The Fair Use Doctrine

Interestingly, the main provision in the Copyright Act that directly addresses "use" of copyrighted works -- as opposed to making copies of, distributing, or performing the work -- is the "fair use" provision, which provides that certain kinds of uses do *not* constitute copyright infringement. In order to ensure that the public is allowed to engage in beneficial uses of copyrighted works, copyright law specifies a series of limits on the copyright owner's set of exclusive rights.<sup>111</sup> The most open-ended -- and most important -- limitation is the "fair use" exception, which is set out in section 107 of the Copyright Act. Unlike the other statutory limitations on copyright, which are directed at specific classes of copyrighted works and specific

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<sup>111</sup> See *id.* §§ 107 - 19.

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types of uses,<sup>112</sup> the fair use exception applies to all categories of protected works and limits each of the copyright owner's exclusive rights.

The first sentence of section 107 states that certain types of uses of copyrighted works, "such as [for] criticism, comment, news reporting, teaching . . . , scholarship, or research" will not be infringements if they are "fair uses."<sup>113</sup> The second sentence sets out four factors to be used in considering whether a particular use is fair:

- (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market for or value of the copyrighted work.

The first two factors -- the purpose and character of the use, and the nature of the copyrighted work -- are directed at the societal benefits accruing from the proposed use, whereas the third and fourth factors -- the amount and substantiality of the portion used, and the effect of the use on the value of or market for the work -- bear directly on the owner's losses resulting from the use. Because the fair use doctrine forces courts to balance the two fundamental competing goals of copyright law -- the public benefit gained by allowing uses versus the need to protect the economic interests of potential authors to stimulate authorship -- the fair use doctrine lies at the very heart of the entire copyright system.<sup>114</sup>

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<sup>112</sup> For example, § 108 exempts certain copies made by libraries, and § 117 exempts copies of computer programs that are necessary to use the program or for archival purposes. *See id.* §§ 108, 117.

<sup>113</sup> *See id.* § 107.

<sup>114</sup> *See* PAUL GOLDSTEIN, 2 COPYRIGHT 10:9 (2d ed. 1994).

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## 5.2 Applying Copyright Law to the Digital Networked Environment

Copyright law is difficult to apply in the digital networked environment because new technologies draw the two goals of copyright – first, fostering dissemination of creative works and second, granting authors legal rights over their works to promote creation – into direct conflict. In a world in which copyrightable works such as books, magazines, and photographs were disseminated through paper hardcopies, copyright law worked mainly by giving copyright owners a remedy against large-scale copiers who had the capacity to harm the market for the copyrighted good. Because copying by a large-scale infringer was the main evil to be deterred, the public was left with quite a bit of freedom to make copies or use copyrighted works, which comported well with copyright's goal of broad dissemination. For example, the first fair use factor (the purpose and character of the use), the third factor (how much of the copyrighted work is copied), and the fourth factor (the effect of the use on the market of the copyrighted work) all suggest that private copying should often be considered fair use and thus be allowed.

In the networked environment, however, there is no single “bottleneck” – such as the large-scale infringer -- that threatens a copyright owner's economic interests.<sup>115</sup> Any user on the network can instantaneously create hundreds or thousands of copies of a work and distribute it to other users. Even if individuals on the network only make copies of works for their own use, with no intention of distributing the work to others, the fact that *every* such individual is able to make such a copy can potentially destroy the market for copyrighted goods. Proponents of copyright reform believe that copyright law in the digital environment must be clarified and strengthened to apply to all digital copies if it is to protect the rights of copyright owners. Accordingly, only very limited types of copying would be exempt from copyright liability. Thus, in order to protect effectively the economic incentives to generate creative works, public access to copyrighted works would be seriously curtailed.

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<sup>115</sup> The White Paper, discussed *infra*, proposes essentially to *create* (as a matter of law) such large-scale infringers to boost copyright protection on-line. Specifically, the White Paper recommends that on-line service providers – those organizations that provide the public with access to the Internet – should be held liable for the actions of their subscribers, on the theory that they are in the best position to monitor and control their subscribers. See NII WHITE PAPER, *supra* note 1, at 114 - 18. This proposal remains the subject of debate and lobbying in Congress.



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This alleged mismatch between current copyright law and digital technologies has led to efforts to change the state of existing law. Several of the most noteworthy examples are described below.

### 5.2.1 The White Paper

In early 1993, President Clinton commissioned the Information Infrastructure Task Force (IITF) to develop his Administration's policy toward the National Information Infrastructure. In September 1995, the IITF released a report titled *Intellectual Property and the National Information Infrastructure*. This report, better known simply as the "White Paper," represents the Administration's official policy with respect to intellectual property rights in the digital network environment. The White Paper proposes strengthening on-line copyright protection in several ways.

#### 5.2.1.2 Temporary Copies in RAM as Infringing "Reproductions"

First, and perhaps most controversially, the White Paper interprets existing law to mean that temporary copies of a work within a computer's volatile memory are sufficiently fixed to constitute infringing copies within the meaning of the copyright statute. Because one has to make such a temporary copy in memory in order to view a work when browsing on the network, such an interpretation would mean that individuals could not read a copyrighted work on-line without infringing the copyright, unless he could assert fair use or some other defense.

Critics of this interpretation argue that, contrary to the White Paper's assertions, the correct interpretation of the Copyright Act with respect to temporary RAM copies is not clear and that the White Paper ignores contrary interpretations.<sup>116</sup> They point to the House of Representatives Report accompanying the 1976 Copyright Act, which distinguishes volatile "copies" from copies recorded on video tape or film, stating that

"the definition of 'fixation' would exclude from the concept purely evanescent or transient reproductions such as those projected briefly on a screen, shown

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<sup>116</sup> See Samuelson, *supra* note 100, at 134, 137.

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electronically on a television or other cathode ray tube, or *captured momentarily in the “memory” of a computer.*<sup>117</sup>

### **5.2.1.2 Transmissions as “Distributions”**

Second, the White Paper recommends that the Copyright Act be amended to explicitly recognize that electronic transmissions of a copyrighted work are distributions, and therefore may fall within the copyright owner’s exclusive right to distribute copies to the public. Under this provision, an individual could not, in general, send copies of a work that he found interesting or worthwhile to others, and could hamper the free flow of information on the network. However, the White Paper notes that the copyright holder’s exclusive right is limited to distributions “to the public,” and furthermore that fair uses would still be allowed.

### **5.2.1.3 Copyright Management Information**

The White Paper proposes that legislation should be enacted to prevent individuals from removing or altering copyright management information that is associated with copyrighted works. Such management information, also known as *metadata*, might include terms such as the name of the author or copyright owner, the terms of use, or where the user should go to find the complete work or to pay for the work.

As the White Paper was released, bills were introduced in both houses of Congress that would have enacted the legislative recommendations in the White Paper.<sup>118</sup> Due to opposition from many sources, including heavy opposition from the on-line service providers, these bills were not enacted. However, as Congress moves to implement the WIPO Copyright Treaty,<sup>119</sup>

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<sup>117</sup> H.R. Rep. No. 94-1476, at 53 (1976), *reprinted in* 1976 U.S.C.C.A.N. 5659, 5666 (emphasis added).

<sup>118</sup> See NII Copyright Protection Act of 1995, H.R. 2441, 104th Cong. (1995); NII Copyright Protection Act of 1995, S. 1284, 104th Cong. (1995).

<sup>119</sup> See *infra* Section 5.2.2.

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there are indications that some of the above provisions – in particular the one dealing with copyright management information – may be incorporated into the implementing legislation.<sup>120</sup>

### 5.2.2 WIPO Copyright Treaty

The World Intellectual Property Organization (WIPO) is a United Nations organization whose purpose is to promote cooperative intellectual property protection among countries. In December 1996, a WIPO conference made up of representatives from various nations adopted the WIPO Copyright Treaty (“Copyright Treaty”), which will become effective when 30 countries have ratified the treaty.<sup>121</sup>

The United States is expected to ratify the Copyright Treaty in 1997.<sup>122</sup> Once the United States ratifies the treaty and the treaty enters into force, it will operate with binding legal force upon the United States. Inconsistent domestic law would place the United States in breach of its treaty obligations. As a result, the Copyright Treaty is instructive because it will limit United States domestic copyright law reform. The full texts of the WIPO Copyright Treaty as well as the official Agreed Statements Concerning the WIPO Copyright Treaty (“Agreed Statements”), both adopted by the WIPO diplomatic conference, are provided in Appendices I and II.

#### 5.2.2.1 *Temporary Copies in RAM Not Infringing Copies*

One significant provision in the Copyright Treaty is the way it defines “copies” that fall under an author’s exclusive right of distribution to the public. Similar to the White Paper’s approach to U.S. copyright law, the first draft of the Copyright Treaty originally defined a protected copy as any “direct or indirect reproduction . . . , *whether permanent or temporary, in any manner or form*” and thus apparently would have covered RAM used to display the content

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<sup>120</sup> See WIPO Copyright and Performances and Phonograms Treaty Implementation Act of 1997, S. 1121, 105th Cong. (1997); WIPO Copyright Treaties Implementation Act, H.R. 2281, 105th Cong. (1997).

<sup>121</sup> See WIPO Copyright Treaty, open for signature Dec. 31, 1997, available at <<http://www.wipo.org>>.

<sup>122</sup> Cf. sources cited *supra* note 120.

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or for caching purposes. In the original draft, individual nations would have been able to create exceptions to this strict definition.

Because of significant criticism from the Internet community, however, the WIPO delegates removed this definition and instead specified in the Agreed Statements accompanying the treaty that copies “refer exclusively to fixed copies that can be put into circulation as tangible objects.”<sup>123</sup> Thus, the WIPO Copyright Treaty seems to reverse the stance adopted by the U.S. government in the White Paper regarding temporary copies in computer memory.

#### **5.2.2.2 Fair Use**

The Copyright Treaty also contains, in Article 10 and its associated Agreed Statement, language that supports continued fair use in the digital environment. At the conference, the United States delegation specifically expressed its concern that the draft language did not adequately allow countries to adapt existing exceptions to copyright -- in particular fair use -- to the digital environment. As a result, the conference adopted the United States’ interpretive language that the Treaty allows signatory countries “to carry forward and appropriately extend” as well as to “devise new exceptions and limitations” to copyright grants that are appropriate.<sup>124</sup> The Clinton Administration’s policy in negotiating international agreements and enacting domestic legislation thus seems to be that the fair use doctrine should be used to protect the public’s right to access copyrighted works.

### **5.3 Database Protection Proposals**

In addition to seeking the changes in both national and international copyright law discussed above, policy-makers and legislators are also moving to expand the scope of intellectual property rights to meet the realities of the marketplace for digital information goods.

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<sup>123</sup> World Intellectual Property Organization, *Agreed Statements Concerning the WIPO Copyright Treaty* (1996), available at <<http://www.wipo.int/eng/diplconf/distrib/96dc.htm>>.

<sup>124</sup> See U.S. Delegation Statement to WIPO Conference, Dec. 12, 1996, <<http://usiahq.usis.usemb.se/topical/global/ip/ip45txt.htm>>.

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In particular, policy-makers have sought to give database owners new protected rights in their databases, which often are not protected under existing copyright law.

### 5.3.1 The *Feist* Decision

The move to create new intellectual property rights in databases was prompted by the United States Supreme Court's decision in a 1991 case called *Feist Publications, Inc. v. Rural Telephone Service Co.*<sup>125</sup> In *Feist*, the plaintiff, a small local phone company that collected the names and addresses of its customers into a "white pages" directory, refused to license its listings to the defendant, a publisher of regional phone directories. The defendant subsequently copied the plaintiff's listings and incorporated them into its own directory service.

The Supreme Court held that there was no copyright infringement because the plaintiff's work – the white pages – was not sufficiently original to qualify for copyright protection. The Court reaffirmed its previous rulings that the Constitution itself requires originality before a work can be copyrighted,<sup>126</sup> and then went on to analyze the copyrightability of database-like works, or "compilations," under the 1976 Copyright Act. Because factual information itself is never copyrightable, a *compilation* of facts only becomes copyrightable if it is "selected, coordinated, or arranged *in such a way that* the resulting work as a whole constitutes an original work of authorship."<sup>127</sup> The Court noted that the requirement for originality is not very rigorous, but that there has to be at least "some minimal degree" or "modicum" of creativity in selecting or arranging the underlying facts "to transform mere selection into copyrightable expression."<sup>128</sup> The Court found that the *Feist* plaintiff's selection and arrangement of the underlying facts – namely collecting names and addresses from all subscribers and listing the names alphabetically by last name – was so obvious and routine as to leave the resulting white pages directory unprotected by copyright.

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<sup>125</sup> 499 U.S. 340 (1991).

<sup>126</sup> *See id.* at 346.

<sup>127</sup> *Id.* at 356 (quoting 17 U.S.C. § 101).

<sup>128</sup> *Id.* at 362.

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The *Feist* decision thus definitively rejected the “sweat of the brow” or “industrious collection” doctrine, which some lower courts had adopted in order to grant copyright protection to those individuals who had labored to collect facts into a database.

### 5.3.2 H.R. 3531 and the WIPO Draft Treaty on Intellectual Property in Databases

After *Feist*, a compilation of facts can receive copyright protection only if it demonstrates some creative expression that is the result of originality in selecting and arranging the underlying facts. However, databases are often useful precisely because they are exhaustive – thus negating the potential for creativity in “selection” – and organized in the most straightforward fashion possible – thus negating the potential for creativity in “arrangement.” As a result, the most useful databases may also be the ones that are least likely to receive copyright protection. At the same time, electronic databases are becoming more and more valuable economically as computers and networks allow more and more people to access and quickly search through large volumes of information.

In response to these developments in copyright law, owners of electronic databases have pressed for new intellectual property protections for their work products. In the United States, the Database Investment and Intellectual Property Antipiracy Act of 1996<sup>129</sup> was introduced in the House of Representatives in May 1996, and a new international treaty on database protection was scheduled for discussion at the December 1996 WIPO conference. These two proposals were rather similar, and would have created a new category of intellectual property right in databases.

Although there were many detailed critiques of these proposals,<sup>130</sup> one of the main criticisms was that the new laws would have denied users access to materials that were previously in the public domain. First, the database proposals did not explicitly create any fair use rights for users. Second, although under the proposed U.S. law users would be allowed to

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<sup>129</sup> H.R. 3531, 104th Cong. (1996).

<sup>130</sup> For an excellent discussion of the implications of the two database proposals, see Love, *supra* note 100.

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use “insubstantial parts of [a database’s] contents . . . for any purposes whatsoever,”<sup>131</sup> “insubstantial parts” was defined so narrowly as to make potentially any use a violation of the right.<sup>132</sup>

Ultimately, neither the House bill nor the proposed treaty was adopted. The House bill died within the committee in which it was introduced when the 104th Congress adjourned, whereas the WIPO diplomatic conference postponed action on the Draft Database Treaty.<sup>133</sup> Nevertheless, a database protection proposal is already on the books in the European Union as an E.C. Directive,<sup>134</sup> and it is quite possible that there will be more future efforts to grant intellectual property rights in database information.

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<sup>131</sup> Database Investment and Intellectual Property Antipiracy Act of 1996, H.R. 3531, 104th Cong. § 5(a) (1996).

<sup>132</sup> See Love, *supra* note 100, at 5 - 6.

<sup>133</sup> See J.H. Reichman & Pamela Samuelson, *Intellectual Property Rights In Data?*, 50 VAND. L. REV. 51, 54 & n.7 (1997).

<sup>134</sup> See Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the Legal Protection of Databases, 1996 O.J. (L 77) 20.

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## MICROPAYMENTS AND INTELLECTUAL PROPERTY PROTECTION

Chapter 5 set out the structure of intellectual property law as it applies to the digital network environment. This chapter analyzes the effect that micropayments may have on intellectual property protection -- on the scope of protection that should be conferred by law, as well as the means to effectuate those protections. First, aside from the *legislative* initiatives discussed in Chapter 5, I analyze what effect a working micropayment system is likely to have on the scope of copyright protections through the *judicially* determined “fair use” doctrine, and conclude that micropayments undermine the core rationale for fair use. Next, I argue that the various efforts to increase intellectual property *rights* is somewhat misguided because the real issue for content owners should be increased intellectual property *protection*, which is related to but not equivalent to broader legal rights. Finally, this chapter considers a different approach to intellectual property protection that might facilitate intellectual property protection without curtailing the public’s right to use the works. Contrary to the legislative initiatives described in Chapter 5, such a system is not based solely on expanding the legal rights of intellectual property rights owners but rather on a combination of technical, legal, and market factors.

### **6.1 The End of Fair Use**

Each of the different positions in the debate over intellectual property rights places emphasis on the fair use doctrine. For example, the White Paper states that criticisms about



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overexpansive copyright grants are misplaced because fair use rights are still available.<sup>135</sup> Critics of the White Paper argue that it misconstrues fair use rights and that the fair use doctrine should be interpreted more broadly to protect the broader purposes of copyright.<sup>136</sup> At the WIPO conference on the Copyright Treaty, the U.S. delegation stressed that the treaty provisions should be interpreted to allow further evolution of the fair use doctrine.<sup>137</sup> And opponents of new database intellectual property laws argue that the fair use analogs in those proposals do not grant the public adequate or meaningful access to and use of public information.<sup>138</sup>

Although each side in the debate seems to argue that fair use is the key to public access in the world of digital information goods, the trend in the courts seems instead to be one of narrowing fair use rights. This section argues that, if micropayments become a viable payment system, they are likely to only further undermine the rationale for fair use.

### 6.1.1 Evolution of the Fair Use Doctrine in the Courts

Courts have played a role in defining the types of uses that are immune from copyright liability for over a century.<sup>139</sup> The 1976 Copyright Act codified this involvement by the courts, and explicitly instructed courts to consider various factors when analyzing fair use claims. Moreover, both Congress and the courts have asserted that fair use is “an equitable rule of reason” and that each case “must be decided on its own facts.”<sup>140</sup> Therefore, the fair use doctrine has evolved and will continue to evolve based on how courts choose to analyze fair use claims.

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<sup>135</sup> See NII WHITE PAPER, *supra* note 1, at 65 & n.203, 216.

<sup>136</sup> See, e.g., Samuelson, *supra* note 100, at 138, 188.

<sup>137</sup> See U.S. Delegation Statement to WIPO Conference, *supra* note 124.

<sup>138</sup> See Love, *supra* note 100.

<sup>139</sup> See GOLDSTEIN, *supra* note 114, at 10:1.

<sup>140</sup> Harper & Row, Publishers, Inc. v. Nation Enterprises, 471 U.S. 539, 560 (1985); H.R. Rep. No. 94-1476, at 65 (1976), reprinted in 1976 U.S.C.C.A.N. 5659, 5679.

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Courts analyzing fair use claims have placed the heaviest emphasis on the fourth factor set out in section 107,<sup>141</sup> which instructs courts to consider “the effect of the use upon the potential market for or value of the copyrighted work.”<sup>142</sup> In *Sony Corp. v. Universal Studios*,<sup>143</sup> the United States Supreme Court’s first decision addressing fair use under the Copyright Act, the Court focused on this fourth factor to find that “time-shifting” – a practice whereby viewers record television programs and view them at a time different from when the programs are broadcast – constitutes a fair use of copyrighted programs.<sup>144</sup>

In its decision, the *Sony* Court adopted a rather low threshold for when it would find harm to the potential market for the copyrighted work under the fourth factor. The court wrote that there need only be proof that “if [the contested use] should become widespread, it would adversely affect the potential market for the copyrighted work.”<sup>145</sup> Despite this low threshold test, the *Sony* Court relied on the trial court’s determination that there was no proof of either present harm or the likelihood of future harm to the market, and concluded that time-shifting constituted fair use. Justice Blackmun, in dissent, criticized the majority for neglecting the potential market represented by the viewers who practiced time-shifting, and argued that copyright owners should have been allowed to exact fees from such viewers.

In *Harper & Row Publishers v. Nation Enterprises*,<sup>146</sup> the Supreme Court’s next case explaining the fair use doctrine, Justice O’Connor’s opinion for the Court reinforced the importance of the potential market. Like the majority opinion in *Sony*, Justice O’Connor stressed that “[f]air use, when properly applied, is limited to copying by others which does not materially impair the marketability” of the copied work.<sup>147</sup> More significantly, however, Justice

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<sup>141</sup> See William W. Fisher III, *Reconstructing the Fair Use Doctrine*, 101 HARV. L. REV. 1659, 1668 (1988) (analyzing the first two Supreme Court opinions on fair use, and concluding that the Court’s most important consideration is the impact of a use on the potential market for the copyrighted work).

<sup>142</sup> 17 U.S.C. § 107 (1994).

<sup>143</sup> 464 U.S. 417 (1984).

<sup>144</sup> See *id.* at 447 - 55.

<sup>145</sup> *Id.* at 451.

<sup>146</sup> 471 U.S. 539 (1985).

<sup>147</sup> *Id.* at 566 - 67; see Fisher, *supra* note 141, at 1671 (1988).

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O'Connor's opinion also adopted Justice Blackmun's dissenting view in *Sony* regarding the significance of the potential market<sup>148</sup> and that fair use should not be allowed to "impair[] the copyright holder's ability to demand compensation from (or to deny access to) any group who would otherwise be willing to pay to see or hear the copyrighted work."<sup>149</sup> Thus, under *Harper & Row*, the fourth factor disfavors a fair use defense whenever the copyright owner has a viable way to seek compensation from users.

After the fourth statutory factor, courts generally consider the first factor to be next in importance.<sup>150</sup> The first factor instructs courts to consider the "purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes." In *Sony*, the Supreme Court implied that commercial, profit-seeking uses should be presumptively unfair whereas noncommercial private uses should be presumptively fair.<sup>151</sup> In a more recent decision, however, the Court rejected such presumptions and wrote that the first factor must be weighed against other facts, and that the weight of this factor would depend on the specific circumstances.<sup>152</sup> Even though the Supreme Court rejected presumptions regarding whether a use is fair based on its commercial or noncommercial nature, the first factor only seems to make sense as setting forth a view that noncommercial uses are more benign than commercial ones, presumably because noncommercial uses pose a smaller threat to a copyright owner's economic interests.<sup>153</sup>

The courts' heavy emphasis on the fourth and first statutory factors in fair use cases reveals the importance of economic analyses in fair use decisions. In fact, economic analysis is "undoubtedly the most venerable and oft-recited of the justifications for the American law of intellectual property."<sup>154</sup> Lower court cases involving fair use claims also show the important

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<sup>148</sup> See *Harper & Row*, 471 U.S. at 568.

<sup>149</sup> *Sony*, 464 U.S. at 485 (Blackmun, J., dissenting).

<sup>150</sup> See *Fisher*, *supra* note 141, at 1668.

<sup>151</sup> See *Sony*, 464 U.S. at 451.

<sup>152</sup> See *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569, 583 - 84 (1994).

<sup>153</sup> See *Fisher*, *supra* note 141, at 1672 - 73.

<sup>154</sup> *Fisher*, *supra* note 8141, at 1688.

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role of economics in the fair use defense. In *Sega Enterprises v. Accolade, Inc.*,<sup>155</sup> for example, Sega alleged that Accolade violated Sega's copyrights over its software when Accolade decompiled object code from Sega video game programs in order to learn how to interface its own programs with the Sega Genesis console. The court disagreed and allowed the copying as a fair use. With respect to the first factor, the court found that Accolade's copying was for a commercial purpose, which weighed against fair use. As to the fourth factor, the court found that there was no basis for thinking that Accolade's game cartridges affected the market for Sega's game cartridges, though the court's reasoning and conclusion on this point seems especially suspect. The court's real rationale for its decision appears to be grounded in the economic considerations that played a role in the court's analysis of the first, second, and fourth fair use factors. The court noted that the underlying functionality of the software was not protectable, and realized that Sega was using copyright law in an effort to monopolize the game market by preventing competitors from creating compatible game cartridges. Thus, *Sega* might also be understood as another decision in which economic considerations – in this case concerns about promoting a competitive market -- dictated the outcome.

### 6.1.2 An Economic Analysis of Fair Use

Given the emphasis that courts place on economic analysis in fair use decisions, it is useful to consider how fair use fits within the economic theory of copyright. As a general matter, economists would employ the fair use exemption to increase social utility.

One copyright scholar notes, however, that there are actually two different conceptual approaches to economic analysis of intellectual property law that lead to very different outcomes regarding the proper scope of intellectual property rights.<sup>156</sup> The *incentive approach* is basically skeptical of intellectual property rights, and asks whether legal rights are needed to create economic incentives for creating new works. Adherents to this approach would limit the scope of copyright, and intellectual property rights in general, to the minimum degree necessary to give

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<sup>155</sup> 977 F.2d 1510 (9th Cir. 1992).

<sup>156</sup> See Neil Weinstock Netanel, *Copyright and a Democratic Civil Society*, 106 YALE L.J. 283, 308 - 09 (1996).

authors incentives to create new works. The *neoclassicist approach*, on the other hand, favors broad, clearly defined property rights that give copyright owners the ability to realize the full economic potential of their works. Neoclassicists argue that such rights allow the market to price and signal consumer preferences, and will lead to works that consumers want. Over the last several decades, the neoclassicist approach has come to dominate the way that courts analyze intellectual property law.<sup>157</sup>

		Public Loss if Fair Use is denied	
		Large	Small
Author's Gain if Fair Use is denied	Large	<i>Box 1</i> Probably No Fair Use	<i>Box 2</i> No Fair Use
	Small	<i>Box 4</i> Fair Use	<i>Box 3</i> Probably Fair Use

**Figure 7 : Economic Rationale for Fair Use**

Under the neoclassicist model, the fair use defense should be allowed when an author can receive a large benefit from protection but the public loses only a small amount of utility. In contrast, when an author receives only a small benefit from copyright protection but the public

<sup>157</sup> For a fuller discussion on this point, and citations to judicial opinions in support of this argument, see *id.* at 308 – 10.

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loses a great deal of utility, fair use should not be granted.<sup>158</sup> These two situations represent Box 4 and Box 2, respectively, in Figure 7.

An incentive-based approach leads to the same conclusion in these two situations: because copyright protection is necessary to induce authors to create new works in Box 2, a fair use defense should not be granted; because copyright protection is not needed to spur creation in Box 4, a fair use defense should be allowed.

The applicability of fair use in the other two situations shown in Figure 7 is more difficult. In Box 1, both the author's potential gain and the public's potential loss are large if fair use is not allowed. Although these two concerns point in opposite directions, the need to give authors legal protection in order to foster creativity would probably lead to no fair use in most cases. In Box 3, on the other hand, both the author's potential gain and the public's potential loss are small if fair use is not allowed. Under the incentive approach, fair use would probably be allowed in many of these cases because there is no compelling need to grant copyright protection to promote new works. Under the neoclassicist approach, the case is closer but fair use would probably still be granted, especially if there is no efficient way for authors to receive compensation for their works.

Consider, for example, a student who wishes to copy a few pages out of a book for a research paper. The student derives utility from the excerpted pages and would be willing to pay some small value for them, but is not willing to buy the entire book. In the print world, the high transaction costs preclude the author and the student from making an agreement for the sale of the pages. Thus, because no transaction occurs, there is no way for the student to buy the pages she values. In this situation, fair use is desirable. The author will not receive any compensation from the student regardless of whether fair use is granted, and the author is therefore neutral with respect to whether fair use is allowed. The student, on the other hand, benefits from fair use because she benefits from being able to use the pages.

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<sup>158</sup> See Fisher, *supra* note 141, at 1767.

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### 6.1.3 Micropayments and the Decline of Fair Use

If micropayment systems become established, they are likely to undermine the justifications for the fair use doctrine. If the example above took place in the on-line environment, micropayments could lower the transaction cost between the parties and make it possible for the student to pay the author a small but nonzero fee for the few pages of material. If fair use is granted, the student will copy the pages for free and the author will not receive compensation. If fair use is *not* granted, however, the student will presumably compensate the author via the micropayment system and receive the desired information. Either way, the student benefits because she can access the information. By making it possible for hundreds and thousands of students to each pay a small fee for the information they consume, micropayments shift this scenario from Box 4 to Box 2. If a fair use exception is allowed, the author loses the ability to recoup substantial revenues from the entire class of users. On the other hand, because information goods sold via micropayments are very cheap, denying fair use excludes very few would-be users and thus imposes very small social costs.

Referring back to copyright doctrine, micropayments are likely to decrease findings of fair use because they enlarge the potential market for the copyrighted work (the fourth factor) and eliminate the rationale to treat private, noncommercial uses differently from commercial uses (the first factor). First, a micropayment system transforms virtually every use of an information good into a viable market transaction. In our current system, very low value transactions are not feasible and therefore many uses of information goods are not captured as market transactions. If micropayments become available, *every* information good and *every* use of an information good becomes part of an actual or potential market, and therefore every finding of fair use inhibits a copyright owner's ability to recover revenues from this market. Under the neoclassicist model, fair use should not be granted in such situations.

Micropayments also undermine the preferred status of private noncommercial uses under the fair use doctrine. Traditionally, private uses have been accorded more protection under fair use because commercial infringements are the main threat to the copyright holder's profits. Commercial infringements tended to adversely affect the market for the owner's copyrighted good, whereas noncommercial infringements did not displace transactions that could otherwise be captured by the market. In the on-line information goods market, however, goods are sold

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directly to end users and the distinction between commercial and noncommercial uses no longer makes sense.<sup>159</sup> Every use is at the same time a private use as well as, at least potentially, a market sale. Private noncommercial uses thus directly impair a copyright holder's economic interests just as much as commercial uses do.

### **6.1.3.1 *The Second Circuit's Texaco Decision***

One recent case by an intermediate level federal court provides some insight into how the courts are likely to construe fair use in light of micropayments. In *American Geophysical Union v. Texaco Inc.*, the United States Court of Appeals for the Second Circuit ruled that Texaco's practice of photocopying academic journal articles was not a fair use because Texaco could have purchased a photocopying license from the journal publishers.<sup>160</sup> Like micropayments, the collective photocopying license is an alternative payment model developed by copyright holders to exact fees from users that would be unrecoverable through the traditional subscription channels. Texaco had subscribed to scientific journals for its research library, but also circulated these journals among its research staff. The researchers regularly photocopied articles that were relevant to their work and kept them in their own files. An association of publishers sued Texaco, claiming that the practice infringed their copyrights, and Texaco asserted a fair use defense in response.

The Second Circuit focused heavily on the market effect factor to find that, although there was no strong evidence that the plaintiffs' sales and subscription revenues would increase if the court rejected the fair use defense, the existence of another avenue for revenues – the photocopying license – was sufficient to support the conclusion that Texaco's actions “substantially harm[ed]” the value of the plaintiffs' copyrights.<sup>161</sup>

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<sup>159</sup> See Jane C. Ginsburg, *Putting Cars on the “Information Superhighway”: Authors, Exploiters, and Copyright in Cyberspace*, 95 COLUM. L. REV. 1466, 1477 (1995) (noting that a distinction for private copying “makes little sense in a world where the work is predominantly marketed directly to the end user”).

<sup>160</sup> See *American Geophysical Union v. Texaco Inc.*, 60 F.3d 913, 931 - 32 (2d Cir. 1994).

<sup>161</sup> See *id.* at 931.



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Under the Second Circuit's reasoning, micropayments present an even more compelling case to deny fair use. Micropayments create the ability to market individual articles directly to consumers, making the "potential market" and "value" of the copyrighted work concrete.<sup>162</sup> Indeed, the *Texaco* court stated that the practice of photocopying journal articles would be more significant (and therefore less likely to be a fair use) if there existed a market for the sale of copies of individual articles.<sup>163</sup>

### 6.1.3.2 *Judicial Reluctance to Interfere with the Market for Copyrighted Works*

More fundamentally, courts are unlikely to try and strike the difficult balance between public access and private property rights if there is a market mechanism that conceivably performs this function. Every time courts assess whether a use is fair, they must decide whether the use should be allowed because it promotes public access, or whether the use should be denied because additional protection gives copyright owners more incentive to create works. However, courts often do not want to tackle this question if they can avoid it; instead, many courts believe that the market should resolve this question without judicial intervention. This is the notion that underlies the neoclassicist approach to intellectual property rights, and is what differentiates it from the incentive approach.

In *Texaco*, the dissent argued that fair use should be granted because giving additional revenue to the journal *publishers* -- a result of the majority's decision to deny fair use -- was unlikely to have any significant effect on the incentives of *scientists* to author new articles.<sup>164</sup> In other words, the dissent unsuccessfully advocated an incentive-based approach to copyright. The majority, on the other hand, rested its decision on the availability of the photocopying licensing scheme<sup>165</sup> and its desire to avoid entangling itself in details about how much incentive authors actually need to create new works<sup>166</sup> -- a neoclassicist approach.

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<sup>162</sup> The dissent in *Texaco*, for instance, argued strenuously that the harm to the potential market that the majority found was "illusory." *See id.* at 932 (Jacobs, J., dissenting).

<sup>163</sup> *See Texaco*, 60 F.3d at 927.

<sup>164</sup> *See id.* at 939 - 40 (Jacobs, J., dissenting).

<sup>165</sup> *See id.* at 938 ("It is hard to escape the conclusion that the existence of the [licensing scheme] -- or the perception that . . . license fees are or may become "administratively tolerable" -- is the

Compared to collective photocopying licences, micropayments provide a more direct method to charge users a fee for information goods and, at least intuitively, do not exclude as many users because they are, by definition, very low cost. Therefore, it seems reasonable to conclude that if micropayments become viable, courts are more likely to rely on the microtransaction market to sort out the degree of access users should have to digital works, rather than to engage in detailed fair use inquiries.

## **6.2 Micropayments and a Market-Based Approach to Intellectual Property Protection**

Even though micropayments may significantly change the meaning of fair use and the scope of copyright *law*, it does not necessarily mean that users will have less access to works. Similarly, even though more constrictive fair use rights mean that copyright owners have broader *legal* rights, it does not necessarily mean that copyright owners will exclude users from information that was previously in the public domain. Instead, micropayments are one part of a new approach to copyright made up of technical, legal, and market elements that can extend our current system of intellectual property protection into the digital environment. This section outlines the different elements that support this approach to intellectual property protection and explains why this approach may be superior to efforts that focus on changing the legal rules of intellectual property.

### **6.2.1 Protecting Uses, Not “Copies”**

As I noted earlier, one of the main problems with applying copyright law to digital technologies is that copyright law, when it was conceived, was aimed targeted at deterring the illegal “copy”ing of – rather than regulating the use of – valuable creative works. Adapting copyright law to meet today’s needs would require defining what constitutes a “copy” very

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chief support for the idea that photocopying scholarly articles is unfair in the first place.”); Ginsburg, *supra* note 159, at 1490 - 91.

<sup>166</sup> See *Texaco*, 60 F.3d at 927; *id.* at 939 - 40 (Jacobs, J., dissenting).

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expansively and would lead to “legal fictions” such as rulings that computer instructions residing solely in a computer’s RAM are sufficiently “fixed” to be an infringing copy. Given the conceptual unease and potential overbreadth these interpretations create – and given that the newly adopted WIPO Copyright Treaty seems to preclude such an interpretation – it is appropriate to find new approaches to protect intellectual property. A system based on micropayments is a desirable alternative because it focuses directly on *use*. Micropayments allow content creators to be compensated when people use or access their work, even if – as in databases or compilations – those works are unprotected by copyright law.

## **6.2.2 Technological Strategies for On-line Intellectual Property Protection**

There are several reasons why illegal copying of information goods is widespread today. First, illegal copying may be widespread because users have no easy way to license or pay for the work. Second, digital works are extremely easy to copy. Third, many, if not most, users may believe that they have a right to make a few copies of any given work. Micropayments, in conjunction with copyright management technologies, might be able to address each of these problems. A working micropayment system can make paying for a license a practical alternative. Both the ease of illegal copying and the casual disregard of intellectual property rights might be alleviated by making copyright notices more conspicuous and securely attaching them to digital works. For example, users faced with prominent copyright information might think twice before making a copy. Combining an easy-to-use and inexpensive micropayment system with such copyright management techniques might provide a way to increase copyright compliance and intellectual property *protection*. I refer to the above approach to intellectual property protection as a *market-based form of intellectual property protection*.

### **6.2.2.1 Attribution and Metadata**

The possibility of using micropayments to facilitate market-based intellectual property protection builds on previous work relating metadata to intellectual property protection. *Metadata* is basically data about data; it is information about and associated with another data element of interest. In particular, researchers have proposed using a labeling mechanism, referred to as “headers and descriptors,” to promote interoperability among the many different

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types of information communicated in open communications environments like digital networks.<sup>167</sup> However, although headers and descriptors allow one to *trace* the source of an information work and to append information such as copy permissions – and thus constitute one part of a system for protecting intellectual property on the network -- they were not designed to prevent the unauthorized copying or use of digital data.<sup>168</sup> Headers and descriptors alone are insufficient to resolve concerns over intellectual property protection in the networked environment because they provide no way to constrain users' behavior.<sup>169</sup>

There are several ways in which micropayments can be combined with other technological strategies to strengthen copyright protection.

Erickson describes a copyright management system, known as the @ttribute system, similar to the pure headers and descriptors approach.<sup>170</sup> This system focuses on the needs of information producers quickly and accurately to incorporate existing information goods into their works, and thus assumes a high degree of voluntary compliance with copyright laws. In particular, @ttribute is *not* designed as a method of copyright *enforcement*. The system is designed to maintain robust *attribution* of a digital work to its author. The @ttribute system ensures that each digital work is securely linked to information describing its ownership and the permissions to others to use the work, and also provides a convenient interface for users to license the work from the copyright owner. The @ttribute system is designed to meet the needs of information *producers* on the network, who need to know who owns the work they are viewing, whether they can incorporate the work into the content they are creating, and how much they must pay for a license to incorporate the work. The link to the management information, or the *attribution*, persists through use, reuse, and reincorporation of the digital work into new

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<sup>167</sup> See Branko J. Gerovac & David Staelin, *SMPTE Task Force on Header/Descriptors, Final Report*, SMPTE J. (1992); Branko J. Gerovac & David C. Carver, *Headers and Descriptors – In the Quest for Interoperability* (1995), available at <[http://farnsworth.mit.edu/pubs/h\\_d\\_paper/abstract.html](http://farnsworth.mit.edu/pubs/h_d_paper/abstract.html)>.

<sup>168</sup> See Center for Technology, Policy and Industrial Development, Massachusetts Institute of Technology, *Report of the Workshop on Technological Strategies for Protecting Intellectual Property in the Networked Multimedia Environment* 6 (1993) (comments of Richard Solomon).

<sup>169</sup> See *id.* at 10 – 11 (comments of Pamela Samuelson).

<sup>170</sup> See John S. Erickson, *Copyright Management through Enhanced Attribution in the Digital Networked Environment* (1997) (unpublished Ph.D. dissertation, Dartmouth College).

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content. Because the @ttribute system is not designed to control access to digital works, but rather simply to make ownership information apparent, it does not place any restrictions on use, access, or transfer of information goods.

In many situations, attribution plus the availability of micropayments can reasonably assure owners of digital works that they will be compensated by users who access the work because many users will be willing to pay the license fee and micropayments provide the means to do so. At the same time, the robust attribution system also allows an owner of an information good to monitor whether users who have incorporated her information good into new content have properly paid her a license fee. In addition, attribution also establishes the owner's legal right over her information good and provides the basis for initiating a lawsuit for copyright infringement, should this prove necessary.

#### 6.2.2.2 *Secure Containers*

An alternative approach to increased intellectual property protection is to combine micropayments with *secure content container* technologies to set up a secure "pay-per-view" system. Secure container technologies, like IBM's Cryptolope container, deliver digital works to users in a sealed (encrypted) package.<sup>171</sup> The sealed package may be accompanied by unencrypted information such as the owner of the work, directions specifying how the user can purchase the contents of the sealed package, and even a sample of the sealed work, such as a low-resolution version of a high-resolution image. The Cryptolope technology prevents a user from subsequently copying or transmitting the sealed information to others without paying for the subsequent uses. Combining micropayments with secure container technologies thus provides a metering mechanism by which vendors can charge consumers for each access and use of an information good, if they so wish.

Secure containers have several drawbacks: they require users to pay for digital content before they have sampled the work, they require special software to unlock the containers, and the computational expense associated with encryption makes it impractical for low-cost goods.

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<sup>171</sup> See IBM infoMarket Development, *IBM Cryptolope Containers* (1995), available at <<http://www.informarket.ibm.com/ht3/crypto.htm>>.

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Nevertheless, secure containers can give owners of relatively valuable digital content more protection against illicit copying than a system like @ttribute, and can induce such content owners to make their digital content available on the network.

### **6.2.3 Micropayments and Market-Driven Compliance With Intellectual Property Rights**

This new approach to intellectual property protection represents a shift toward a market-driven model of copyright “enforcement” that resembles, in many ways, our current system of copyright protection and which precludes the need to expand current copyright law. Copyright enforcement through the legal system entails lawyers, court costs, and delay. Such enforcement is simply be too expensive and impractical for most violations of intellectual property rights on the network. Nevertheless, it will still be an option in cases of large-scale infringement or where large economic interests are at stake.<sup>172</sup>

More importantly, however, micropayment-based protection may make coercive enforcement actions largely unnecessary because they increase consumers’ ability and willingness to pay content providers for their goods, which is what most content providers want in the first place. Most users probably attach value to the information goods they procure on the Internet, and are willing to pay content providers a small sum of money for the good or service. These consumers are like the student in the fair use example: they are perfectly willing to pay for the good if a suitable payment mechanism allows them to do so. Technology that attributes works to their authors ensures that users know whom to compensate, and micropayments make the transactions possible.

Even if consumers would otherwise prefer *not* to pay content providers for each access of a work, micropayments can reduce the level of “cheating” by consumers. Economic self-interest will often prompt users to pay content providers because consumers will attach a *convenience value* to information goods that are cheap and readily available. In order to “cheat,”

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<sup>172</sup> Presumably, large-scale infringers who set up their own site to sell pirated works would be easily locatable and could be prosecuted under existing laws. Thus, the hard-to-control infringers are individual consumers.

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on-line consumers would have to make their own copies of information goods and store them in local memory, or send the copied works to friends and neighbors. Consumers are not likely to engage in this practice, however, if the good is readily available on the Internet. Storing a good at home creates both storage costs and, more significantly, organization costs associated with filing and indexing the good so that it can be retrieved when needed. For low cost information goods, these storage and organization costs probably exceed the cost to the consumer of just purchasing another copy whenever she needs one. Similarly, if a work is inexpensive and easily available on the network, consumers who want to share an interesting piece of information with their friends may well be more inclined to send a link to the site where the information resides, rather than to go through the trouble of downloading the information and then passing it on to others.

#### 6.2.4 Access Concerns

A common objection voiced against attempts to broaden copyright protection -- and one that can be leveled against a market-based intellectual property protection system based on micropayments as well -- is that these efforts to increase intellectual property protection improperly remove information from the public domain. Broader intellectual property rights mean that individuals will have to pay for each and every use of a work, turning the "information superhighway into a publisher-dominated toll road." Consequently, some people who have access to information now because it is in the public domain will be denied access once information providers start charging fees for every use. Critics of copyright expansion have therefore argued that proposals to modify the Copyright Act should include provisions that preserve free private uses by individuals and loans by digital libraries.<sup>173</sup>

However, if digital access and dissemination of works becomes significant, authors and copyright owners will need revenue from the on-line market to substitute for lost revenues in the print market. In addition, the very definition of *micropayments* suggests that most digital users will not be excluded by the cost of digital works. There is also no reason to think that digital

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<sup>173</sup> See, e.g., Marci A. Hamilton, *The TRIPs Agreement: Imperialistic, Outdated, and Overprotective*, 29 VAND. J. TRANSNAT'L L. 613, 631 - 32 (1996).

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libraries could not fill the same role that traditional libraries play today – paying a larger fee for works and providing free access to patrons. Moreover, depending on the character of the on-line information market and the kind of micropayment protocols that emerge, a pay-per-use system might support a broader array of content providers. Such a system might give consumers a wider range of information sources, and could reduce the dangers of monopoly power that are associated with alternative payment schemes such as collective licensing.<sup>174</sup>

### 6.3 Changes to Copyright Law Reexamined

With the above model in mind, it is useful now to reconsider proposals to expand copyright protection in the network environment. If technologies such as micropayments, robust attribution, and secure containers develop, there may be no need to change existing practices on the network because a unique market mechanism for protecting intellectual property may emerge in the on-line environment. At the same time, large-scale infringers who pirate works can be easily located through the network, and the combination of attribution technologies and existing laws can be used to punish and deter such illegal conduct. Moreover, because micropayments offer a system of protection tied to the *use* of an information provider's goods, they protect the economic interests of database compilers – whose goods receive no copyright protection – just like they protect owners and creators of copyrighted works. Therefore, legislation creating *sui generis* rights in database compilations should be written to preclude only large-scale, commercial copying of databases, and should exempt individual uses. Finally, intellectual property rights such as copyright are extremely difficult and costly to enforce in the digital networked environment. Micropayments and other technologies suggest that this kind of costly enforcement may be unnecessary, because the *market* – rather than copyright law – will itself provide the economic incentives necessary to promote the creation of new works.

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<sup>174</sup> See generally Netanel, *supra* note 156, at 372 - 76.



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## CONCLUSION

The Internet has already had a significant impact on how people around the world communicate. Current trends suggest that the next stage of its growth will be efforts by corporations, individuals, or governments to exploit the commercial possibilities of the Internet for economic gain. What will commerce on the Internet look like? Will the Internet develop as a medium for selling information goods and services? Who will provide these information goods, and at what price?

The network is a logical medium for buying, selling, and transferring information goods because of the efficiencies and convenience that it offers to both information merchants and information consumers. However, this thesis suggests that the Internet will emerge as a marketplace for low-value information goods only if payment schemes that are more efficient than payment card processing emerge, and if content providers are satisfied that they will be adequately compensated for making their information available on the network.

This thesis argues that, although predictions about future growth of the on-line market in information goods is necessarily unreliable, there does seem to be a market emerging for low-value information goods on the network. There are a number of ways on-line content providers might acquire revenues from users for their information, such as through traditional advertising or subscription strategies. However, there will probably not be enough advertising revenue to support many content providers – including the smallest ones – in this new market. Subscription and other bundling strategies, on the other hand, do not allow content providers to capture revenues from the impulse-buying behavior that may characterize this on-line, low-value information market. Therefore, charging users a fee for each good may be the only viable pricing strategy for many on-line information vendors. The aggregate fees to be earned off such small

transactions will probably not be large enough to attract payment operators like credit and charge card issuers, but they may be significant enough to attract new, more efficient micropayment operators.

The character of the on-line information goods market may be linked to the type of micropayment protocols that become dominant. This thesis has shown that current and proposed micropayment protocols can be divided into two categories, one that focuses on transaction security and one that focuses on transaction efficiency. These two categories of micropayment protocols vary in terms of how much computationally expensive cryptography is used, and whether transaction processing occurs at a central server or at the individual merchant sites. These differences mean that in theory efficiency-oriented protocols cost several orders of magnitude less to operate, and that under current technology, processing a microtransaction using a security-oriented protocol costs at least 1¢ whereas processing a microtransaction using an efficiency-oriented protocol costs fractions of a penny. As a result, the smallest transaction that is feasible varies depending on the particular micropayment protocol. The effect that minimum transaction size has on the character of the emerging on-line information market, including what kinds of information can be sold and who will provide the information, is open to speculation.

Although the need for micropayment protocols, based on predictions of the potential on-line information market, is quite speculative, there is another more pressing concern that may spur the growth of micropayments. Together with other technologies, micropayments may offer a new approach to intellectual property protection that strikes the proper balance between intellectual property rights and public access to information. First, combining micropayments with copyright management information promotes voluntary compliance with copyright laws because information providers will be able to charge users a small fee for using their information. Because these charges are distributed across most or all information consumers, the fees should remain relatively low. In addition, low barriers to entry and competition can also ensure that these fees remain reasonable. For more valuable information goods, micropayments can be combined with secure container technologies to create a fee-per-use payment system, if content creators so desire. This approach will likely be imposed only for relatively important or valuable information because it is more expensive to operate and because it reduces the number of individuals who will be willing to pay for the information good.

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What does a market-based approach to intellectual property protection using micropayments imply for intellectual property law? First, widespread use of micropayments would likely mean the demise of judicially sanctioned fair use exemptions from copyright liability. This means that fair use could probably no longer be used to guarantee free access to copyrighted works, unless copyright laws are amended to redefine fair use. At the same time, however, this new approach to intellectual property protection suggests that there is no need to broaden intellectual property law, either in the domain of copyright or by creating expansive rights in factual databases.

In the digital era, the traditional task of copyright law becomes a general task “to design new forms of market organization that will provide compensation and at the same time reflect the character of the new technology.”<sup>175</sup> As the Internet develops into a market in low-value information goods and services, micropayments may emerge as a form of payment efficient enough to serve this niche market. Micropayments also can help create a microtransaction market in which the economics of the market, rather than legal rules such as copyright, provide the main source of protection for authors’ economic interests and thus the necessary incentive to create new works.

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<sup>175</sup> ITHIEL DE SOLA POOL, *TECHNOLOGIES OF FREEDOM* 249 (1983).

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APPENDIX I: WIPO COPYRIGHT  
TREATY

**WIPO**



**CRNR/DC/94**  
**ORIGINAL:** English

**DATE:** December 23, 1996

**WORLD INTELLECTUAL PROPERTY ORGANIZATION**

GENEVA

**DIPLOMATIC CONFERENCE  
ON  
CERTAIN COPYRIGHT AND NEIGHBORING RIGHTS  
QUESTIONS**

**Geneva, December 2 to 20, 1996**

**WIPO COPYRIGHT TREATY**

*adopted by the Diplomatic Conference on December 20, 1996*

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**Preamble**

*The Contracting Parties,*

*Desiring* to develop and maintain the protection of the rights of authors in their literary and artistic works in a manner as effective and uniform as possible,

*Recognizing* the need to introduce new international rules and clarify the interpretation of certain existing rules in order to provide adequate solutions to the questions raised by new economic, social, cultural and technological developments,

*Recognizing* the profound impact of the development and convergence of information and communication technologies on the creation and use of literary and artistic works,

*Emphasizing* the outstanding significance of copyright protection as an incentive for literary and artistic creation,

*Recognizing* the need to maintain a balance between the rights of authors and the larger public interest, particularly education, research and access to information, as reflected in the Berne Convention,

*Have agreed as follows:*

## **Article 1**

### **Relation to the Berne Convention**

- (1) This Treaty is a special agreement within the meaning of Article 20 of the Berne Convention for the Protection of Literary and Artistic Works, as regards Contracting Parties that are countries of the Union established by that Convention. This Treaty shall not have any connection with treaties other than the Berne Convention, nor shall it prejudice any rights and obligations under any other treaties.
  
- (2) Nothing in this Treaty shall derogate from existing obligations that Contracting Parties have to each other under the Berne Convention for the Protection of Literary and Artistic Works.
  
- (3) Hereinafter, "Berne Convention" shall refer to the Paris Act of July 24, 1971 of the Berne Convention for the Protection of Literary and Artistic Works.
  
- (4) Contracting Parties shall comply with Articles 1 to 21 and the Appendix of the Berne Convention.



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**Article 2****Scope of Copyright Protection**

Copyright protection extends to expressions and not to ideas, procedures, methods of operation or mathematical concepts as such.

**Article 3****Application of Articles 2 to 6 of the Berne Convention**

Contracting Parties shall apply *mutatis mutandis* the provisions of Articles 2 to 6 of the Berne Convention in respect of the protection provided for in this Treaty.

**Article 4****Computer Programs**

Computer programs are protected as literary works within the meaning of Article 2 of the Berne Convention. Such protection applies to computer programs, whatever may be the mode or form of their expression.

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**Article 5****Compilations of Data (Databases)**

Compilations of data or other material, in any form, which by reason of the selection or arrangement of their contents constitute intellectual creations, are protected as such. This protection does not extend to the data or the material itself and is without prejudice to any copyright subsisting in the data or material contained in the compilation.

**Article 6****Right of Distribution**

- (1) Authors of literary and artistic works shall enjoy the exclusive right of authorizing the making available to the public of the original and copies of their works through sale or other transfer of ownership.
- (2) Nothing in this Treaty shall affect the freedom of Contracting Parties to determine the conditions, if any, under which the exhaustion of the right in paragraph (1) applies after the first sale or other transfer of ownership of the original or a copy of the work with the authorization of the author.

**Article 7****Right of Rental**

- (1) Authors of
  - (i) computer programs;

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(ii) cinematographic works; and

(iii) works embodied in phonograms, as determined in the national law of Contracting Parties, shall enjoy the exclusive right of authorizing commercial rental to the public of the originals or copies of their works.

(2) Paragraph (1) shall not apply

(i) in the case of computer programs, where the program itself is not the essential object of the rental; and

(ii) in the case of cinematographic works, unless such commercial rental has led to widespread copying of such works materially impairing the exclusive right of reproduction.

(3) Notwithstanding the provisions of paragraph (1), a Contracting Party that, on April 15, 1994, had and continues to have in force a system of equitable remuneration of authors for the rental of copies of their works embodied in phonograms may maintain that system provided that the commercial rental of works embodied in phonograms is not giving rise to the material impairment of the exclusive right of reproduction of authors.

## **Article 8**

### **Right of Communication to the Public**

Without prejudice to the provisions of Articles 11(1)(ii), 11*bis*(1)(i) and (ii), 11*ter*(1)(ii), 14(1)(ii) and 14*bis*(1) of the Berne Convention, authors of literary and artistic works shall enjoy the exclusive right of authorizing any communication to the public of their works, by wire or wireless means, including the making available to the public of their works in such a way that members of the public may access these works from a place and at a time individually chosen by them.

## **Article 9**

### **Duration of the Protection of Photographic Works**

In respect of photographic works, the Contracting Parties shall not apply the provisions of Article 7(4) of the Berne Convention.

## **Article 10**

### **Limitations and Exceptions**

(1) Contracting Parties may, in their national legislation, provide for limitations of or exceptions to the rights granted to authors of literary and artistic works under this Treaty in certain special cases that do not conflict with a normal exploitation of the work and do not unreasonably prejudice the legitimate interests of the author.

(2) Contracting Parties shall, when applying the Berne Convention, confine any limitations of or exceptions to rights provided for therein to certain special cases that do not conflict with a normal exploitation of the work and do not unreasonably prejudice the legitimate interests of the author.

## **Article 11**

### **Obligations concerning Technological Measures**

Contracting Parties shall provide adequate legal protection and effective legal remedies against the circumvention of effective technological measures that are used by authors in

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connection with the exercise of their rights under this Treaty or the Berne Convention and that restrict acts, in respect of their works, which are not authorized by the authors concerned or permitted by law.

## **Article 12**

### **Obligations concerning Rights Management Information**

(1) Contracting Parties shall provide adequate and effective legal remedies against any person knowingly performing any of the following acts knowing, or with respect to civil remedies having reasonable grounds to know, that it will induce, enable, facilitate or conceal an infringement of any right covered by this Treaty or the Berne Convention:

- (i) to remove or alter any electronic rights management information without authority;
- (ii) to distribute, import for distribution, broadcast or communicate to the public, without authority, works or copies of works knowing that electronic rights management information has been removed or altered without authority.

(2) As used in this Article, “rights management information” means information which identifies the work, the author of the work, the owner of any right in the work, or information about the terms and conditions of use of the work, and any numbers or codes that represent such information, when any of these items of information is attached to a copy of a work or appears in connection with the communication of a work to the public.

## **Article 13**

### **Application in Time**

Contracting Parties shall apply the provisions of Article 18 of the Berne Convention to all protection provided for in this Treaty.

## **Article 14**

### **Provisions on Enforcement of Rights**

- (1) Contracting Parties undertake to adopt, in accordance with their legal systems, the measures necessary to ensure the application of this Treaty.
- (2) Contracting Parties shall ensure that enforcement procedures are available under their law so as to permit effective action against any act of infringement of rights covered by this Treaty, including expeditious remedies to prevent infringements and remedies which constitute a deterrent to further infringements.

## **Article 15**

### **Assembly**

- (1)(a) The Contracting Parties shall have an Assembly.
  - (b) Each Contracting Party shall be represented by one delegate who may be assisted by alternate delegates, advisors and experts.
  - (c) The expenses of each delegation shall be borne by the Contracting Party that has appointed the delegation. The Assembly may ask the World Intellectual Property Organization (hereinafter referred to as "WIPO") to grant financial assistance to facilitate the participation of delegations of Contracting Parties that are regarded as developing countries in conformity with the established practice of the General Assembly of the United Nations or that are countries in transition to a market economy.
- (2)(a) The Assembly shall deal with matters concerning the maintenance and development of this Treaty and the application and operation of this Treaty.

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(b) The Assembly shall perform the function allocated to it under Article 17(2) in respect of the admission of certain intergovernmental organizations to become party to this Treaty.

(c) The Assembly shall decide the convocation of any diplomatic conference for the revision of this Treaty and give the necessary instructions to the Director General of WIPO for the preparation of such diplomatic conference.

(3)(a) Each Contracting Party that is a State shall have one vote and shall vote only in its own name.

(b) Any Contracting Party that is an intergovernmental organization may participate in the vote, in place of its Member States, with a number of votes equal to the number of its Member States which are party to this Treaty. No such intergovernmental organization shall participate in the vote if any one of its Member States exercises its right to vote and *vice versa*.

(4) The Assembly shall meet in ordinary session once every two years upon convocation by the Director General of WIPO.

(5) The Assembly shall establish its own rules of procedure, including the convocation of extraordinary sessions, the requirements of a quorum and, subject to the provisions of this Treaty, the required majority for various kinds of decisions.

## **Article 16**

### **International Bureau**

The International Bureau of WIPO shall perform the administrative tasks concerning the Treaty.

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**Article 17****Eligibility for Becoming Party to the Treaty**

- (1) Any Member State of WIPO may become party to this Treaty.
- (2) The Assembly may decide to admit any intergovernmental organization to become party to this Treaty which declares that it is competent in respect of, and has its own legislation binding on all its Member States on, matters covered by this Treaty and that it has been duly authorized, in accordance with its internal procedures, to become party to this Treaty.
- (3) The European Community, having made the declaration referred to in the preceding paragraph in the Diplomatic Conference that has adopted this Treaty, may become party to this Treaty.

**Article 18****Rights and Obligations under the Treaty**

Subject to any specific provisions to the contrary in this Treaty, each Contracting Party shall enjoy all of the rights and assume all of the obligations under this Treaty.

**Article 19****Signature of the Treaty**

This Treaty shall be open for signature until December 31, 1997, by any Member State of WIPO and by the European Community.

**Article 20****Entry into Force of the Treaty**



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This Treaty shall enter into force three months after 30 instruments of ratification or accession by States have been deposited with the Director General of WIPO.

## **Article 21**

### **Effective Date of Becoming Party to the Treaty**

This Treaty shall bind

- (i) the 30 States referred to in Article 20, from the date on which this Treaty has entered into force;
- (ii) each other State from the expiration of three months from the date on which the State has deposited its instrument with the Director General of WIPO;
- (iii) the European Community, from the expiration of three months after the deposit of its instrument of ratification or accession if such instrument has been deposited after the entry into force of this Treaty according to Article 20, or, three months after the entry into force of this Treaty if such instrument has been deposited before the entry into force of this Treaty;
- (iv) any other intergovernmental organization that is admitted to become party to this Treaty, from the expiration of three months after the deposit of its instrument of accession.

## **Article 22**

### **No Reservations to the Treaty**

No reservation to this Treaty shall be admitted.

**Article 23****Denunciation of the Treaty**

This Treaty may be denounced by any Contracting Party by notification addressed to the Director General of WIPO. Any denunciation shall take effect one year from the date on which the Director General of WIPO received the notification.

**Article 24****Languages of the Treaty**

- (1) This Treaty is signed in a single original in English, Arabic, Chinese, French, Russian and Spanish languages, the versions in all these languages being equally authentic.
- (2) An official text in any language other than those referred to in paragraph (1) shall be established by the Director General of WIPO on the request of an interested party, after consultation with all the interested parties. For the purposes of this paragraph, "interested party" means any Member State of WIPO whose official language, or one of whose official languages, is involved and the European Community, and any other intergovernmental organization that may become party to this Treaty, if one of its official languages is involved.

**Article 25****Depositary**

The Director General of WIPO is the depositary of this Treaty.

[End]

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APPENDIX II: WIPO AGREED  
STATEMENTS

**WIPO**



**CRNR/DC/96**  
**ORIGINAL:** English

**DATE:** December 23, 1996

**WORLD INTELLECTUAL PROPERTY ORGANIZATION**

GENEVA

**DIPLOMATIC CONFERENCE  
ON  
CERTAIN COPYRIGHT AND NEIGHBORING RIGHTS  
QUESTIONS**

**Geneva, December 2 to 20, 1996**

**AGREED STATEMENTS CONCERNING THE WIPO COPYRIGHT TREATY**

*adopted by the Diplomatic Conference on December 20, 1996*

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### Concerning Article 1(4)

The reproduction right, as set out in Article 9 of the Berne Convention, and the exceptions permitted thereunder, fully apply in the digital environment, in particular to the use of works in digital form. It is understood that the storage of a protected work in digital form in an electronic medium constitutes a reproduction within the meaning of Article 9 of the Berne Convention.

### Concerning Article 3

It is understood that in applying Article 3 of this Treaty, the expression “country of the Union” in Articles 2 to 6 of the Berne Convention will be read as if it were a reference to a Contracting Party to this Treaty, in the application of those Berne Articles in respect of protection provided for in this Treaty. It is also understood that the expression “country outside the Union” in those Articles in the Berne Convention will, in the same circumstances, be read as if it were a reference to a country that is not a Contracting Party to this Treaty, and that “this Convention” in Articles 2(8), *2bis*(2), 3, 4 and 5 of the Berne Convention will be read as if it were a reference to the Berne Convention and this Treaty. Finally, it is understood that a reference in Articles 3 to 6 of the Berne Convention to a “national of one of the countries of the Union” will, when these Articles are applied to this Treaty, mean, in regard to an intergovernmental organization that is a Contracting Party to this Treaty, a national of one of the countries that is member of that organization.

### Concerning Article 4

The scope of protection for computer programs under Article 4 of this Treaty, read with Article 2, is consistent with Article 2 of the Berne Convention and on a par with the relevant provisions of the TRIPS Agreement.

### Concerning Article 5

The scope of protection for compilations of data (databases) under Article 5 of this Treaty, read with Article 2, is consistent with Article 2 of the Berne Convention and on a par with the relevant provisions of the TRIPS Agreement.

#### **Concerning Articles 6 and 7**

As used in these Articles, the expressions “copies” and “original and copies,” being subject to the right of distribution and the right of rental under the said Articles, refer exclusively to fixed copies that can be put into circulation as tangible objects.

#### **Concerning Article 7**

It is understood that the obligation under Article 7(1) does not require a Contracting Party to provide an exclusive right of commercial rental to authors who, under that Contracting Party’s law, are not granted rights in respect of phonograms. It is understood that this obligation is consistent with Article 14(4) of the TRIPS Agreement.

#### **Concerning Article 8**

It is understood that the mere provision of physical facilities for enabling or making a communication does not in itself amount to communication within the meaning of this Treaty or the Berne Convention. It is further understood that nothing in Article 8 precludes a Contracting Party from applying Article 11*bis*(2).

#### **Concerning Article 10**

It is understood that the provisions of Article 10 permit Contracting Parties to carry forward and appropriately extend into the digital environment limitations and exceptions in their national laws which have been considered acceptable under the Berne Convention. Similarly,

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these provisions should be understood to permit Contracting Parties to devise new exceptions and limitations that are appropriate in the digital network environment.

It is also understood that Article 10(2) neither reduces nor extends the scope of applicability of the limitations and exceptions permitted by the Berne Convention.

#### **Concerning Article 12**

It is understood that the reference to “infringement of any right covered by this Treaty or the Berne Convention” includes both exclusive rights and rights of remuneration.

It is further understood that Contracting Parties will not rely on this Article to devise or implement rights management systems that would have the effect of imposing formalities which are not permitted under the Berne Convention or this Treaty, prohibiting the free movement of goods or impeding the enjoyment of rights under this Treaty.

[End]

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