

# The Case Against Micropayments

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**Abstract.** Micropayments are likely to continue disappointing their advocates. They are an interesting technology. However, there are many non-technological reasons why they will take far longer than is generally expected to be widely used, and most probably will play only a minor role in the economy.

## 1 Introduction

This is an extended version of my remarks at the panel on “Does anyone really need MicroPayments?” at the Financial Cryptography 2003 Conference. For a report on the entire panel, see [20].

Micropayments are the technology of the future, and always will be. This was said about gallium arsenide (GaAs) over a decade ago, and has proven to be largely accurate. Although GaAs has found some niche applications (especially in high frequency communications), silicon continues to dominate the semiconductor industry.

The fate of micropayments is likely to be similar to that of gallium arsenide. They may become widespread eventually, but only after a long incubation period. They are also likely to play only a minor role in the economy. The reasons differ from the ones for the disappointments with GaAs. GaAs is playing a minor role because of technology trends. Silicon has improved faster than had been expected, and GaAs more slowly. On the other hand, the obstacles to micropayment adoption have very little to do with technology, and are rooted in economics, sociology, and psychology. Known micropayment schemes appear more than adequate in terms of providing low cost operations and adequate security. What is missing are convincing business cases.

This note is not a general survey of micropayments (see [1] for that, for example). It does not even present full details of the arguments against micropayments. Instead, it summarizes what appear to be the main obstacles to micropayment adoption. References are primarily to my own papers that are relevant, and those papers contain more detailed arguments and references. (Many of the arguments cited here have also been made by others, for example Clay Shirky [18].)

There have been and continue to be many proponents of micropayments. For example, Bob Metcalfe was an ardent advocate for them while he was a columnist for InfoWorld, arguing they were indispensable for a healthy Internet, and continues to believe they are inevitable. More recently, Merrill Lynch's Technology Strategist, Steve Milunovich, has also endorsed micropayments as a promising technology [8]. Many people have proposed to solve the spam problem by requiring micropayments on email (to be paid to the service providers or to recipients), to raise costs to spammers. The potential of micropayment appears high enough that even though many micropayment startups have folded, new ones keep springing up.

While I am pessimistic about micropayments, I am not opposed to them. The standard arguments for micropayments do have some validity. I have worked on several schemes, and together with S. Jarecki coined the probabilistic polling scheme [7]. However, while that work was being done during the summer of 1996, I was also involved in another study, of the economics of ecommerce. The research of that study led to a paper that predicted explicitly that micropayments were destined for only a marginal role in the economy [3]. Since that time, I have accumulated a variety of additional arguments supporting the pessimistic conclusion of [3].

As usual, micropayments in this note refer to systems where value changes hands at the time of the transaction. Accounted systems, such as electricity meters, which keep track of tiny transactions and bill for them at the end of a period, are not micropayments in this sense. Thus the arguments against micropayments here do not rule out microtransactions such as purchases of ring tones from cellular carriers or providers who bill through the cellular carriers. (However, some of the arguments do suggest that even such accounted systems are likely to be less important than various fixed fee subscription options.)

The following sections outline the main barriers to micropayment adoption. The final section discusses the most promising avenues for micropayment diffusion.

## 2 Competition From Other Payment Schemes

There is just one argument against micropayments that is based on technology. The same advances in computing and communications that make implementations of micropayment schemes feasible are also enabling competing payment systems (especially credit and debit cards) to economically handle decreasingly small transactions. Hence the market for handling small transactions that only micropayments can handle is shrinking rapidly. (Note that this is similar to what happened in semiconductors. There improvements in silicon technologies have limited the areas that seemed likely to be taken over by gallium arsenide.)

The slow pace of change in payment systems (discussed in the next section) strengthens this argument significantly.

### 3 Payment Evolution on Non-Internet Time

Probably the most damaging myth behind the high-tech bubble of the late 1990s was that of "Internet time," that technology and the economy were changing far faster than before. While there are a few small grains of truth to this, overall the pace of change has not accelerated all that much. In particular, new technologies still take on the order of a decade to diffuse widely [11], [15]. Changes in payment systems tend to be even slower [12]. (In fact, international comparisons of payment systems provide interesting examples for discussions of "path dependence," "lock-in," and similar concepts.) As a simple example, consider credit cards. They are ubiquitous in North America and many other industrialized countries. They are even spreading in countries like Germany, where it had been claimed for a long time that there would be no room for them for institutional and cultural factors. However, it took credit cards several decades to achieve their high penetration [2].

As yet another example, debit cards (which were common in other countries for a long time) have only recently achieved significant penetration in the United States. The reason for their adoption is largely the push by banks, which found this to be a high-profit opportunity. Thus banks played the roles of "forcing agents" discussed in [11] that can sometimes propel faster adoption of new technologies than would have happened otherwise. Even so, the progress of debit transactions in the United States has not been very rapid. When there are no "forcing agents," progress is often glacial, as in the lack of acceptance of the Sacagawea dollar coin. It was introduced several years ago without the serious design flaws of the earlier Susan B. Anthony coin, but is practically never used in early 2003. (By contrast, other countries, such as Britain, France, Germany, or Japan, that did successfully introduce large denomination coins, did it by government fiat, by withdrawing corresponding bills from circulation.)

The slow pace of adoption of new payment schemes does not doom micropayments. However, it does demolish the hopes of venture capitalists who invest in micropayment startups, and certainly goes counter to the general expectations of micropayment proponents for rapid acceptance. (In particular, it does decrease the "first mover advantage" that many startups count on.) It also leaves an opening for competing payment systems to take over much of those parts of the economy that seemed natural preserves for micropayments, as is discussed in the preceding section.

### 4 Bundling

Proponents of micropayments have claimed that they would open up new avenues for commerce. They would enable microtransactions, such as newspapers selling individual stories instead of entire issues, Web sites selling access to individual pages, and even ISPs charging for each packet transmitted. We have seen very little of that, and for good reasons. In general, it is to the sellers' advantage to sell bundles of goods, as that maximizes their profits. As an example, the

Microsoft Office bundle typically sells for about half of the sum of the prices of components (Word, PowerPoint, ...). This is not done out of charitable impulses, but to increase revenues and profits. What Microsoft and other sellers are doing is taking advantage of uneven preferences among their customers for different parts of the bundle.

The advantages of bundling in increasing revenues have been known in economics for about four decades. There are various mathematical models that demonstrate how useful bundling is, and how its advantages depend on number of items in the bundle, distribution of customer preferences, marginal costs, and other factors. (For some references, see [3].) The general conclusion is that aggregation strategies tend to be more profitable for sellers. This argument again does not doom micropayments, since it is well known that mixed strategies (offering both bundles and individual items, but with prices of separate items higher than they would be if bundling were not feasible) are usually more profitable than pure bundling. (And indeed Microsoft does sell Word by itself.) However, this again limits the range of transactions that seemed the natural domain for micropayments.

## 5 Resistance to Anonymity

Micropayments have often been promoted as providing the anonymity of cash transactions. However, while anonymity is often desired by consumers, it is resisted by both governments and sellers. Government resistance is based on concerns about money laundering, tax evasion, terrorism funding, and other illegal activities, and is well understood. Commercial entities, on the other hand, might be expected to be more receptive to their customers' wishes. In practice, though, they are the ones most responsible for the persistent privacy erosion we see. The reason is that sellers have strong incentives to price discriminate, either explicitly or implicitly, through versioning and other techniques. Therefore they have strong interests in avoiding anonymous transactions [10], [16]. Thus another factor that has been widely hailed as an advantage of micropayments works against them.

## 6 Behavioral Economics

Behavioral economics, the study of what had for a long time been dismissed as the economically irrational behavior of people, is finally becoming respectable within economics. In marketing, it has long been used in implicit ways. One of the most relevant findings for micropayments is that consumers are willing to pay more for flat-rate plans than for metered ones. This appears to have been discovered first about a century ago, in pricing of local telephone calls [13], but was then forgotten. It was rediscovered in the 1970s in some large scale experiments done by the Bell System [3]. There is now far more evidence of this, see references in [13], [14]. As one example of this phenomenon, in the fall

of 1996, AOL was forced to switch to flat rate pricing for Internet access. The reasons are described in [19]:

What was the biggest complaint of AOL users? Not the widely mocked and irritating blue bar that appeared when members downloaded information. Not the frequent unsolicited junk e-mail. Not dropped connections. Their overwhelming gripe: the ticking clock. Users didn't want to pay by the hour anymore. ... Case had heard from one AOL member who insisted that she was being cheated by AOL's hourly rate pricing. When he checked her average monthly usage, he found that she would be paying AOL more under the flat-rate price of \$19.95. When Case informed the user of that fact, her reaction was immediate. 'I don't care,' she told an incredulous Case. 'I am being cheated by you.'

The lesson of behavioral economics is thus that small payments are to be avoided, since consumers are likely to pay more for flat-rate plans. This again argues against micropayments.

## 7 Incentives to Increase Usage

Both behavioral economics and conventional economic utility analysis argue that in an environment of low marginal costs (which are increasingly prevalent in our economy), sellers have a strong incentive to increase usage of their goods and services. Although "network effects" were a much-overused mantra of the dot-com bubble, they are real. As one example, Bill Gates said in 1998 [17]:

Although about three million computers get sold every year in China, people don't pay for the software. Someday they will, though. And as long as they're going to steal it, we want them to steal ours. They'll get sort of addicted, and then we'll somehow figure out how to collect sometime in the next decade.

Any kind of barrier to usage, such as explicit payment, serves to discourage usage. (That was the basis for the prediction in [9] that pay-per-view was doomed in scholarly publishing.) Even small barriers, such as having to pay for individual pages, act as a severe deterrent to usage. During the mid- to late-1990s, several scholarly publishers experimented with a variety of payment schemes for science, technology, and medical information through the PEAK system. The conclusion that the main publisher in the experiment, Elsevier, drew, was very clear [6]:

[Elsevier's] goal is to give people access to as much information as possible on a flat fee, unlimited use basis. [Elsevier's] experience has been that as soon as the usage is metered on a per-article basis, there is an inhibition on use or a concern about exceeding some budget allocation.

The same arguments will be increasingly persuasive as we become more of an “attention economy” [5], in which the most scarce resource is human attention. The incentives to increase usage argue for selling goods and services in ways that maximize usage, and nothing does that as well as flat-rate (or subscription) pricing. A general rule of thumb is that switching from metered to flat-rate pricing increases usage by 50 to 200 percent [13], [14]. As one particularly noteworthy example, when AOL switched to the unlimited usage plans in the fall of 1996, the average time spent online per subscriber tripled over the next year. Hence we should expect to see a continuing and even increasing dominance of flat-rate plans, and this again destroys much of the argument for micropayments.

As a final example, a recent story about new communication, information, and entertainment services stated that “[w]hat all these emerging services have in common is a business model based on subscriptions that are billed monthly or yearly” [4]. The sellers of these services are reacting to a variety of incentives mentioned in this and previous sections. While one can argue that widespread availability of micropayments might lead them to offer different payment options (for example, to encourage people to try out a novelty), this is unlikely, since accounted systems (with billing ultimately to a credit card, say) would be quite adequate for most of these services, had the sellers had real incentives to use them.

## 8 Conclusions

The general conclusion drawn from the discussion above is that there are many factors working against the success of micropayments. Even some of the features that seemed to be very attractive about micropayments, such as anonymity, work against them. The technologists have produced many micropayment schemes that are efficient and secure enough to be used widely. However, economics, sociology, and psychology place obstacles in the path of micropayments that are likely to keep them restricted to a marginal role in the economy forever.

Still, micropayments may become widespread. There are needs that micropayments are uniquely suited to fill. However, given all the obstacles that micropayments face, they are unlikely to succeed if offered as a service that requires special hardware or software. They are most likely to succeed if they piggyback on top of something that is already widely used, such as cell phones, or (in some places) mass-transit smart cards. When offered as an additional feature for something that is already carried by most of the population, micropayments might be able to overcome the usual chicken and egg problem, and find their (very likely small) niche in the economy.

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