

# Payment Systems For The Internet – Consumer Requirements

Citation for published version (APA):

Walczuch, R. M., & Duppen, R. (2002). Payment Systems For The Internet – Consumer Requirements. METEOR, Maastricht University School of Business and Economics. METEOR Research Memorandum No. 044 <https://doi.org/10.26481/umamet.2002044>

**Document status and date:**

Published: 01/01/2002

**DOI:**

[10.26481/umamet.2002044](https://doi.org/10.26481/umamet.2002044)

**Document Version:**

Publisher's PDF, also known as Version of record

**Please check the document version of this publication:**

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# PAYMENT SYSTEMS FOR THE INTERNET – CONSUMER REQUIREMENTS

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## Abstract

*This paper examines the consumer requirements for payment systems on the Internet. According to previous literature, the eight important features of payment systems from a consumer's point of view are: security, reliability, privacy, acceptability, person-to-person (P2P), flexibility, price, and ease of use. This research focuses on identifying the importance of these features in general and in specific situations. Five hypotheses are formulated.*

*The results of a mail questionnaire indicate that there is indeed a clear preference ranking of the eight features. This ranking shows that security, reliability and privacy are the most important features of a payment system for Internet purchases.*

*This ranking remains stable for unknown Web shops and expensive products. Internet users value price less than non-users. Buyers value security significantly more than non-buyers, although both groups rank security first. In addition, reliability is less important for buyers than for non-buyers.*

*The research shows that current payment systems used on the Internet (mainly credit cards) do not satisfy consumer requirements. This may be a reason for the disappointing e-retailing sales.*

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## **1. INTRODUCTION**

Today, the Internet has not become what we had expected it to be. Many early dot.coms have gone bankrupt, and few firms are actually making money through the Web. There are many reasons for this failure, but one of the main ones has been, and still is, the difficulty to pay on the Internet. Traditional payment systems have been adjusted to function in cyber space and, in addition, new electronic payment schemes have emerged. The demand for new and improved electronic payment systems for online purchases as well as offline purchases is steadily increasing.

These new needs stem from three main developments. First, there is globalization. People from all over the world are more and more willing to trade with each other. Sending products across borders does not represent a problem anymore, due to the advent of many global logistic firms. However, payments that cross borders do represent a problem. The bank's clearing systems differ considerably, resulting in high transaction fees. Thus, the incompatibility of the bank's clearing systems represents a severe bottleneck for international trade, especially in the person-to-person (P2P) segment, where the transaction costs are relatively high, in comparison to business transactions.

Second, competition in the money market is greater than ever. Slowly, regulatory barriers are lifted world-wide, making room for global competition. In addition, rules for non-banks that would like to offer financial services are further relaxed. Consequently, banks and other financial institutions are continuously seeking to lower costs, especially now margins are deteriorating. New electronic payment methods offer ample opportunities to further lower transaction costs.

Third, as a by-product of the dramatic increase in online shopping of the past years there has been an increased demand for convenient and secure online payment methods. Consumers are making almost all their online purchases with credit cards. But the supremacy of credit cards in the online sales market does not imply that credit cards are regarded as the ideal way to pay on the Internet.

These three developments have made clear that current electronic payment systems are far from ideal. This paper will attempt to determine what the ideal electronic payment system on the Internet should look like, from the consumer's point of view.

## **2. CONSUMER REQUIREMENTS**

When purchases are made on the Internet, rarely does the transaction involve a purely Internet-based payment form. Although, since the development of Internet-based electronic commerce, new electronic payment systems have emerged with the objective to allow merchants and customers to settle their transactions directly on the web, today the most frequently used payment approach remains the credit card.

According to Lafferty Publications 78% of U.S. online transactions in 1999 were accounted for by credit cards (ePaynews.com, 2002). Western Europe produces less extreme figures with 42% credit card usage on the Internet (ePSO, 2001).

A couple a years ago, the future for new electronic payment systems looked very promising. Actually, it still looks very promising, with the notion that most ventures from that time either never got through their pilot stage or went bankrupt (e.g. Dicash). The French Kleline project has been put to a hold and even the offerings of CyberCash, the acknowledged Internet payments market leader, have not really caught on. As a consequence, CyberCash has recently been acquired by VeriSign, Inc., the leading provider of digital trust services.

What are the reasons for what appears as a general lack of success of electronic payment systems on the Internet? Charles Goldfinger (1999) argues that the main problem of the first generation of Internet payment systems is that they have not focused on customer behavior and attitudes.

This paper will examine the consumer requirements of payment systems for the Internet. We focus on the demand-side because it apparently represents a big hurdle. Retail customers want a payment system to fulfill their payment needs on the Internet in a satisfying way, without being bothered by the underlying technology.

**Table 1 Overview of Literature regarding the consumer requirements for Internet payment systems**

Requirement	Author(s)	Focus
Security	Neuman & Medvinsky, 1995 Howland, 1996	Consumer/Merchant/Issuer
Reliability	Neuman & Medvinsky, 1995	Consumer/Merchant/Issuer
Anonymity/Privacy	Neuman & Medvinsky, 1995 Howland, 1996	Consumer
Scalability	Neuman & Medvinsky, 1995 Howland, 1996	Merchant/Issuer
Acceptability	Neuman & Medvinsky, 1995	Consumer/Merchants/Issuer
Efficiency	Neuman & Medvinsky, 1995 Howland, 1996	Merchant/Issuer
Customer base	Neuman & Medvinsky, 1995	Merchant/Issuer
Ease of Integration	Neuman & Medvinsky, 1995	Merchant
Ease of Use	Neuman & Medvinsky, 1995 Howland, 1996	Consumer
Flexibility/ Convertibility	Neuman & Medvinsky, 1995 Howland, 1996	Consumer/Merchant
Price/cost	Westland, 2002	Consumer/Merchant
P2P	---	Consumer

Table 1 summarized the literature on requirements for Internet Payment systems. The consumer's requirements are shaded grey. According to previous literature, the consumer requirements of payment systems on the Internet are: security, reliability, privacy, acceptability, person-to-person (P2P), flexibility, price, and ease of use. We will focus on these requirements in the remainder of this paper.

### 3. HYPOTHESES

Buying online is a significantly different experience from shopping in a brick 'n mortar shop. Likewise, the paying procedure is rather different. There is no personal interaction with the shop's personnel and important personal details have to be trusted to an abstract network that connects the world called the Internet. When determining what the ideal payment system on the Internet should look like, it would be beneficial to know which features of a payment system are most important. It would be logical to assume that consumers do not value all features equally. This leads to hypothesis 1.

*Hypothesis 1: Consumers do not consider all features of payment systems of equal importance.*

Trust is an important condition in any payment process. However, in an online payment process it is even more important than in an offline payment process. Often there is a period of time between the payment of the product and the delivery of the product. People put more trust in Web shops that are known to them counter to unknown Web shops. Therefore, it could well be that also consumer preferences concerning payment system features differ with the familiarity of the buyer with the Web shop.

*Hypothesis 2: The fact that a Web shop is unknown influences feature preference.*

In general, the bigger the amount of money involved the more prudent a person becomes. We suspect the same to be true for online payments. When a person buys an expensive product (e.g. a wide-screen television) in contrast to a relatively cheap product (e.g. a compact disc), different considerations for the preferred features may come into play.

*Hypothesis 3: The fact that it concerns an expensive product influences feature preference.*

Although a large number of people have access to the Internet, there is still a part of the population that does not use the Internet yet. Experience with the Internet, with its advantages and disadvantages, could have an influence on people's ideas of which features of a payment system are most important.

*Hypothesis 4: Non-Internet users' opinions on feature importance differ from Internet users' opinions on feature importance.*

The actual experience of paying online might be different from what people expect it to be. Thus, the people indicating to have bought products online may possibly have a different opinion on the importance of the features of a payment system.

*Hypothesis 5: Non-buyers' opinions on feature preference differ from buyers' opinions.*

## 4. METHODOLOGY

### 4.1 The sample

The sampling frame consists of all inhabitants of a large Dutch city. This city can be held representative for the whole of the Netherlands as it has rural as well as urban characteristics.

Six hundred questionnaires were distributed evenly among all neighborhoods of the city. In each neighborhood a street was chosen at random. As the city has village-like neighborhoods as well as inner-city neighborhoods, it is thus ensured that our sample is representative of the entire city and thus of the entire country.

### 4.2 The questionnaire

A structured, undisguised mail questionnaire was used in this research. The questionnaire contains a few nominally scaled background questions. These questions ask about demographics, Internet use, Internet purchases, and payment methods used.

The main questions asked the respondents to rank the eight features (security, reliability, privacy, acceptability, p2p, flexibility, price, and ease of use). It was possible to assign two or more features the same rank. Each feature was briefly explained in a table on a separate page. People were encouraged to cut out each cell of the table to ease the ranking of the features. This ranking took place three times for three different cases.

In the first case, people were asked to do their ranking in the case they would buy a compact disc for 20 euros at a known Web shop. In the second case the respondents were asked if their ranking would change if they did not know the Web shop. In the third case they were asked to consider their ranking if they were planning to buy an expensive product.

Three weeks after distribution, 94 of 600 questionnaires were returned. This response rate of 15.7% matches our expectations and can be regarded as sufficient to draw conclusions.

## 5. RESULTS

### 5.1 Demographic data

In our sample males are somewhat over represented (61.5 %). The Central Office for Statistics of the Netherlands (CBS, 2002) reports that the Dutch population is made up of 49.5% males and 50.5% females. This overrepresentation of males in our sample can be attributed to the fact that males tend to be more interested in computers and in the Internet than females. Men's bigger interest in the subject could have caused them to reply more often than women.

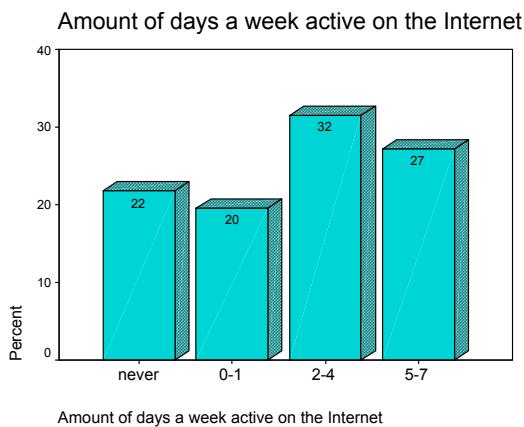
**Table 2 Age demographics of our sample**

18-24 years	25-34 years	35-44 years	45-54 years	55-64	65+ years
10%	16.7%	17.8%	16.7%	20%	18.9%

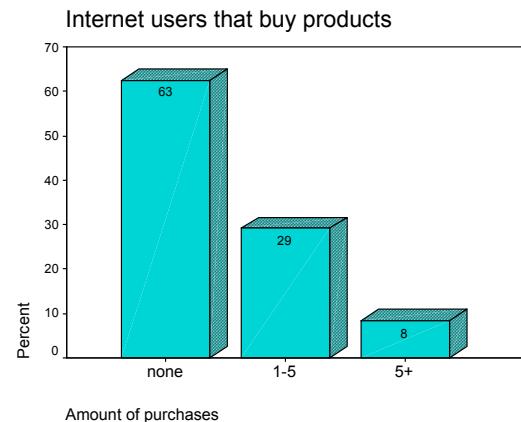
Average age: 47.67 years

The age distribution of our sample is presented in table 2. The sample shows a more or less even distribution over the age groups and can be considered representative of the Dutch population.

**Figure 1 Days a/w on the Internet (%)**



**Figure 2 Internet users that buy products (%)**



Of all our respondents, 78% indicates to use the Internet (see Figure 1). Taylor Nelson Sofres (2002), a global research company, reports that 61% of the Dutch population uses the Internet. Again we attribute the overrepresentation in our sample to the fact that Internet users were probably more willing to return the questionnaire, because of their affinity with the subject.

Figure 2 reports on the percentage of Internet users that also buy products online. In our sample, 37% of the Internet users indicate to have bought at least one product online. Taylor Nelson Sofres (2002) reports the figure of 20% for Internet users that have bought a product online.

Overall, our sample uses the Internet more, and buys more products online than the average Dutch person. For the purposes of this research this may be regarded as an advantage. Who can better determine the importance of consumer requirements of a payment system on the Internet than the actual users?

In our sample, 27 participants indicated to have bought something on the Internet. Some people used more than one method of payment. The four most used methods of payment are “credit transfer,” “credit card,” “cash on delivery,” and “direct debit” (table 3.) They represent 97% of the used payment methods. As expected, these methods are all based on traditional methods.

**Table 3 Payment instrument's use**

	Method of payment	Number of people	%
1.	credit transfer	17	33.3%
2.	credit card	15	29.4%
3.	cash on delivery	11	21.6%
4.	direct debit	6	11.8%
5.	telephone number	1	2%
6.	pay pal	1	2%
7.	debit card	0	0%

## 5.2 Hypotheses testing

### 5.2.1 Hypothesis 1 - Consumers do not consider all features of payment systems of equal importance

The Friedman test sums the ranks for each feature and then divides this sum by the number of respondents. This yields an average rank (see Table 4 below). Note that the lower the mean rank, the more important the feature is.

**Table 4 Overall feature ranking**

	Importance of	Mean Rank
1.	Security	1.84
2.	Reliability	2.78
3.	Privacy	3.28
4.	Ease of use	4.42
5.	Price	4.76
6.	Flexibility	5.97
7.	Acceptability	6.03
8.	Person to person	6.93

It is clear that “security,” “reliability,” and “privacy” are the most important features. Person-to-person capability is regarded as the least important feature. “Ease of use” and “price” are ranked similarly, and also “flexibility” and “acceptability” are close together.

The Friedman chi-square statistic shows that there is a systematic difference between the ranks of the variables ( $\text{ChiSquare}=297.081$ ;  $p<0,01$ ). Thus, hypothesis 1 is supported.

### 5.2.2 Hypothesis 2 - The fact that a Web shop is unknown influences feature preference.

The Kruskal-Wallis test uses ranks of the original values and not the values themselves. This is appropriate in this case because the scale used by the respondents is ordinal (the results are presented in table 5).

From the high asymptotic significance values for all eight features we conclude that the fact that a Web shop is unknown has no influence on feature preference. Thus, we do not find support for hypothesis two.

**Table 5 Kruskal-Wallis – known versus unknown Web shop**

Importance of	Case*	Number of cases	Mean Rank	Chi-square	Degrees of freedom	Asymp. Sig.
Security	Case 1	81	82.83	.073	1	.787
	Case 2	82	81.18			
	Total	163				
Reliability	Case 1	82	83.70	.229	1	.632
	Case 2	81	80.28			
	Total	163				
Privacy	Case 1	81	80.02	.169	1	.681
	Case 2	81	82.98			
	Total	162				
Acceptability	Case 1	80	82.38	.276	1	.599
	Case 2	80	78.62			
	Total	160				
P2p	Case 1	80	83.53	.765	1	.382
	Case 2	80	77.47			
	Total	160				
Flexibility	Case 1	80	78.93	.195	1	.659
	Case 2	80	82.07			
	Total	160				
Price	Case 1	80	79.72	.047	1	.829

	Case 2	80	81.28			
	Total	160				
Ease of use	Case 1	80	79.32	.108	1	.742
	Case 2	80	81.68			
	Total	160				

\*Case 1 = original, Case 2 = unknown Web shop

#### 5.2.3 Hypothesis 3 - The fact that it concerns an expensive product influences feature preference.

We asked our respondents to do the same ranking of features as with the previous hypotheses, but now in the case of buying an *expensive* product online. The results of the Kruskal-Wallis test is presented in table 6.

From the high asymptotic significance values for all eight features we conclude that the fact that it concerns an expensive product has no influence on feature preference. Thus, we find no support for hypothesis three.

**Table 6 Kruskal-Wallis – cheap versus expensive product**

Importance of	Case*	Number of Cases	Mean Rank	Chi-square	Degrees of Freedom	Asympt. Sig.
Security	Case 1	81	80.58	.088	1	.767
	Case 3	81	82.42			
	Total	162				
Reliability	Case 1	82	82.52	.000	1	.996
	Case 3	82	82.48			
	Total	164				
Privacy	Case 1	81	79.39	.343	1	.558
	Case 3	81	83.61			
	Total	162				
Acceptability	Case 1	80	80.69	.003	1	.958
	Case 3	80	80.31			
	Total	160				
P2p	Case 1	80	85.45	2.021	1	.155
	Case 3	80	75.55			
	Total	160				
Flexibility	Case 1	80	79.61	.064	1	.801
	Case 3	80	81.39			
	Total	160				
Price	Case 1	80	82.81	.408	1	.523
	Case 3	80	78.19			
	Total	160				
Ease of use	Case 1	80	77.49	.710	1	.400
	Case 3	80	83.51			
	Total	160				

\*Case 1 = original, Case 3 = expensive product

#### 5.2.4 Hypothesis 4 - Non-Internet users' opinions on feature importance differ from Internet users' opinions on feature importance.

To examine this hypothesis the respondents were divided into two groups: Non-Internet users, and Internet users. Again, the Kruskal-Wallis test is used to test hypothesis four. The results are presented in table 7. The ranking of “price” differs between users and non-users. Thus, hypothesis 4 is supported.

**Table 7 Kruskal-Wallis – user versus non-user**

Importance of	Internet users vs. non-users	Number of Users	Mean Rank	Chi-square	Degrees of freedom	Asympt. Sig.
Security	Non-user	12	46.75	1.771	1	.183

	User	67	38.79			
	Total	79				
Reliability	Non-user	12	32.54	1.776	1	.183
	User	68	41.90			
	Total	80				
Privacy	Non-user	12	46.29	1.119	1	.290
	User	67	38.87			
	Total	79				
Acceptability	Non-user	12	49.58	2.950	1	.086
	User	66	37.67			
	Total	78				
P2p	Non-user	12	34.17	.895	1	.344
	User	66	40.47			
	Total	78				
Flexibility	Non-user	12	38.33	.040	1	.842
	User	66	39.71			
	Total	78				
Price	Non-user	12	26.46	4.833	1	<b>.028*</b>
	User	66	41.87			
	Total	78				
Ease of use	Non-user	12	39.67	.001	1	.977
	User	66	39.47			
	Total	78				

It is interesting to examine whether this also means a change in the ranking of the eight features. Hence, we perform two new Friedman tests (table 8 and 9)

**Table 8 Feature ranking by non-Internet**

Ranking by non-users		
	Importance of	Mean rank
1.	Security	2.04
2.	Reliability	2.04
3.	Privacy	3.92
4.	<b>Price</b>	<b>3.92</b>
5.	Ease of use	4.67
6.	Flexibility	6.00
7.	Acceptability	6.67
8.	P2p	6.75

**Table 9 Feature ranking by Internet users**

Ranking by users		
	Importance of	Mean rank
1.	Security	1.82
2.	Reliability	2.87
3.	Privacy	3.08
4.	Ease of use	4.42
5.	<b>Price</b>	<b>5.00</b>
6.	Acceptability	5.88
7.	Flexibility	5.98
8.	P2p	6.95

Price has dropped a rank in the table for users, in comparison with the non-users. For Internet users price is not as important a feature as for non-users. Also note that “acceptability” has risen a spot in the table for users, in comparison with the non-users. Although the difference in ranks for “acceptability” between users and non-users is considerable (0.79 points), it is not significant at a 95% confidence level (see Table 7).

#### 5.2.5 Hypothesis 5 - Non-buyers' opinions on feature preference differ from buyers' opinions.

To examine this hypothesis the Internet users are divided in two groups: buyers and non-buyers. The analysis shows significant differences in the rankings of “security” and “reliability” by buyers and non-buyers (table 10). Thus hypothesis 5 is supported.

**Table 10 Kruskal-Wallis – buyers versus non-buyers**

Importance of	Buyers vs. non-buyers	Number of buyers	Mean Rank	Chi-square	Degrees of freedom	Asymp. Sig.

Security	Non-buyer Buyer Total	54 25 79	43.65 32.12	6.239	1	.012*
Reliability	Non-buyer Buyer Total	54 26 80	36.98 47.81	4.087	1	.043*
Privacy	Non-buyer Buyer Total	54 25 79	41.15 37.52	.449	1	.503
Acceptability	Non-buyer Buyer Total	54 24 78	38.70 41.29	.228	1	.633
P2p	Non-buyer Buyer Total	54 24 78	36.56 46.13	3.375	1	.066
Flexibility	Non-buyer Buyer Total	54 24 78	40.09 38.17	.127	1	.722
Price	Non-buyer Buyer Total	54 24 78	41.42 35.19	1.292	1	.256
Ease of use	Non-buyer Buyer Total	54 24 78	39.11 40.38	.054	1	.815

The results of two Friedman tests present the rankings of buyers and non-buyers (table 11/12). Indeed, we see that “privacy” and “reliability” have swapped places for buyers in comparison with non-buyers. Although “security” ranks first for both buyers and non-buyers, there is a significant difference in mean ranks. Security is more important to buyers than to non-buyers.

All further changes in the ranking are not statistically significant.

**Table 11** Feature ranking by non-buyers

Ranking by non-buyers		
	Importance of	Mean rank
1.	<b>Security</b>	<b>2.05</b>
2.	<b>Reliability</b>	<b>2.54</b>
3.	Privacy	3.24
4.	Ease of use	4.45
5.	Price	4.99
6.	Acceptability	5.98
7.	Flexibility	6.01
8.	P2p	6.74

**Table 12** Feature ranking by buyers

Ranking by buyers		
	Importance of	Mean rank
1.	<b>Security</b>	<b>1.42</b>
2.	Privacy	3.13
3.	<b>Reliability</b>	<b>3.21</b>
4.	Ease of use	4.46
5.	Price	4.48
6.	Flexibility	5.94
7.	Acceptability	6.04
8.	P2p	7.33

## 6. CONCLUSIONS

This research started off with the objective of uncovering the critical features of a payment system for Internet purchases, as judged by the consumers. The reason for focusing on the demand-side was that we attribute the failure of many new payment methods to the fact that their creators have overlooked consumer requirements. This ignorance prevented these methods to establish a significant customer base, which is necessary for survival.

It has become clear that security, reliability, and privacy are the most important consumer requirements, with security ranking number one in all circumstances. This does not come as a surprise, because security has always been reported as being the most important feature, independent of whether it concerns offline or online purchases. Suppliers of payment systems should thus focus on these requirements. Person-to-person (P2P) capability is consistently ranked last, and should not have priority.

Whether a Web shop is known or unknown does not change a consumer's preference for the features of a payment system. This implies that the fact that people are familiar with a Web shop does not make them less demanding concerning security, reliability, or privacy.

Whether an online shop is selling wide-screen televisions or music CDs, the consumers cannot be tempted to change their attitude concerning the payment system's features. Thus, a compact disc e-retailer that wants to increase ease of use at the cost of security will not do his customers a favor.

People that have experience with the Internet do not consider the price of a payment system as important as non-Internet users.

People that not only have experience with the Internet, but also have experienced buying a product on the Internet show a significant higher appreciation for security, even if this comes at the cost of reliability. This shows exactly how different the online buying experience is from the traditional experience. The importance of all other features pales in comparison to security. Evidently, people distrust the Internet when it comes to purchases. Emphasizing guaranteed reimbursement in the case of fraud would be a good start to win people's confidence, regardless of whether the payment process is really secure.

However, when we look at the feature ranking produced in this paper, it appears people's payment behavior is not consistent with their attitudes. The fact that Credit card is the most used payment method on the Internet makes no sense in light of the findings of this study. This is a rather disturbing outcome. Can we trust anything our respondents say? We believe we can. We believe that our findings indicate that although people prefer a secure system they are basically forced into using a credit card. This could be one of the main reasons that online sales have not lived up to expectations.

Taking a look at the payment systems on the market, it is not easy to make predictions about what payment system will prove most suitable. In addition to consumer requirements there are other factors that play a role.

Our results would indicate that any payment method, which requires private data to be stored in a digital wallet, would not pass the security and privacy test. The biggest player on the market, Microsoft with its .Net Passport, has repeatedly proven not to be able to write software without security flaws. People will not put their trust in these providers of Web services when it comes to payments.

Thus we will have to look to the traditional financial service providers for a solution. Cash on delivery, credit transfers, direct debits, and (electronic) checks simply lack ease of use to become the most used online payment method. In addition those processes are too inefficient for international and small transactions. Credit cards have confirmed to function online, but only to bridge the period before a better method has been designed. The clearing process is too costly for small amounts, and the lack of authentication makes it prone to fraud.

This leaves us with prepaid value products and solutions that use the telephone bill for settlement. We see big potential for chip-based e-money like smart cards. It can be used offline as well as online (with a card reader). Personal information is stored on the card, as opposed to in an online database, which guards privacy. In case of theft, the loss is restricted to the prepaid amount. In addition, mobile applications of e-money (mobile phones) will improve ease of use greatly. The use of telephone bills for settlement is rather new, but also offers perspective. It is a secure, reliable, and private solution for micro payments.

We do not believe that credit cards will loose their dominance for large payments any time soon. Nevertheless, developments in the payment industry follow each other quickly, and the future is uncertain. It is very likely that not one payment solution on the Internet will be adopted. We use many different ways of paying in brick 'n mortar shops and it is probable that this will also be the case on the Internet. No matter which payment methods will win the battle for widespread adoption on the Internet, they have to be secure, reliable, and private.

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