Electronic Commerce Online Payments

Roger W.H. Bons, VU University Amsterdam, The Netherlands, r.w.h.bons@vu.nl
Rainer Alt, University of Leipzig, Germany, rainer.alt@uni-leipzig.de


Keywords: banking, mobile, virtual money

Abstract

The ability to pay for goods and services bought online is vital for any successful business model in electronic, mobile, or social commerce. This entry discusses the most common categories of online payments which involve real as well as virtual currencies. The classification applies a user perspective based on the needs of buyers and sellers, and looks in particular at risk, convenience and cost. The entry primarily addresses the most common payment methods in use today and offers some future directions for research on online payments.

1. Introduction

“Payment systems are the plumbing of the economy” (Kahn & Roberds 2009, p. 1). This notion summarizes the role of payment systems in modern economies that are based on the division of labor. Payments facilitate exchanges between economic actors and occur “when one economic agent transfers value to another agent for the purpose of discharging a debt.”(p. 2). In transaction cost theory, payments are an essential part of the settlement of an economic transaction and the transfer of property rights (Williamson, 1998, p. 28). The metaphor of plumbing relates to the ubiquity of payments which amount to a total of 270 billion payment transactions for the Committee of Payment and Settlement Systems (CPSS) countries (25 countries including China, Germany, India, Japan, Russia, and the United States). These have grown annually by a factor of between 5.8 and 8.0 percent since 2007 (Bank for International Settlements, 2013). Like plumbing, payments are mundane in nature and a key part of any economic infrastructure. Although the design of payment systems was an important concern before the computer age, the rise of information technology (IT) in the mid twentieth century led to substantial improvements in terms of their efficiency and effectiveness.

Efficiency denotes the costs and the speed of transactions in a given payment system. Compared to traditional payment schemes which take a share of 5 percent or more of the value of an average consumer transaction and national payment systems which incur total costs of approximately 3 percent of the country’s GDP, electronic payment systems have a cost advantage of 50 to 75 percent (Hancock & Humphrey, 1998, p. 1574). Electronic payment systems have accelerated the transfer of money considerably and payments are - depending on the scheme - feasible in real-time. Effectiveness characterizes the functionality, security and reliability aspects of payment systems. A large variety of different payment schemes has emerged on behalf of national governments and private providers to address the various requirements of settling economic transactions. For example, payments for small sums of
money (micro payments) involved in purchases of electronic newspaper articles are different from credit card payments for higher-value goods due to the varying cost structures of the underlying payment infrastructure. Security and reliability are especially critical in electronic and mobile transactions since buyers and sellers are mostly physically dispersed when the transaction occurs and since they take place in a virtual, digitized, and automated world. This means that when problems occur, the implications may propagate in real-time and more quickly before the damaged parties can intervene.

Understanding the design alternatives of online payments can help practitioners and academics to address the ever present difficulty of making payments as convenient and cost efficient as possible for the users, while maximizing safeguards against opportunistic behavior.

2. Requirements for online payment methods

Providers of electronic commerce solutions may choose between a variety of competing payment methods and systems. Payment methods refer to a specific scheme for transferring value between various parties and concentrate on the activities that need to be performed in a predetermined logical order. The notion of payment systems is a more static concept and emphasizes the participating actors, institutions and information systems. Usually, a payment method is implemented in a payment system and is offered on the market by publicly or privately owned payment providers. The classification of alternative payment systems may follow functional criteria, such as anonymity or privacy, applicability, authorization type, convertibility, efficiency, interoperability, multi-currency, reliability, scalability, security, traceability, trust and usability (Abrazhevich, 2001, 2004, p. 46). Where there are competing payment systems, buyers and sellers ultimately determine which payment systems are used to support their transactions. Since the choice of payment systems following differentiated functional criteria exceeds the available knowledge of average users, the three criteria of risk, convenience and costs can be applied (Dahlgren et al., 2008; Hancock & Humphrey, 1998; Humphrey, 2010; O’Mahony, Peirce, & Tewari, 2001; Yu, Hsi, & Kuo, 2002). These three decision variables influence the choice of the payment service provider who offers one or more payment methods. As shown in Figure 1, this model recognizes payments as part of the ‘purchase consumption’ phase within an (electronic) transaction which, in addition, includes pre-purchase as well as post-purchase interactions (see also Kalakota & Whinston, 1997, p. 237). Note, that dependencies between the three variables are mutual. For example, parties may have to reconsider their priorities in the risk and convenience dimensions and find a new compromise should the resulting payment exceed the cost expectation of one or both parties involved.
2.1 Risk management

The first and possibly most important dimension for buyers and sellers is to control the risk involved in payments. A variety of criminal threats exists (e.g. money laundering, terrorism financing, fraud) which call for efficacious risk management mechanisms to cover the buyers’ as well as the sellers’ risks (Choo 2013).

2.1.1 Risks from a buyer’s perspective

The main risk for a buyer is the seller’s performance. Will the goods be delivered as specified in terms of quality, quantity and timing? In addition, product liabilities, warranties, and the like apply in the longer term but are not examined further here. From a buyer’s perspective, four generic payment options exist:

- The buyer pays after the goods/services have been delivered and confirmation has taken place that they are as expected.
- Prior to paying, the buyer receives confirmation from a trusted third party that the seller has performed as agreed.
- The buyer has the possibility to reverse the payment unconditionally without having to rely on the seller’s willingness to comply (and without the necessity of legal action).
- The buyer has no insurances against non-performance but has to pay up-front.

The sequence of these options shows a growing risk and cost of capital for the buyer as the time between paying and delivery proceeds and the recourse possibilities in case of a seller’s non-performance decrease. The first two options are more common in a business-to-business (B2B) setting, whereas the latter two are more prominent in a business-to-consumer (B2C) environment. Depending on the situation, the buyer will have to decide what level of risk to accept, which depends on many factors among which are the availability of alternative suppliers with more favorable conditions, the ability of the buyer to absorb a potential loss (which is a function of his financial position and the size of the transaction), and the trust in the seller and availability of risk-mitigating (payment) methods.
The second major category of risk is associated with the exchange of personal data. Data protection is an increasing concern, both from a privacy and a criminal perspective (identity theft). Three privacy categories in the context of online payments may be distinguished, again in order of increasing risk to the buyer:

- Anonymous payments: Sellers lack information about the buyer without name, address or other data being made available.
- Core data availability: The seller knows the identity (and delivery address if relevant) of the buyer, and any other elements that are essential to fulfill the transaction. For instance, some transactions require that a client is of a certain age, but additional data needed to facilitate the payment, such as credit card authentication and authorization data are not available to the seller.
- Full data availability: The seller has access to all data, including data that potentially enable the seller (or anybody with (illegal) access to the systems) to initiate payments on the buyer’s behalf.

While anonymous (cash) payments are common practice in the physical Point-of-Sale world, for Internet transactions it is the opposite, since a delivery address is needed for all sales of goods at a minimum. Most early payment systems provided full data to the seller, including the “wiring” of money (i.e., credit transfers), credit card transactions and checks. There is, however, a pressure to redesign payment systems (e.g., using transaction references instead of card holder data in credit card schemes) because of increasing regulation regarding the security of the data at the merchant and all intermediary parties (e.g., the Payment Cards Industry initiative on Data Security Standards (PCI/DSS)). There is demand for fully anonymous online transactions, but regulators are hesitant to support such initiatives given the potential it would provide for money laundering and funding for criminal activities.

2.1.2 Risks from a seller’s perspective

For sellers, the main risk is a failure to receive money for the goods or services delivered. The reverse order of risk preference as compared to the buyer is likely to occur from the seller’s perspective. In general, five levels of finalization of payment may be distinguished in a sequence of growing risk:

- The buyer pays up front and the payment is received before the seller releases control of the goods or delivers the service.
- A third party (typically a payment service provider or a bank) guarantees that the funds will be received by the seller and that the buyer cannot roll-back the payment unless the seller agrees and instructs the bank accordingly.
- The same as the previous two, but the seller hands over the goods to a carrier and delivery to the buyer does not occur until payment (or a guarantee) is received.
- The seller receives the payment before delivering the goods or services, but the transaction may be reversed by the buyer without the seller’s permission.
- The payment to the seller is effected after the goods or services have been delivered.

The second type of risk associated with payments is the counterpart of the buyer’s risk for privacy and identity theft. Sellers may have an inclination to maximize their knowledge about consumers and customers for marketing and sales purposes and, therefore, prefer core or full data over an anonymous scenario. However, having this data in the system makes sellers liable for the damage caused when
hackers obtain access to them. In a core data scenario, this damage could be reputational risk and some (individual) claims for breach of privacy. However, in a full data scenario, there might be substantially higher claims from the parties involved. Credit card companies may penalize the seller over and beyond the actual financial damage caused by the criminals from exploiting the stolen cards.

2.2 Convenience

The second dimension that influences the choice of a specific online payment method is convenience. Again, the perspectives of a buyer and a seller may be distinguished.

2.2.1 Convenience from a buyer’s perspective

The first aspect in the “convenience” dimension is the vague term *ease of use*. Buyers may want to employ a payment method that is simple to use (or that they are already familiar with) and that is widely accepted (or that they may use in transactions with other sellers as well). Any investments in the use of a seller-specific payment method are a sunk cost. The payment part of the transaction should be easy to understand and involve a minimum of additional steps. Ideally, a payment method can be used regardless of the device the buyer employs to access the Internet (desktop, laptop, smartphone etc.) anywhere, any time, and should be integrated with electronic, mobile or social commerce solutions.

The other dimension is the *availability of credit*. From a buyer’s perspective, two basic types of collections are:

- **Without credit facility**: The buyer needs to have the value of the transaction available prior to executing the transaction. Cash, credit transfers from bank accounts, debit cards, virtual wallets such as PayPal, or pre-paid balances in the telecom industry belong to this category.

- **With credit facility**: The buyer has a credit limit and, while the intermediary party initiates the transfer value to the seller immediately, the buyer will reimburse the intermediary party later. For the seller it is not relevant whether or not the buyer is able to do so, for example, credit card payments, overdraft facilities on bank accounts as well as subscription-based telecom contracts.

2.2.2 Convenience from a seller’s perspective

For sellers, there are three key elements of convenience: reach, reconciliation and timing of debit. The *reach* of a payment method refers to the number of clients that have the ability to pay using this method. For a seller it is essential not to exclude potential buyers by offering a limited selection of payment method(s). For example, sellers with international scope may limit the available payment methods to internationally accepted ones and bear the cost for integrating and maintaining multiple (domestic) payment services. To increase reach to local businesses they may, however, also offer domestic solutions, thereby increasing their payment costs. Sellers may require easy reconciliation of the payments received via the payment method with the internal accounting system, preferably automatically, and with the availability of an audit trail to satisfy regulatory requirements.

The *timing* of debit refers to the elapsed time until sellers have access to the funds. From a liquidity perspective a payment method that encompasses an immediate transfer of value (like cash, or some virtual currencies) is preferred to a payment method that takes a few days to settle. This is regardless of the timing and finality of the payment itself (see section on risk above). Even if the buyer pays up front, it may still take a few days for the seller to receive the money:
- **Real time:** The settlement of the payment transaction is done without noticeable deferral after the payment instruction by the buyer.

- **Batch-processed:** Payment transactions are cleared and settled in batches between the involved parties, often over-night, but possibly taking a few days to complete. In this period, the buyer typically no longer has access to the funds, while the seller has yet to receive the funds.

### 2.3 Cost of payment

A third characteristic of an electronic payment system is the cost incurred by sellers and buyers. The effective costs will be determined by the pricing policy of a specific provider, the configuration of the payment system and local agreements. The following are some possible options:

- **Subscription fees** are periodical payments by the buyer or seller to engage in a transaction, independent of whether payments have been made. Examples are the subscription to a virtual community, such as Second Life, or the account or card fees charged by banks to both buyers and sellers.

- **Merchant fees:** The merchant will incur a fee from whichever payment processor is used, whether it is a credit card company, a payment service provider or a logistical service provider. Typically, the amount to be paid is a combination of a fixed transaction fee and a percentage of the value of the transaction. The first typically covers the processing costs of the provider(s), while the latter is a compensation for the risk, especially in case of credit card companies. If a merchant goes bankrupt in the period when buyers still have a right to reverse a transaction, the acquiring bank (and if it goes bankrupt, the credit company) still has to pay.

- **Buyer surcharge:** In most cases the buyer does not directly pay for the actual transaction to the payment provider. The normal convention is that the buyer only pays his periodical charges (card fee, account fee) while the merchant pays for the transaction-related costs. However, the merchant needs to recover these costs from the buyer. This can be part of the price she charges for the goods or services, but increasingly sellers offer buyers a variety of payment options (so-called multiple payments see Abrazhevich 2004) with a possible surcharge depending on the method, trying to steer the buyer to the cheapest solution for the buyer. It is of questionable legality whether the seller is or should be allowed to make a profit on this particular charge.

### 3. Classification of online payment methods

Various payment service providers offer payment methods to the market. The classification of payment methods in Figure 2 follows the requirements discussed in the previous section and suggests the type of currency, the process used and the type of party offering the payment service as key classification criteria.
3.1 Payment methods based on real currency

Real economy currencies are used for most online transactions and such transactions have been growing since the 2000s (Bons et al., 2012, p. 197). They are backed by a formal government or other legislator, such as the European Central Bank for the euro or the US Federal Reserve for the US Dollar. This implies that parties involved in payment services are strongly regulated, for instance via the Payment Services Directive in the European Union (EU) or the Dodd-Frank regulations in the USA. From a process point of view, buyers have six basic ways to transfer funds to sellers:

- **Cash transaction**: the buyer owns legal tender (bank notes) that is handed over to the seller at the appropriate time. No banks are involved in the transaction, although the buyer may have received the cash via an ATM and the seller may deposit daily proceeds into a bank account. In the electronic commerce context, “cash on delivery” denotes a scenario where a seller collects, typically via logistics service providers (LSP) the funds at the doorstep of the buyer or, alternatively, directs the buyer to a pick-up point with point-of-sale payment capabilities (e.g., specific stores, central distribution hubs of the LSP).

- **Credit transfer**: the buyer instructs a bank to move part of a balance to the seller; also known as “wiring” funds. It can be performed domestically and internationally, and within the Single European Payments Area (SEPA) in Europe, and also multi-domestically, meaning that the transaction fees are the same as for domestic transactions. For online payments, this can only be used for transactions where payments happen prior to or after delivery without any online authorization taking place during the concluding of the transaction. However, new services have been developed that enhance these classic processes and utilize the fact that many clients use online banking. In particular, online banking electronic payments (OBeP)
add an information layer to the classic credit transfer (Oakes, 2011). OBeP provides an immediate confirmation to the seller that the buyer indeed did instruct his bank to make the payment. Typically, OBeP is implemented in a (national) scheme where the seller uses an “acquirer” who facilitates the payment. The scheme requires that buyers are not able to retract instructions. For instance, in the Netherlands, nearly 60 percent of all online payments take place via the local OBeP scheme iDEAL (Currence, 2011). The popularity of the system is explained by the Dutch resistance to buying on credit, fear of credit card data theft, and on the part of the sellers, more favorable pricing compared to credit card transactions. This category also applies to Electronic Bill Presentment and Payment (EBPP) or e-invoicing (Alt & Zbornik, 2002). EBPP enables a seller to send an invoice to a buyer and to have a credit transfer prepared in the buyer’s online banking environment. In contrast to OBeP, EBPP payments are not effected in real-time and can be used for both pay-before and pay-after transactions with the latter being more common.

- **Direct debit**: the buyer authorizes the seller to collect the funds from an account. This option typically is used for repetitive payments. Direct debits used to occur within a domestic banking community, but the SEPA Direct Debit will allow parties in the EU to conduct cross-border direct debits. Building on the direct debit process new processes are developing such as e-mandates, which are similar to OBeP payments. They provide a way for the seller to know during the transaction that the buyer has authorized the collection of funds. Sellers offering repetitive services have a need for this type of service and can benefit from the fully digital and instantaneous process. From a process perspective, a check can be seen as a form of a direct debit: the drawer of the check authorizes the drawee to have funds collected from the drawer’s account. The check is still popular in some countries, most notably the USA and France, but has been phased out in many other countries because of the limited possibilities of automating its processing. In an online setting, checks can be used in pay-before and pay-after scenarios, but this is not common and is of decreasing relevance (Broxis, 2012).

- **Card-based**: For card-based payments, the main difference between online payments and point-of-sale payment is the absence of a physical terminal and the ability to check the identity of the card holder. While this has long been unprotected, card companies are offering additional levels of security where – via a different channel – the buyer is asked to provide an additional password to authenticate his identity. This information is not shared with the seller which effectively prevents the use of the data stored by the seller to make a payment under the buyer’s identity. However, not all websites make use of these 3D Secure technologies (e.g. Verified by Visa, SecureCode by MasterCard etc.), and so this system can still be circumvented. Two schemes may be distinguished:
  
  o Debit card: instead of giving a payment instruction to a bank, the buyer has a (virtual) account with a card company and authorizes a transfer to the seller; the seller will receive the funds in an account, typically a few days later. In most cases, debit card accounts are connected to a bank account, and for the card user the effect of making a payment is no different from a credit transfer.
  
  o Credit card: in contrast to the debit card scheme, the buyer may delay the actual payment based on the credit terms in an account and invoke a charge-back in case of non delivery. Even if sellers are able to prove the delivery of goods, significant effort is needed to obtain the payment. In the popular four corner model used by
MasterCard, Visa and others, issuers and acquirers connect to the end-users (card holders and merchants). Three corner models handle all activities themselves (with the exception of the connectivity), the leading example here being American Express.

Other large credit card schemes are Japan Credit Bureau (JCB) and ChinaUnionPay.

- **e-money**: This is a term legally defined by the EU as "value as represented by a claim on the issuer which is: stored electronically; issued on receipt of funds of an amount not less in value than the monetary value issued; and accepted as a means of payment by undertakings other than the issuer" (Directive 2009/110/EC). Offered as an alternative to the banking system, it allows consumers to fill their wallets by transferring real currency (via one of the previous processes) into an e-money account offered by a payment service provider. Transferring value occurs within the systems of this provider, including reconversion into real money. The most well known example is PayPal, which has a banking license in Luxembourg and is expanding the application of this payment engine from the virtual world to the Point-of-Sale world.

Figures 3 and 4 show these schemes in the overall process (in the purchase consumption stage in Figure 1).

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**Figure 3**: Process view of pay-before activities in the purchase consumption stage
In all these scenarios, sellers typically need to engage an “acquirer” to handle the routing of the authorizations and the clearance and settlement that result in a credit transfer to the seller’s bank account. In some cases, the seller’s bank will offer acquiring services as well, but this role differs from other payment service providers. Tables 1 and 2 summarize how the payment methods address the requirements of the buyers and sellers (see Section 2).

<table>
<thead>
<tr>
<th>Buyer</th>
<th>Risk</th>
<th>Convenience</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash (on delivery)</td>
<td>No risk</td>
<td>Anonymous except for delivery address</td>
<td>High</td>
</tr>
<tr>
<td>Credit transfer</td>
<td>No risk if paid after the delivery high risk if paid up front</td>
<td>Core data available to seller the key data needed for authorization not given</td>
<td>Medium; may require going to different website and coordinating payment details with seller</td>
</tr>
<tr>
<td>OBeP</td>
<td>High risk</td>
<td>Same as credit transfer</td>
<td>Easy to use because of integration between seller’s website and online banking system</td>
</tr>
<tr>
<td>Direct Debit</td>
<td>Medium risk as initiative for collection is with seller, but mitigated by unconditional charge back possibility</td>
<td>Same as credit transfer</td>
<td>Similar to credit transfer; signed mandate has to be given to seller (e-mandate will facilitate this)</td>
</tr>
<tr>
<td>Credit Card</td>
<td>High risk of non delivery, but mitigated by unconditional charge back possibility</td>
<td>Full data available to seller</td>
<td>Easy to use across multiple countries</td>
</tr>
<tr>
<td>Debit Card</td>
<td>Same as Credit Transfer</td>
<td>Same as Credit Transfer</td>
<td>Same as Credit Card</td>
</tr>
<tr>
<td>e-money</td>
<td>High risk as payment is before delivery, but the risk may be mitigated by the PSP offering the e-money solution</td>
<td>Low risk due to limited data availability, e.g. email address only</td>
<td>Easy to use during the transaction; filling the e-money account may be a bit more difficult</td>
</tr>
</tbody>
</table>

Table 1: Payment methods based on real currency assessed from a buyer’s perspective
Table 2: Payment methods based on real currency assessed from a seller’s perspective

<table>
<thead>
<tr>
<th>Payment risk</th>
<th>Data Theft</th>
<th>Reach</th>
<th>Reconciliation</th>
<th>Timing of crediting</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash (on delivery)</td>
<td>Medium risk; non-perishable goods will not be lost but need to be returned at a cost</td>
<td>Anonymous except for delivery address</td>
<td>Service exists in most countries, but connectivity depends on offering of Logistical Partner(s)</td>
<td>Depends on the level of service of the Logistical Partner(s)</td>
<td>Fee per transaction, typically (partly) charged to the buyer via the delivery costs</td>
</tr>
<tr>
<td>Credit Transfer</td>
<td>High risk if paid after the delivery, no risk if paid up front</td>
<td>Full data available to seller so vulnerability created</td>
<td>Cumbersome as the payment description is entered by the buyer and may contain errors or lacking references</td>
<td>Typically a few days depending on banking practice</td>
<td>Bank charges only (annual account fees and a per transaction fee)</td>
</tr>
<tr>
<td>OBEP</td>
<td>Low risk as confirmation of bank is given prior to delivery</td>
<td>Same as Credit Transfer</td>
<td>Easy as payment description is defined by seller enabling easy referencing</td>
<td>Same as Credit Transfer</td>
<td>Same as Credit Transfer</td>
</tr>
<tr>
<td>Direct Debit</td>
<td>Medium risk as buyer may not have sufficient balance when the direct debit occurs and/or may revoke the payment</td>
<td>Same as Credit Transfer</td>
<td>Easy as payment description is defined by seller enabling easy referencing</td>
<td>Same as Credit Transfer, with some possibilities for delays</td>
<td>Slightly higher than Credit Transfer</td>
</tr>
<tr>
<td>Credit Card</td>
<td>Low risk as payment guarantee is given prior to delivery, but risk of frivolous charge backs</td>
<td>Same as Credit Transfer</td>
<td>Easy to use across multiple countries</td>
<td>Depending on quality of IT system as a cross-reference is needed between credit card tx# (number of transactions) and internal tx#</td>
<td>Typically within a few days</td>
</tr>
<tr>
<td>Debit Card</td>
<td>Same as Credit Transfer</td>
<td>Same as Credit Transfer</td>
<td>Slightly less used than credit cards in major markets</td>
<td>Same as Credit Transfer</td>
<td>Typically, within a few days</td>
</tr>
<tr>
<td>e-money</td>
<td>Low risk as payment guarantee is given prior to delivery, but risk of frivolous charge backs via the PSP</td>
<td>Low risk due to limited data availability, e.g. email address only</td>
<td>Depend on the PSP: some schemes have global reach</td>
<td>May be cumbersome depending on the service level of the PSP</td>
<td>Within a few days after instructing conversion from eMoney into bank/card account</td>
</tr>
</tbody>
</table>

3.2 Payment methods based on virtual currencies

The virtual world created by the Internet has triggered the emergence of alternative currencies. Whether to save the costs or to counter the inefficiencies associated with traditional payments across the Internet, out of a desire to transfer value anonymously, or for political/philosophical reasons, virtual currencies are increasing being used. Following the definition and classification by the EU (European Central Bank, 2012) all virtual currencies have in common that they are not issued and regulated by a
government agency, but by another entity. This is also the main difference between virtual money and electronic money. In contrast to virtual money, electronic money also has a regulated and supervised link to real-economy money.

The first type of currency, the closed virtual scheme, best known from (online) gaming, features only limited interaction with the real economy (European Central Bank, 2012). While some sort of membership fee may apply to be part of a virtual community, all value generating and spending activities occur within the virtual community. The buying and selling of “credits” through the real economy is not allowed and may lead to expulsion from a game (which does not mean there is no black market for “World of Warcraft” credits).

The second and third types of virtual currency allow members to purchase virtual money using real money (e.g., buying prepaid minutes for a mobile phone) or earn virtual money by executing activities in the real world (e.g. earning frequent flyer miles) or a combination of the two (e.g. buying extra frequent flyer miles). The entity running the virtual currency system typically has implemented a mechanism to issue new value, to spend the value on products and services provided by the entity and, in more advance systems, to allow transfers between members. In Type 2 virtual currencies, the provider does not offer a mechanism beyond this to allow users to transfer the virtual currency into a real currency, Type 3 virtual currencies do. Some forecast a US$4.8 billion market for mobile in-game purchases by 2016 (Juniper, 2012), an increase from $2.1 billion in 2011. This is driven by the “freemium” model, where smartphone users may download an application for free, but have to pay to obtain specific features of it. These systems are under the close scrutiny of authorities as they raise concerns about money laundering, the funding of illegal activities and the undermining of financial stability. The Bitcoin scheme is an example of a “Type 3” currency, and the controversy surrounding it is being closely followed (ECB, 2012). According to Blockchain (2012), over 11 million Bitcoins were “mined” in April 2013, peaking at a market capitalization of over US$2.5 billion. It should be noted that the Internal Revenue Service has recently ruled that “virtual currency is treated as property for U.S. federal tax purposes” (IRS, 2014), making for instance Bitcoins similar to gold and requiring taxpayers to convert the value into a real currency before reporting it into the tax return statement.

Type 1 virtual currencies are not relevant for most online sellers unless they offer their own community in which parties may wish to transact. Type 2 virtual currencies may be useful if the seller is able to connect to the owner of the currency to define a conversion method (e.g., accepting frequent flyer miles as a payment). Other examples of Type 2 virtual currencies are balances held by (mobile) telecom companies, especially when they offer the ability for one user to transfer a balance (in terms of calling minutes, SMS messages, megabytes etc.) to another. M-Pesa is one of several services that is used in for “remittances”: payments by foreign workers to their home community, and has entered the market for online payments (Mulligan, 2013). Type 3 virtual currencies may be of interest to all sellers because they allow buyers to pay using their mobile phone balance, Bitcoin or other virtual currencies.

### 3.3 Examples of value-added payment services

In practice, payment service providers combine one or more core payment methods and value-added services in a single offering to the market making it difficult to distinguish between or to position the individual components. Among the value-added services that may be combined with core payment services are the following.
The first is the online cash register. Sellers may decide to outsource the payment processing part of their online store to payment service providers who offer a (hosted) module. This module handles all the information exchanges regarding payments and interacts with the seller's internal systems and the one or more systems that manage the authorization, clearing and settling of the payment methods that are offered. This removes the complexity and some of the risk from the seller's environment, although the seller remains accountable to stakeholders in the payment if something goes wrong.

The second example is the wallet service. There is some confusion about the meaning of this term. To some, it refers to what has been defined here as e-money, which allows parties to pay each other inside their own payment system. A more recent development of the wallet acts as a man-in-the-middle to shield the buyer's sensitive data from the seller. It allows a buyer to use a full data solution while giving the seller only the core data needed. It still provides the seller with sufficient guarantees, without having to handle sensitive data such as credit card data. Examples are Google Wallet (formerly known as Google Checkout), MasterCard PayPass Wallet and Visa’s V.me. These offer a web interface to the consumer while providing the software integration for merchants that want to route transactions via these wallets.

The third type of service aims at sellers and facilitates their invoice-to-cash process. Providers offer a range of services, from financial products such as “receivables financing” also known as factoring - where the provider purchases the seller's invoice, including the right to receive the payment from the buyer and (most of) the risks of default by the buyer with variations in the amount of risk, anonymity of the service, portfolio versus single transaction and so on - to information processing-related services that provide detailed insight into the status of invoice portfolios. At the single transaction level, some of these service providers (e.g AcceptEmail in the Netherlands) offer convenient ways for the buyer to pay a bill quickly, building on the payment methods discussed above.

The fourth type of services are delivered by logistical service providers when they execute what is in effect a point-of-sale real-world transaction when delivering goods to the doorstep of the customer. The payment methods available are the classic Point-of-Sale methods, ranging from cash and checks to card payments.

Finally, if buyers and sellers do not use the same currency, the payment will have to be converted, for instance from US dollars into British pounds. The underlying financial service provider(s) can handle this, but it may also be a service offered by a third party specializing in conversion, for instance dynamic currency conversion, which offers the buyer the option to “buy” the foreign currency at a given rate instead of relying on the rates offered by a bank after the fact. This may also apply to conversion between real and virtual currencies, for instance, Bitcoin exchanges.

4. Summary and Outlook

Online payments are a key enabler of the diffusion of electronic commerce. This entry has suggested a classification taking a systematic customer perspective as a means of structuring the most important payment methods and services. The evolution of electronic, mobile, or social commerce is not blocked by a lack of practical, reliable, and safe payment methods. Parties have found ways to implement and adjust payment methods from the physical world to the online world. It appears, however, that the perfect payment method does not exist. Limitations in terms of usability, risk avoidance, and cost control are always present. The dilemma in all payment transactions is that, while buyers and sellers typically have an overarching goal of making the transaction successful, they have opposite incentives in areas
such as risk management, that is, the lack of risk for the buyer increases the seller’s risk and vice versa, and insuring against these risks using trusted third parties increases the costs of the transaction.

The further development of online electronic payments is likely to see the continued consolidation of the large payment methods such as credit and debit card payments. Payment service providers are sensitive to economies of scale and mergers and acquisitions are likely. Banks are outsourcing (part of) their payment operations to such parties, making this a viable model for the future. Established providers have been slow to adapt to new market requirements and technological potentials. One of the reasons that e-money initiatives, such as PayPal or Dwolla, have emerged is a lack of attention on the part of the providers of traditional payment methods to low-value and low-cost transactions. The advent of smart-phones has enabled new ways to transact. For instance, Apple’s iTunes store or Google’s Play environment have attracted revenues from the in-game “freemium” models as people use smartphones for playing games and interacting on social platforms. While this is not (yet?) relevant for the payment methods used - consumers still use their credit card or other payment methods to pay for their apps - it does influence market dynamics for content providers as they become dependent on the willingness of these stores to accept their products. Other examples are payments among (end) customers (so-called C2C payments), group payments as well as payments that are directly linked to loyalty schemes and that allow immediate conversion of points into currency at point of sale terminals. Non-banks, especially, will challenge established payment providers in the future.

There is a continuing need for research into new payment technologies and methods. As the use of these grows, research will be needed into how the landscape of payment service providers evolves and the conditions under which parties can offer services. It is also interesting to position payments in the context of Big Data research initiatives. Companies specializing in generating value from analyzing large quantities of (operational) data see increasing benefit from being involved in payments. To them, a payment is not just a transition of funds from buyer to seller, but information that may create value by linking it with other data. Google’s Checkout/Wallet service is but one example of how such companies gain access to these data. It will also be interesting to explore why little added value has been generated so far by the traditional parties that already have access to these massive data resources.

In summary, the basic requirements for online payments may be expected to remain stable and payment providers are likely to retain their critical “plumbing” role. However, the technologies used, the parties offering payment methods, and the resulting risk, convenience and cost fulfillments will continue to evolve, making electronic commerce online payments an exciting and relevant field for future research.

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Authors’ Bio

Roger W. H. Bons is a guest lecturer at the VU University, Amsterdam and the owner of Bons Academic Services, a small consultancy in the Netherlands. He holds a master’s degree in computer science from the Eindhoven University of Technology, and a PhD from the Rotterdam School of Management at Erasmus University Rotterdam. Prior to his current position, he worked for the ING Group of the Netherlands in the payments and cash management domain and for Philips Electronics in several positions related to e-commerce.

Rainer Alt is a professor at the University of Leipzig, Managing Director of the Information Systems Institute (www.iwi.uni-leipzig.de) and Editor-in-Chief of Electronic Markets (www.electronicmarkets.org). He earned a master's degree in business administration from the University of Erlangen–Nuremberg, Germany, and a PhD, as well as a postdoctoral degree, from the University of St. Gallen, Switzerland. Before assuming his current position, he was a visiting researcher at the University of California, Irvine, a senior consultant at Roland Berger Strategy Consultants in Germany, and an assistant professor at the Institute of Information Management, University of St. Gallen.