Innovation in Non-bank Payment Systems

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Abstract

One of the consequences of the IT revolution has been the proliferation of innovative payment systems. This paper provides a brief survey of the determinants of innovation and how they might apply to the introduction of non-bank payments systems. The role of network economies and interoperability standards is stressed. The paper concludes with some thoughts on micro-payment systems.

Introduction

Innovation is a fact of life in any sector and the payments industry is no exception. What is relatively new and prompts this conference is the innovation in payment systems that has arisen as a consequence of the introduction of the worldwide web and the resulting growth in Internet usage, accompanied by the related spread of mobile telephony.[2] The possibility of constant digital connection to (almost) any place in the world in combination with the fact that a means of payment is not necessarily a physical object but one that can be represented in a form suitable for wired or wireless transmission has the potential to render older more familiar forms of payment (bills or physical checks) obsolete. Such disruptive technological change very often leads to accompanying changes in the market structure of an industry and this one is no exception. Examples are the growth of firms like PayPal (now a part of eBay) and the entry of wireless telephone service providers into the micropayment business.

An old story in the history and economics of innovation is the importance of new entrants in creating radical innovations, where the innovation either results in whole new industries or in a transformation of an existing industry. In many cases, such firms go on to become dominant in

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2 As is the case for so many other innovations, one can argue that the fundamental innovation was the integrated circuit, which has enabled both the Internet and wireless telephony at much lower costs than might have been possible without it. See Jorgenson and Wessner (2007) for an overview of the productivity consequences of the IT revolution.

their sector. Obvious examples are General Electric Company or the old American Telephone and Telegraph. The banking sector appears to follow this pattern: many recent innovations in payment systems, largely electronic or internet-based, have come from non-banks, that is, from firms that are not traditionally in the sector. As detailed later in the paper, about 40 per cent of the prominent examples are new firms that have entered during the past ten years. Because of the importance of the banking system, the entry of these non-banks into the payment system naturally raises concerns about increased risks to the system and its regulation. Our past experience with the relationship of economic regulation and innovation suggests that regulation sometimes has difficulties keeping up with innovation-induced changes in the functioning of particular sectors (telecommunications regulation is a prominent example).

This paper will provide a broad assessment of the current state of innovation and diffusion of bank and non-bank payment systems and its relationship to evolving market structure in the sector. Several themes from research literature on the economics of innovation will be emphasized: the slow diffusion of general purpose technologies (GPTs) that require the restructuring of the productive process, the two-way relationship of innovation and market structure, the role played by new firms in introducing radical innovations, and the importance of standards and network effects in achieving cost savings.

The paper begins with a brief review of the determinants of innovation and how they apply in this sector and for these technologies. Innovation in payment systems is one of the consequences of the introduction of what economic historians of innovation call a new "general purpose technology," the internet, so I begin by presenting an overview of this type of technology and its impact. Factors that encourage innovation in this sector are the potential reduction in processing costs, consumer convenience and faster settlement of payment transactions. Factors that may inhibit growth are the costs of providing appropriate security measures, consumer reluctance due to privacy and security concerns or lack of perceived advantage over older methods, and the problem of diffusion when there are many competing standards.

Because invention in this sector is now fairly well represented in the patent system due to the recent changes in the interpretation of patent law as it relates to subject matter (State Street 1998), it is in principle possible to provide some data on the specific ways in which it is taking place, and to identify the main actors. The set of innovators can then be compared to the set of firms that have high profiles in the bank and non-bank payment system area – are they the same? Have the innovating firms changed or remained the same over the history of financial innovation? Unfortunately, although patenting in financial innovation *per se* is generally confined to a single U.S. patent class (705), innovations in payment systems involve combining a number of interrelated technologies (software, image processing, telecommunications, register processing, etc.) and are therefore not easy to track using the patent classification system. For this reason, only very limited evidence on trends in patenting by firms in this sector is provided in the body of the paper.

Network effects in payment systems imply substantial returns to scale and the potential for customer lock-in and therefore have the potential to create market power. This means that understanding the economics of two-sided payment systems (platforms) is important both for an understanding of the diffusion of these systems and for their regulation (or non-regulation). I will touch on the role of network effects/market structure in innovation and diffusion briefly, but the question of the need for some form of regulation will be covered by later presentations at this conference in more detail (Economides, Rochet).

Another aspect of market structure evolution that is closely related to the innovative process in sectors where standards are important is the degree of vertical integration of the industry. As an industry matures and standards stabilize, there is a general tendency for firms to specialize at one level of the productive process, leading to greater outsourcing and a lower share of value added at each step. We seem to observe this phenomenon happening in the banking sector also, but can it be interpreted as arising from an innovation-induced process?

General purpose technologies

To a great extent, payment system innovation would not have happened without the

internet and associated changes in computing technology. Although proprietary networks with wide geographic scale existed before the internet, they involved relatively higher costs for users and access was restricted largely to the individual firms that owned them and perhaps their suppliers or customers. The importance of the world wide web is that it lowered cost and created an open standards platform that anyone could use, which facilitated the entry of new firms and business models.

The set of innovations that consist of personal computers, networked computing, and the internet (the "IT revolution") is what economists call a "General Purpose Technology (GPT)." A GPT is a technology that is useful in a broad range of industries and for a variety of purposes. As defined by Bresnahan and Trajtenberg (1995), "GPTS are characterized by pervasiveness, inherent potential for technical improvements, and 'innovational complementarities,' giving rise to increasing returns-to-scale." To this one might add the importance of technical standards that enable components produced by a range of firms to operate together without expensive customization. Classical examples of GPTs are the steam engine and the electric motor; modern examples are the semiconductor and the internet.

GPTs require many co-inventions to make them useful for particular purposes and achieving the full productivity benefits of a shift to these technologies usually requires reorganization of the productive process. All of these characteristics have been frequently attributed to the diffusion of the computer and the internet, and in fact used to explain the so-called "productivity paradox." An oft-told story is that the magnitude of the changes required to use a new GPT effectively mean that there are substantial costs associated with them and that achieving full diffusion to the relevant population of users may take a very long time (David 1990). A second consequence is that introduction of a new GPT may lead to substantial shifts in the types of employee skills demanded by firms, temporarily raising the wages of those workers who are most adaptable and trainable in the use of the new technologies. After the technology becomes pervasive in the economy, the relevant skills are acquired by a larger number of workers and wage inequality is reduced (Aghion and Howitt 1998, *inter alia*).

Electronic payment systems might be considered one application of the GPT that is networked computing (including the internet and private secure networks such as those used by banks) and they therefore are expected to share many of the characteristics described above: the need for standards of interoperability, for new-to-the-firm labor skills for their development and operation, and delayed adoption because they require complementary investments by their users, both physical and intangible. In the discussion of the determinants of innovation that follows, the role of these factors in inducing or discouraging innovation is highlighted.

The determinants of innovation

The economic analysis of innovation emphasizes the conventional economic determinants of demand and supply, but adds to these considerations that derive from two sources of externalities: incomplete appropriability of the returns to innovation (Arrow 1962) and increasing returns effects due to network benefits (David and Greenstein 1990). The former implies a potential for underinvestment in innovation and the latter can lead to a "winner-takes-all" race for market share that leads to overinvestment. At the risk of restating the obvious, in this section I review the various determinants of innovation as they relate to payment systems.

Network effects

Payment systems are inherently communication systems. That is, they involve transfers between and among large networks of individuals and firms, similar to way that the telephone system allows for voice communication among its many users. Network goods often have the property that the benefits to its users increase as the number of users of the network grows; this is certainly true of the phone system and may be true of most payment systems. A number of implications follow from this definition: First, firms producing a network good have an incentive to subsidize its use, at least initially, to compensate early adopters for the fact that they do not benefit at first from the presence of a large network and also for the possibility that these consumers will choose a network that does not survive in the marketplace. Second, once a network is established, the existence of customer switching costs may reduce entry incentives and create an entry barrier. These characteristics mean that ultimate network size is not

necessarily socially optimal under either monopoly or competition and that the resulting size depends to a great extent on the strength of the network effects.[3]

A second characteristic of network technologies is the importance of interoperability standards that allow different ways of connecting to the network in order to maximize the number of users when users are heterogeneous. Such standards can be "open," which implies that they are free for anyone to use, or proprietary. Proprietary standards may be open to others to use via a license, or they may be free but require the use of the owner's platform, which confers some monopoly power on the owner. The quintessential open standards are internet protocols such as TCP/IP and HTTP/HTML. The openness of these standards facilitated the creation of many payment system innovations, such as PayPal. However, these standards alone were not enough, given the need for security in transactions and additional technologies, notably Secure Socket Layer (SSL) technologies are also necessary.

Another kind of network effect may also be important in consumer adoption of payment systems: the costs of learning to use various systems. Having once become accustomed to the protocols for one type of security system (password requirements, special browser features, etc.) and having learned to trust them, consumers will be reluctant to adopt systems that use different or more complex methods of identification. This kind of network effect was identified by David (1985) in his oft-cited article on the QWERTY keyboard layout.

Supply factors

The supply of innovation in any sector depends on its cost, market size and expected demand, the presence or absence of well-defined standards and the cost of using those standards, and the extent to which regulation permits the trial of new ideas and ways of doing things. Because of the increasing returns to scale implied by network effects, market size and expected demand will play an important role for innovations in payment systems.

A large economic literature explores the question of whether existing firms that possess substantial market power or new entrants have a greater incentive to innovate. Although this

3 See Scotchmer 2005 for a survey of the theoretical literature on this topic.

literature does not reach definitive conclusions, it does tend to indicate that both very fragmented and competitive industries and industries dominated by a single firm are relatively worse at innovation. It also shows that established firms are better at incremental innovations, whereas radical innovations are more likely to come from new entrants. The payment systems sector seems to be no exception, with the prominent examples of Paypal (now part of eBay) and Verisign.

An important determinant of the supply of innovations is appropriability, the ability of firms to recoup their investments in introducing a new system. Traditionally, the patent system has served to protect firms from imitation for temporary periods, in order to ensure that they are able to earn some supranormal profits from their inventions. Of course, this is a very blunt instrument and can be problematical in network industries, both because of the need for open standards, and also because of consumer lock-in, which may extend a firm's market power beyond the statutory term of a patent. It is by no means a settled issue whether the advantages of the patent system in encouraging innovation in the financial innovation area outweigh its costs. Lerner 2007 shows that litigation over financial patents largely comes from very small players, and not from the firms that have actually successfully introduced financial innovations. A number of writers have criticized the quality of patents issued in this area specifically and in software more broadly, suggesting that the patent system has not functioned in the way it was designed to (see Hall 2003 for a survey).

Demand factors

Innovation is also driven by the perceived demand from consumers and other users, although this can be difficult to forecast. In the case of payment systems, which have a cost structure that relies heavily on scale economies, persuading consumers and firms to adopt them is an important part of the story. Consumers' reluctance to adopt new systems depends on several factors: 1) sunk costs of learning how to use the system; 2) perceived benefits relative to the system they currently use; and 3) concerns over reliability and security of payment. Factors 1 and 3 mean that systems supported by institutions that they already rely on, such as their bank or

broker, are often preferred. Factor 2 means that they will resist new systems that cost more to use than the payment systems they currently use, many of which have no visible fees attached. There are often hidden fees such as the foregone interest when holding funds in a checking account or the merchant fees that are passed on to consumers when they use a credit card, but these are largely invisible to consumers (and in the latter case, they are partly subsidized by cash users).

Network effects also play a role here, with consumers reluctant to adopt a new payment system unless they have reasonable expectations that it will survive. This fact means that systems sponsored by large players with whom they are used to dealing (e.g., banks or credit card providers) may have an advantage, although the success of some new entrants does suggest that this factor is not the most important determinant of adoption.

Innovation in payment systems: the players

Who are the major firms in this space? Are the most important innovators banks or non-banks? Has this changed over time? Are innovations well captured by patent data? Does U.S. patent class 705 (Data Processing: Financial, Business Practice, Management, or Cost/Price Determination) contain the important patents in this area? To answer these questions using available data, I rely on several sources:

- A dataset comprising all U.S. utility patents issued by December 31, 2004, together with the names of their assignees (the owners, whether corporate or not).
- Standard & Poor's Compustat annual industrial data (including financial firms) as of the end of 2005.
- A list of major US players in the market supplied by Bradford, Davies, and Weiner (BDW 2005).
- Additional sources of information on the rest of the developed world from OECD.

For the US, see Table 1, drawn from BDW 2005, but augmented to show the patents held by the firms as of 2004.[4] For almost all of these firms, financial data is available, so that their

4 In fact, a small number of these firms (Source Media, Identix, Harbinger) have exited or been acquired as of

size and sector is also known. The table also shows the date of entry into the Compustat file (corresponding roughly to the public listing date) for firms that entered after 1973. The final column of the table gives the number of patents held by the firm and its subsidiaries that lie in the patent class/subclass combinations in which the "pure play" subset of the firms patent.[5]

The table allows us to form a rough picture of the sector, although it is necessarily limited to the set of firms identified by BDW in their paper as the more important players. The most interesting thing about these firms is their heterogeneity. First, about 20 per cent of these entities are alliances of some kind among firms in the financial sector, reflecting the inherent need for standards and networking in payment systems. Among the firms, the older ones that have entered the payment systems sector are generally large firms active in other sectors such as oil and gas or machinery, mixed with a few financial firms that have successfully transitioned to the use of the internet for transactions processing. After 1994 and the introduction of widespread internet use, the entry rate increases considerably, but only three of the newer firms have more than one billion dollars of revenue in 2005 (e-Trade, eBay, and Verisign).

Table 2 gives the industry breakdown for the publicly-traded firms that were shown in Table 1, using the NAICS classification system.[6] The table excludes the U.S. Post Office and the alliances. The firms come from 6 major sectors (oil, machinery, information, banking, computer services, and other support services) and 22 subsectors within those. It is noteworthy that only two come directly from the commercial banking sector, although some of the alliances also involve commercial banks. In his study of the ePayment Systems Database, which concerns mostly European innovation in this area, Carat (2002) reports that about 40 per cent of

2007. One (Metavante) has been spun off from its parent (Marshall and Ilsley).

5 The pure play subsample is essentially all those firms on the list that are in the financial or software sectors. The patent classification system is a technology-based system used by patent examiners when they search for prior art when examining a new patent application. I defined the payment system technology as the class/subclass combinations in which the pure play firms had more than one patent. There are approximately 400 such patents in 100 class/subclass combinations, which are in turn contained in 23 classes. Table 3 lists the 10 most important classes.

6 NAICS is the North American Industry Classification System introduced in 1997; it replaces the older SIC system that was used for industry classification in government statistical publications. It is noteworthy that for this innovative sector it gives a much more refined breakdown than the SIC classification, which classifies half of these firms simply into the software sector.

"successful" payment systems are introduced by banks or near-banks and about 14 per cent by alliances that include banks. So although the data are not completely comparable for a number of reasons, it does appear that in the U.S. non-banks are relatively more likely to innovate in this area than in Europe.

The range of players in Tables 1 and 2 shows that there are in fact multiple areas of payment system innovation in the U.S. economy. One can identify traditional credit card issuers and transaction processors, firms that supply back office processing services to banks but are not banks themselves, firms specializing in paycheck processing, security and identification service firms, and a few firms that deal in payment methods that do not involve checks or credit cards and can therefore be used by those without bank accounts. However, in contrast to Europe, there seem to be relatively few firms that deal in smart card (cash) payments or payments using mobile telephones. This may reflect the higher penetration of credit cards in the United States and lower mobile telephone use, both of which are partly due to longstanding differences in regulatory treatment. For example, the U.S. has a tradition of unlimited free local area calling from fixed line phones which arguably discouraged the adoption of mobile telephones as a substitute for fixed line phones.

Patenting in payment systems

Many, but not all, of the firms in this sector make use of the patent system. Those firms that came from manufacturing (e.g., Exxon, Mobil, Diebold, etc.) were of course accustomed to patenting and this is reflected both in their aggregate patenting in all technologies, and in their patenting in the payment system technology classes. Some, but by no means all, of the newer entrants are also active patenters, and a few (Identix, Checkfree, Hypercom, Bottomline Technologies, Sterling Commerce, etc.) have patent intensities (patent to revenue) ratios that resemble those of the older manufacturing firms. Many of these startups will be venture capital-backed, and acquiring patents is often a requirement for obtaining such funding.

Table 3 gives an indication of the relative importance or unimportance of these firms in class 705, the financial and business methods class. The firms in the BDW sample in fact hold

almost all of the patents that lie in the payment system subset of class 705 (see Appendix A for a list of these subclasses). However, the vast majority of the payment system patents held by BDW firms are held by 5 large firms that operate in a number of other sectors: Exxon Mobil (698), Chevron (320), NCR (336), Lockheed Martin (207), and Diebold (26). The remaining 39 patents are held by BDW firms that compete only in the payment systems sector. Looked at in another way, "pure play" firms in this sector hold most of their patents outside class 705, in other data processing technologies, display, and communications (see Table 4). But even when I restrict the counts to subclasses in which these firms operate, they hold only one to four per cent of the patents issued in these technologies during the past decade.

This brief *tour d'horizon* does not suggest that firms in the payment system sector are innovating heavily relative to their size, but it does suggest several conclusions. First, without a major data construction effort to collect the other firms in the sector, it will be difficult to form a full picture. Second, the patent class system is not well designed to give definitive results on innovation in payment systems because there are so many different technologies involved and many of them lie in areas where computing and software more generally are very active. In particular, the financial and business method class (705) is only a small part of the story.

Conclusion and a proposal

This section draws a few tentative conclusions on the subject. An important distinction is between stored value systems and systems similar to checking or credit card systems. The former may reach more consumers and offer more anonymity, as well as being more suitable for micro-payments. In the latter system, funds are transferred at least part of the way from buyer to seller at the time of the transaction but there is some risk of nonclearance. In some cases, the seller bears the risk that the transaction will not be completed, whereas in others the risk is borne by the bank or credit card issuing company. In principle, the allocation of risk is not changed by moving the transaction to the internet or other electronic means of payment.

In contrast, stored value systems have the advantage that the seller and the card issuer face less risk of buyer default. They also appear to be convenient for micro-payment settings such as

parking and vending machines. Given this fact, it is surprising that they have not spread more than they have. The main use of stored value cards is by particular vendors who use them to ensure customer loyalty (e.g., Starbucks cards, transit system tickets, etc.). But this has its limits as cards proliferate and a better system might be to widen acceptance of a single card.

A proposal

The ultimate stored value instrument is cash (money). This instrument is universally accepted and well-suited to micro-payments. However, it is sometimes costly for merchants or governments to process (change must be provided, which requires an attendant or at least some form of point-of-sale storage for cash) and is also not completely secure to carry. A stored value card has the potential to operate like cash but to mitigate the problems of costly processing and security. The one downside is that some setup cost is required for acceptance, which rules out easy use for such purposes as tipping, small loans to friends or children, etc.

In a single country, cash essentially operates using a single government-mandated standard and this system has operated quite well for an extended period of time. Why should stored value cards be different? The best way to ensure wide diffusion and a low cost of entering the system might be to have the government or central bank define the standard for processing such transactions and then let banks issue them in whatever form is appropriate (e.g. standardized card or mobile phone recharge in some cases).

Such a system has the advantage that its cost would be relatively low, given widespread use. The government imprimatur ensures that potential adopters could be confident that their investment would not be wasted. This is important in the case of vending machines and other small payment machines. The consumer benefits from having a secure means of payment that can be used in a variety of places, especially those where he or she currently has difficulties due to the correct change requirement.

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Figure 1

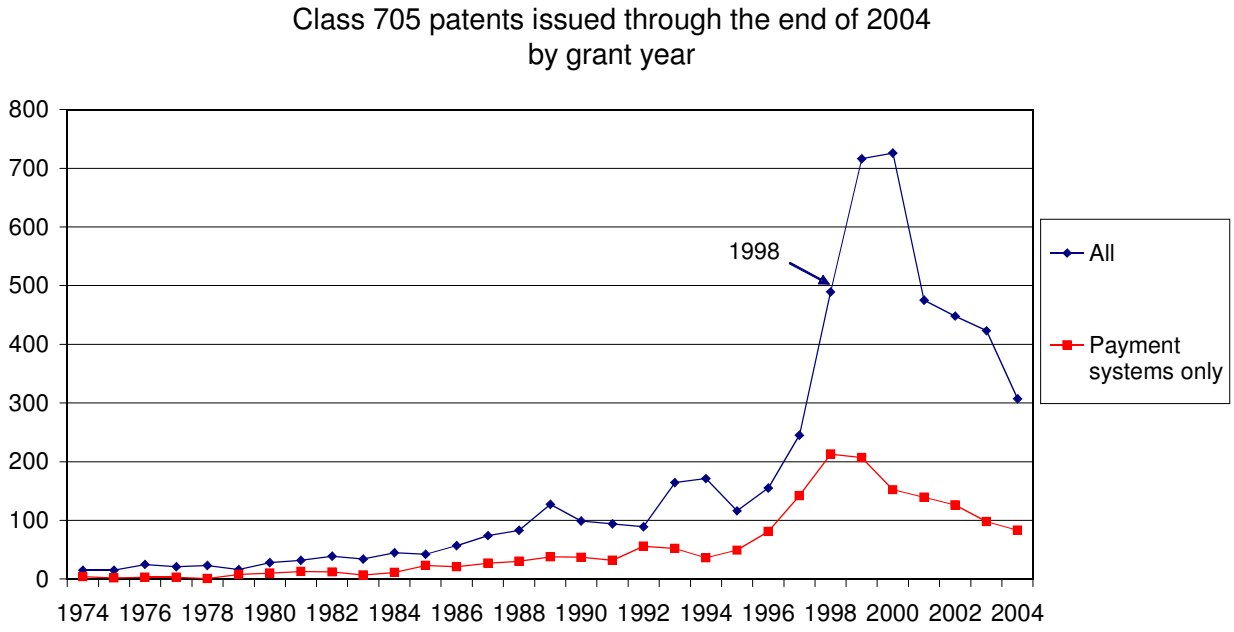

Figure 2

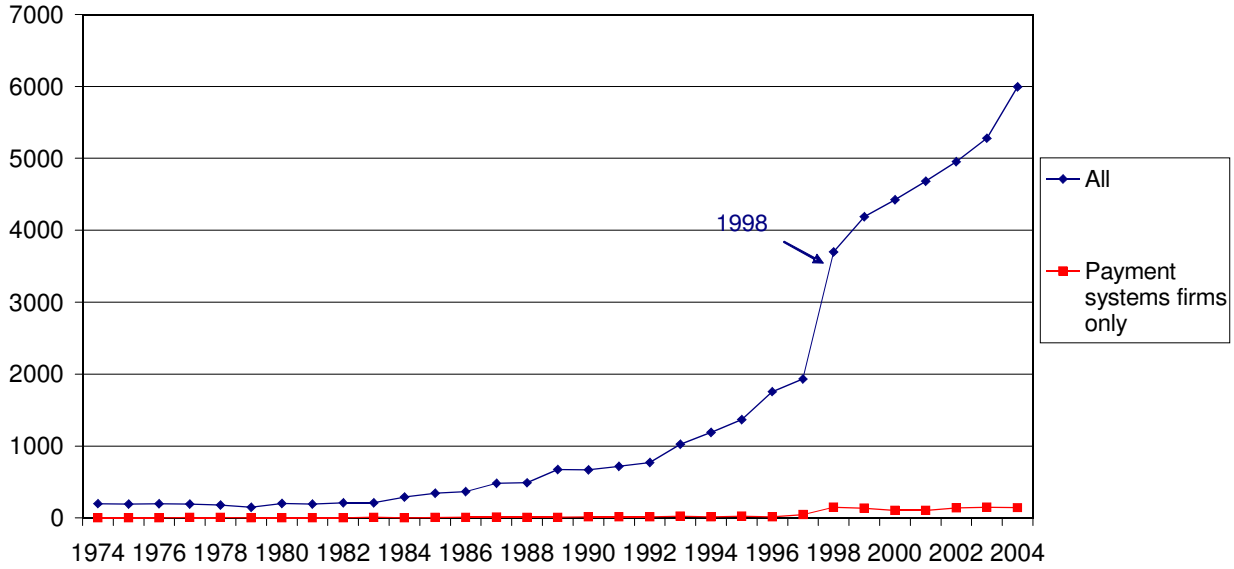

Table 1

Firm name	Type	Entry date (post 1970)	Revenue ($M) in 2005	Industry	Patents issued 1995-2004: All	Patents issued 1995-2004: Payment system technology
Concord/star alliance	alliance			financial		
EPN	alliance			financial		
Identrus	alliance			software		
Mastercard/Cook	alliance			financial		
Regulus	alliance			other		
Regulus Group LLC	alliance			other		
Small Value Payments Co LLC	alliance			software		
SVPCo	alliance			software		
The Clearing House Service Company LLC	alliance			software	3	3
Visa International	alliance			financial	61	44
Wespay	alliance			financial		
Western Payments Alliance	alliance			financial		
United states postal service	govt			other		
ALLTEL CORP	public	pre-1974	9,487.0	other	1	0
AMERICAN EXPRESS CO	public	pre-1974	25,457.0	financial	49	4
AUTOMATIC DATA PROCESSING	public	pre-1974	8,499.1	software	2	2
CERIDIAN CORP	public	pre-1974	1,459.0	software	20	8
CHEVRON CORP	public	pre-1974	184,922.0	other	4851	0
CITIGROUP INC	public	pre-1974	119,750.0	financial	103	97
DIEBOLD INC	public	pre-1974	2,587.0	mach	236	64
ELECTRONIC DATA SYSTEMS CORP	public	pre-1974	19,757.0	software	207	197
EXXON MOBIL CORP	public	pre-1974	328,213.0	other	8293	3
LOCKHEED MARTIN CORP	public	pre-1974	37,213.0	other	2593	49
MARSHALL & ILSLEY CORP	public	pre-1974	3,962.9	financial	1	1
MASTERCARD INC	public	pre-1974	2,937.6	software	16	12
MOBIL CORP	public	pre-1974	46,287.0	other	16	0
MONEYGRAM INTERNATIONAL INC	public	pre-1974	971.2	financial		
NCR CORP	public	pre-1974	6,028.0	mach	3246	386
STATE FARM INSURANCE	public	pre-1974	38,678.0	financial	4	4
GENERAL ELECTRIC CAP CORP	public	1974	55,515.0	financial		
PAY-O-MATIC CORP	public	1974	37.2	software		
WESTERN UNION TELEGRAPH CO	public	1974	862.6	other	16	0
PAYCHEX INC	public	1982	1,445.1	financial		
TOTAL SYSTEM SERVICES INC	public	1983	1,602.9	software	1	1
BALTIMORE BANCORP	public	1984	211.6	financial		
FISERV INC	public	1985	4,059.5	financial		
HENRY (JACK) & ASSOCIATES	public	1985	535.9	software		
IDENTIX INC	public	1985	73.8	software	13	11
DISCOVER CREDIT CORP	public	1989	252.2	financial		
FIRST DATA CORP	public	1991	10,490.4	software	61	55
ACE CASH EXPRESS INC	public	1992	268.6	financial		
CHECKFREE CORP	public	1994	757.8	software	8	8
SOURCE MEDIA INC	public	1994	18.6	financial		
VIEWPOINT CORP	public	1994	25.3	software	8	8
CHOICEPOINT INC	public	1995	1,057.9	financial	2	2
COINSTAR INC	public	1995	459.7	mach	31	2
E TRADE FINANCIAL CORP	public	1995	2,548.1	financial		
HARBINGER CORP	public	1995	155.5	software		
MONEYGRAM PAYMENT SYS INC	public	1995	140.9	financial		
STERLING COMMERCE INC	public	1995	623.1	software	18	18
VERISIGN INC	public	1995	1,609.5	software	10	10
EBAY INC	public	1996	4,552.4	software	8	8
HYPERCOM CORP	public	1996	245.2	mach	4	3
BOTTOMLINE TECHNOLOGIES INC	public	1997	96.5	software	2	2
ONLINE RESOURCES CORP	public	1997	60.5	software		
DIGITAL INSIGHT CORP	public	1998	214.0	software		
EFUNDS CORP	public	1998	501.7	software	3	3
METAVANTE CORP	public	1998	546.4	software	1	1
S1 CORP	public	1998	204.1	software		
HEARTLAND PAYMENT SYSTEMS	public	2004	834.6	financial		

Table 2

Sectoral distribution - Payment System Firms in BDW, Table 1

NAICS	Firms	NAICS description	Firms
324110	3	petroleum refineries	Chevron, Exxon, Mobil
333313	1	office machinery manufacturing	Coinstar
334119	3	other computer peripheral equipment manufacturing	Diebold, Hypercom, NCR
336414	1	guided missile and space vehicle manufacturing	Lockheed-Martin
511210	5	software publishers	
513310	1	wired telecomm carriers	Western Union
514191	1	online info services	Source Media
514210	1	data processing services	Metavante
517212	1	cellular and other wireless communication	Alltel
518111	2	internet service providers	Digital Insight, eBay
518210	6	data processing, hosting and related services	
522110	2	commercial banking	Marshall & Ilsley, Baltimore Bancorp
522220	1	sales financing	Discover
522298	1	all other nondepository credit intermediation	GE capital corp
522320	7	financial transactions processing, reserve, & clearinghouse activities	
523110	1	investment banking and securities dealing	E-trade
524126	1	direct property & casualty insurance carriers	State Farm
524298	1	all other insurance related activities	Choicepoint
541214	2	payroll services	Paychex, Ceridian
541512	3	computer systems design services	
541513	1	computer facilities management services	EDS
561990	1	all other support services	Checkfree
All sectors	**46**		

Table 3
Patenting in Class 705

Description	**Patents**	**Share**
Total patents in class 705 granted 1974-2004	**5393**	
in payment system subset	1716	31.82%
in payment system subset & BDW firms	1626	30.15%
in payment system subset & pure play firms	39	0.72%
Total patents granted 1974-2004 to BDW firms	**16036**	
in pure play subsample	448	2.79%
in class 705	164	1.02%
pure play and in class 705	56	0.35%
pure play and class 705/payment system subset	39	0.24%

Table 4
Most important US Patent classes (subclasses) with patents held by pure play firms

Patents issued 1995-2004

Patent Class	All firms	"pure play" firms	Class description
705	2918	132	Data processing: financial or cost/price determination
235	2189	66	Registers
707	7473	61	Data processing: database and file management or data structures
709	5948	38	Electrical computers and digital processing systems: multicomputer data transferring
713	2474	28	Electrical computers and digital processing systems: support
715	1045	16	Data processing: presentation processing of document
717	610	12	Data processing: software development
345	1031	11	Computer graphics processing and selective visual display systems
382	2182	11	Image analysis
379	587	10	Telephonic communications

Appendix A
Subclasses in Class 705

Subclass	Payment system class	Number of patents	Class description
1		215	AUTOMATED ELECTRICAL FINANCIAL OR BUSINESS PRACTICE OR MANAGEMENT ARRANGEMENT
2		128	.Health care management (e.g., record management, ICDA billing)
3		112	..Patient record management
4		110	.Insurance (e.g., computer implemented system or method for writing insurance policy, processing insurance claim,
5		67	.Reservation, check-in, or booking display for reserved space
6		30	..Coordination of plural reservations (e.g., plural trip segments; transportation and accommodation, etc.)
7		131	.Operations research
8		202	..Allocating resources or scheduling for an administrative function
9		99	...Staff scheduling or task assignment
10		151	..Market analysis, demand forecasting or surveying
11		37	..Job performance analysis
12		18	.Voting or election arrangement
13		27	.Transportation facility access (e.g., fare, toll, parking)
14	x	326	.Distribution or redemption of coupon, or incentive or promotion program
15		31	.Restaurant or bar
16	x	63	.Including point of sale terminal or electronic cash register
17	x	27	..Having interface for record bearing medium or carrier for electronic funds transfer or payment credit
18	x	27	..Having security or user identification provision (password entry, etc.)
19		17	..Tax processing
20		59	..Price look-up processing (e.g., updating)
21	x	43	..Interconnection or interaction of plural electronic cash registers (ECRs) or to host computer (e.g., network detail, transfer of information from host to ECR or from ECR ro ECR, etc.)
22		24	..Inventory monitoring
23		18	..Input by product or record sensing (weighing, scanner processing)
24		41	..Specified transaction journal output feature (e.g., printed receipt, voice output, etc.)
25		10	..Specified keyboard feature
26		258	.Electronic shopping (e.g., remote ordering)
27		108	..Presentation of image or description of sales item (e.g., electronic catalog browsing)
28		128	.Inventory management
29		30	..Itemization of parts, supplies, or services (e.g., bill of materials)
30		87	.Accounting
31		15	..Tax preparation or submission
32		31	..Time accounting (time and attendance, monitoring billable hours)
33	x	12	..Checkbook balancing, updating or printing arrangement
34		53	..Bill preparation
35		137	.Finance (e.g., banking, investment or credit)
36		148	R ..Portfolio selection, planning or analysis T ...Tax strategies
37	x	172	..Trading, matching, or bidding
38		98	..Credit (risk) processing or loan processing (e.g., mortgage)
39	x	68	..Including funds transfer or credit transaction
40	x	94	...Bill distribution or payment
41	x	54	...Having programming of a portable memory device (e.g., IC card, "electronic purse")
42	x	20	...Remote banking (e.g., home banking)
43	x	46	....Including Automatic Teller Machine (i.e., ATM)
44	x	50	...Requiring authorization or authentication
45	x	34	...With paper check handling
50		17	BUSINESS PROCESSING USING CRYPTOGRAPHY
51		71	.Usage protection of distributed data files
52		54	..Usage or charge determination
53	x	22	...Including third party for collecting or distributing payment (e.g., clearinghouse)
54	x	28	...Adding plural layers of rights or limitations by other than the original producer
55	x	21	..Requiring a supplemental attachment or input (e.g., dongle) to open
56	x	19	...Specific computer ID (e.g., serial number, configuration, etc.)

57		50	..Copy protection or prevention
58		14	...Having origin or program ID
59		43	..Licensing
60		37	.Postage metering system
61	x	8	..Reloading/recharging
62		20	..Having printing detail (e.g., verification of mark)
63		6	.Utility metering system
64	x	21	.Secure transaction (e.g., EFT/ POS)
65	x	34	..Including intelligent token (e.g., electronic purse)
66	x	16	...Intelligent token initializing or reloading
67	x	32	...Including authentication
68	x	13	...Balancing account
69	x	24	...Electronic cash detail (e.g., blinded, divisible, or detecting double spending)
70	x	6	..Home banking
71	x	16	..Including key management
72	x	20	..Verifying PIN
73	x	8	..Terminal detail (e.g., initializing)
74	x	9	..Anonymous user system
75	x	38	..Transaction verification
76	x	21	..Electronic credential
77	x	9	..Including remote charge determination or related payment system
78	x	16	...Including third party
79	x	12	...Including a payment switch or gateway
80		18	ELECTRONIC NEGOTIATION
400		89	FOR COST/PRICE
401		51	.Postage meter system
402		24	..Special service or fee (e.g., discount, surcharge, adjustment, etc.)
403		41	..Recharging
404		29	..Record keeping
405		34	..Data protection
406		28	..With specific mail handling means
407		37	..Including mailed item weight
408		64	..Specific printing
409		13	..Rate updating
410		97	..Specialized function performed
411		11	...Display controlling
412		49	.Utility usage
413		26	.Fluid
414		2	.Weight
415		10	..Correcting or compensating
416		11	..Specific input and output device
417		27	.Distance (e.g., taximeter)
418		19	.Time (e.g., parking meter)
500		3	MISCELLANEOUS

Source: USPTO website as of 2007, http://www.uspto.gov