

Presentation

**The Risk Implications of Changing Technology
for Financial Institutions and
Central Banks:
The Central Bank Perspective**

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**Symposium on Risk Reduction in Payments,
Clearance and Settlement Systems**

**January 25 and 26, 1996
New York, NY**

From the perspective of the Federal Reserve System, the pace of change in the payment system--particularly technological change--has never been greater. Smart cards, electronic checks and various electronic money alternatives, combined with the emergence of extensive, broadly accessible, communications facilities such as the Internet are rapidly expanding the choices available for low value, or "retail" payments. The Internet has also become the home--at least for the time being--of "Virtual access to Banks" that provide services not only from multiple banking organizations, but also from a wide variety of non-bank service providers and software companies, such as Intuit, Microsoft, and Netscape. In the "wholesale" payments arena, new and enhanced communications, trading, clearing, and settlement systems are forging linkages among growing numbers of institutions. And these institutions participate in diverse markets in both developed and developing countries, creating a truly global marketplace for financial services. Technology is changing the face of the payment system, and potentially integrating its two aspects--retail and wholesale--in ways never possible before.

In that regard, it's tempting to look at the proliferation of technology and service providers in the retail arena with an attitude

quite unlike that with which we have addressed wholesale systems over the past two decades. There are, after all, relatively small values involved, the potential for great efficiency is sizeable, and the risks to the casual observer seem low. However, I think such an approach would be foolhardy if not dangerous. In my remarks today, I will consider this retail scenario against the experiences of the last 20 years and suggest five lessons that should guide us in payment system development, whether retail or wholesale, as we capitalize on the advances provided by technological change.

There is no doubt that applications of technology to the business of payments can be a double-edged sword, bringing efficiency and increased service levels, but also holding the potential for unanticipated results and increased risk, particularly in times of stress in the financial markets. Developers rush new technology to the marketplace in an attempt to "be there first" to attract new business. Users are quick to adopt the new technology for fear of relinquishing competitive advantage. Systems proliferate with inherent levels of complexity that can exceed our ability to manage or even understand them. This rapid introduction and adoption of new technology, and particularly the speed at which it is occurring, often precludes analysis of the potential

impacts, intended or unintended, of the new technology. And while technology may increase efficiency, it does not necessarily eliminate--and in fact sometimes increases--the risks inherent in the payments system. A brief examination of the evolution of large value transfer systems should illustrate this point.

In the 70s and early 80s, technology was applied to payment and clearing systems with a vengeance. Automated payments processing and communications systems, such as Fedwire and CHIPS in the U.S. experienced phenomenal growth in the numbers of on-line participants and in the volume and value of transactions processed. Bigger computers were linked using faster networks to carry increasing numbers of payments to more and more participants at ever increasing speed.

Throughout this period it seemed that "bigger" and "faster" meant "better". And, in many ways, this was true. However, our ability to deliver payment instructions and securities transactions outpaced our ability to achieve final settlement for these transactions. Payment instruction delivery was essentially real-time for on-line institutions, but final settlement--the actual posting of entries to participants' settlement accounts--was typically an end-of-day (or next

day) processing activity. Even in systems that settle with each transaction like Fedwire, payment transfers were completed without regard for balances on hand. As a result, the amount of intra-day credit incurred by payments system participants grew at a staggering rate. The technology genie was not only out of the bottle, it was also out of control.

Similar applications of technology to the securities and foreign exchange markets increased both the volume and the velocity of turnover in these markets. The time lag between the initiation and ultimate settlement of securities and foreign exchange transactions often was even greater than the time lags in settlement of most pure payment transactions. As a result, the temporal risk incurred by market participants was greater as well.

As the 70s gave way to the 80s, countries around the world began to take note of the growing risk inherent in their payments systems. Isolated payment system problems during the 70s and the losses that resulted served to focus the attention of commercial banks and central banks on the problems of risk. Payment system risk was not created by technological change but such change did increase the levels of risk and make risk control more difficult.

By the mid-80s, however, technology was being applied to improve risk control in domestic payments systems. Sophisticated software systems were developed to measure risk as a first step toward controlling it. With some prompting from regulatory authorities, risk management software began to be integrated with and operated as part of the payment system applications. Real-time balance monitoring, net debit caps and bi-lateral limits are all examples of automated risk management controls made possible by creative application of technology in wholesale payments systems. But it has taken us some twenty years to start to regain control of the technology genie in our wholesale payments business. It is possible we could be poised to repeat this process in the retail payments arena. Moreover, with the proliferation of competing retail electronic systems, the landscape is beginning to be reminiscent of the mid-1800s in the U.S., when commercial banks issued their own currencies and an integrated nationwide payment system was a dream, not a reality.

Are there reasons to be concerned about these new retail payment initiatives? The central answer to this question lies in the possibility that the trends I have been discussing may entail new elements of risk we don't yet fully understand.

- o Is the proliferation of payment and payment information systems working to increase rather than decrease the time between the exchange of payment transactions and their ultimate finality?**
- o Will the ease of access and low cost of these new systems attract payments of increasing size in ways that enhance short-term efficiency but increase long-term risk?**
- o Does the disintermediation of payments away from the banking system work to make payment systems more or less accident prone?**
- o Are the new linkages among systems--national and international--more or less likely to induce a chain reaction should one system encounter a major disruption, whether mechanical or credit in nature?**
- o Are the risks of unauthorized entry and large scale fraud greater? And even if security is adequate, who will guarantee that access to electronic cash is unimpeded by technological failure?**
- o And finally, at the extreme, is there a danger that these trends, particularly as they regard smart cards and electronic**

cash, can produce distortions in the measures of the money supply thereby further complicating the conduct of monetary policy?

I don't know the answers to these questions, but they strike me as critical to consider as we move forward. And, at least for now, I don't think the answer to them lies in new legislation or regulation since that could stifle the forces of innovation and creativity. However, I do believe that in addressing these questions we need to view these new applications of technology from the vantage of all the hard-won experience we've had in working to tame wholesale systems over the past 20 years. Let me suggest five lessons that may help to guide us.

First, we must recognize that neither technology nor payments systems are ends in and of themselves. They are the means to the larger ends of the efficient allocation of economic resources within our society. They are important, if not vital, to economic growth, but it is that growth itself that is our end game.

In that regard, it would be both fruitless, and ultimately counter-productive to believe we can or should hinder the infusion of new technologies into the payment system. Particularly in the United States where 60 billion paper checks are still processed and collected each

year, a major shift to electronics holds the potential for reducing the cost of payments operations and increasing returns to banks, bank customers and society in general in a significant way. But we must be careful how we do this. If we learned nothing else during the 80s, we learned that the impossible can, and sometimes does happen.

Computers fail just as payments overdrafts are mounting; liquidity problems can complicate creditworthiness; markets can drop precipitously; interest rates don't move in the same direction indefinitely--and on and on. Payments systems can be developed in ways that strengthen and underpin the financial system, allowing it to weather turmoil, or they can contribute to systemic fragility. And systemic fragility can damage economic growth just as surely, and perhaps more violently, than if new technologies were never introduced.

Second, it is impossible to separate credit and payment systems. While time intervals are short, there is probably more credit extended through payment systems than through any other single modality of credit extension. This is why depository institutions with their inherent expertise in assessing credit risk have specialized in payments

operations, and also why central banks take payment systems so seriously.

It is true that information services can make value transfer more efficient, and it is also true that central banks that are active as payment system service providers like the Federal Reserve System may not have taken the information component of payments as seriously as they should have. However, I worry about providers of information technology that offer systems to support retail payments transfer that attempt to remove credit expertise from the heart of the system. When the impossible happens, and liquidity is needed to make some new payment system that has become all-pervasive function, the further banks and central banks are from the action, the more difficult will be the solution.

Third, if we reflect on the importance of payments systems to economic growth, and on their use of credit, we realize that effective payments systems, whether wholesale or retail, must have certain crucial characteristics--accuracy, security, reliability, timeliness and certainty of value. The means of achieving these characteristics may vary with the system, but they must be present.

The presence of these attributes, in turn, is determined by the integration of the system's technology, its structure and participants, and a legal and regulatory framework that clearly defines the roles, rights, obligations and liabilities of those who use it. Thus, while it may come as a surprise to some high-tech vendors, it is not technology alone, or even primarily technology, that creates a payment system. Technology interacts with the needs and responsibilities of participants and with the legal and regulatory realities to define a payment system. To assess whether new technology is appropriate, we must force ourselves beyond the relatively narrow concerns of cost, capacity, and technical feasibility. We must ask if existing control systems, particularly ways of achieving electronic security, are robust enough for the new technology, and if the payment system rules and regulations are compatible and supportive.

Fourth, we've also learned that payment systems function best when they have a degree of both transparency and effective internal oversight. In the wholesale payments world, considerable attention has been focused on making the ultimate transfer of value as transparent as to timing as possible. This has been done by emphasizing finality-- that is, irrevocable funds availability at a predictable time. Increasingly,

central banks and other payment system participants have seen the advantage of systems that grant finality transfer by transfer--so called real-time gross settlement systems; and in the area of securities transfer and foreign exchange, systems that achieve simultaneity in the delivery of security and the cash (so-called DVP) or the two legs of the FX settlement (so-called PVP). Again--total transparency as to both timing and irrevocable value.

But wholesale systems did not all start out like this. Many began as the new retail systems are--as net settlements, largely because the netting process is so highly efficient. Large value net settlement systems have been strengthened over the years and continue to be valuable payment service providers. However, when we look at the new retail systems, we see that the use of technology could have the potential to take netting to new heights, with transactions passed between the ultimate settling banks only on a net, net, net basis. And if one adds to this mixture the clear technical ability to add larger and larger value payments to the mix, one wonders whether some of the surprises we found in large value payments systems won't come back to haunt us in the new retail systems.

This gets us to the issue of system oversight. As I noted earlier, legislation and regulation of new payments system alternatives could be unwise right now, but that does not mean that participants in such systems should not oversee them or that central banks should not be concerned. In many clearing houses it is the members who are the severest regulators of each other, as they realize their ability to be funded at the end of clearing cycle depends on the strength of the weakest participant in the clearing. The new broad retail electronic networks do not invite the same kind of participant control as has been the case with clearing houses, and I fear the addition of participants is more a matter of marketing than system control. Banks and other payments system providers need to ask themselves whether they know in detail what will happen if a participant fails to make payment, or computers malfunction, or a power outage stops normal operations. And, as these systems become more pervasive, enlightened oversight by central banks will be necessary to ensure that payment system rules, controls, and participation all work in the direction of enhancing financial stability.

In this regard, it is especially intriguing to consider how the "virtual" bank might be regulated. Some maintain that virtual banking

is "just a new form of bank" to which all the usual rules and regulations apply. Is it that, or an entirely new financial vehicle that cuts across existing rules and regulations in ways that render them meaningless? If the point behind bank regulation is to ensure the depositor of safety and soundness, and limit panic during times of financial instability, how does that happen when the package of banking services--even the medium of cash itself--is provided by any number of service vendors, all or none of whom might be regulated? Frankly, the regulatory community has just begun to consider these issues, and much work needs to be done before we even know all the questions to ask, let alone the answers.

Finally, drawing on this last point, central banks must continue to play a large role in strategic payment system development. I mentioned earlier that the proliferation of different systems and technologies reminds me of the old days of competing commercial bank currencies and non-par banking. It would be a shame if in the move to more electronic retail and wholesale systems, consideration was not given to how payments initiated in one system can be transferred and settled in another. One of the reasons the Federal Reserve System came into being was to create a nationally integrated payment transfer

process; we succeeded beyond our wildest dreams, no doubt contributing to the lingering popularity of the paper check. Now we are on the cusp, I hope, in the U.S. of great inroads being made into paper-based payment volumes, but we cannot lose the fabric of a nation-wide retail payment system in the process.

Similarly, in the wholesale arena, we have for some time talked about the need to reduce Herstatt risk. I noted the drive toward PVP systems earlier and this will certainly be facilitated when Fedwire extends its hours in 1997. We at the Federal Reserve and central banks in general, must work to develop and guide the payments systems within our nations in a strategic and cooperative way to ensure they work together nationally and internationally.

In closing, let me say that the infusion of new technologies promises much for payment system development. We need to be sensitive to the risks, sensitive to the power of new technology and how it can drive a process to an importance that is unforeseeable at the outset. We also need to capitalize on the advantages, the increase in efficiency and the minimization of risk that can come with new technology. But most of all, we need to ensure the lessons of the past indeed are there to guide us. Technologically superior payment

systems are only the means to the end, not an end in themselves; they must be developed in ways that are sensitive to the inherent credit risk involved in their operation; they must be characterized by accuracy, security, reliability, timeliness and certainty of value; they must address issues of finality and participant oversight, and they need central bank involvement and strategic direction. Technology is a powerful genie, but it must remain a dutiful servant to the important realities of the payment system.