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# Service-oriented architecture

Revolutionizing today's banking systems

Application Innovation  
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Banking



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# Service-oriented architecture

## Revolutionizing today's banking systems

By Jay DiMare and Richard S. Ma

*Globalization continues to pressure industries for increased collaboration within their value chains. The banking industry, a virtual backbone for all other industries, feels this pressure both within their industry and with those they serve. Collaboration demands technology integration, and approaches so far have resulted in redundancy and inefficiency wired together with inefficient systems. Through a modular approach to underlying technology integration, service-oriented architecture (SOA) can help reduce redundancy, inflexibility and inefficiency in crucial banking processes such as payments, multichannel integration and account opening.*

### Introduction

It's no secret – to banks and their customers alike – that the banking industry is facing significant challenges. It's also evident that the requirements for doing business successfully – indeed at all – are going to change dramatically over the next decade. The question is, given the nature of today's banks, and given the way they tend (or are able) to react to change, are they prepared for a vastly different future? And just how different will the future be?

According to an IBM Institute for Business Value study, "The paradox of Banking 2015: Achieving more by doing less," the future, by any measure, is going to be drastically different:

- Banking customers (thanks in large part to the Internet, which has altered the balance of power between companies and customers everywhere) are going to demand more advocacy, more personal security and, above all, more control in their banking relationships.
- With the universal banking business model coming under increasing pressure, community banks, industry specialists and non-banks will compete by offering unique and relevant value to targeted groups of customers.
- Banks, recognizing that no matter how good they are, they cannot be world-class in everything they do, will source products and

services from a large number of specialized and best-in-class service providers – both independents and other banks providing white-label products and services.

- Innovation – in business models, relationships, processes and products – will be the primary path to sustainable growth.

All of this will transpire in an atmosphere of significant economic and geopolitical uncertainty, intense regulatory scrutiny and compliance requirements, merger and acquisition activity, risk exposure and technological change. In our view, success will therefore require an investment in three primary realms: operational efficiency, growth enablement and risk resiliency:

- *Operational efficiency* entails key business processes (such as institutional payments and trade execution) and enabling technologies (like messaging and data integration).
- *Growth enablement* calls for a better understanding of the customer (whether individual or institutional), and the development of new products and services.

- *Risk resilience* concentrates on mitigating various kinds of risk, complying with an array of regulations and establishing an operational environment that is less vulnerable to interruption.

How are banks going to attain the flexibility, simplicity, shared services, and business and IT alignment they will need to grapple with the geometrically more complex business environment that is speeding their way? At IBM, we believe one of the answers is service-oriented architecture (see sidebar, “What is SOA?”).

#### **What is SOA?**

Service-oriented architecture (SOA) is a style of developing and integrating software. It involves breaking an application down into common, repeatable “services” that can be used by other applications, both internal and external, in an organization – independent of the applications and computing platforms on which the business and its partners rely. Using this approach, enterprises can assemble and reassemble these open, standards-based services to extend and improve integration among existing applications, support collaboration, build new capabilities, and drive innovation at every point in the value chain.

# Service-oriented architecture

## *Revolutionizing today's banking systems*

SOA is an IT architectural style that separates an organization's applications into their elemental parts, called service components (common business commands like "check credit" or "calculate interest rate," for example). These can then be rearranged with unprecedented speed to create new applications (meaning, among other things, that banks can extend the life of existing IT assets almost indefinitely, and conserve on the purchase of new assets). Think of the Lego toy, or the atomic elements. From a few basic parts, banks can create a virtually unlimited number of combinations, of any size or shape. This modular concept is at the heart of SOA.

Now, due to open business and technology standards, service components from an institution's applications can be combined with those of its partners, suppliers and even its customers to create new "super applications" – composites of functionality that can span companies and industries. Through this kind of integration and collaboration, SOA can spark innovation, and lead to entirely new business opportunities.

In essence, SOA makes IT adapt to the needs of business in a way never before possible. Before SOA, to have this level of flexibility, an institution might have compelled to deploy – and integrate – 20 different software applications. With SOA, an enterprise has to build only one – which, comparatively fast, it can reconfigure 20 different ways to meet the imperatives of changing business and market conditions.

It is this extraordinary flexibility (the root of all SOA benefits) that we will discuss in the context of payments, multi-channel integration and account opening.

### **Simplifying payments**

In payments, because there are duplicate applications with point-to-point connections, the architecture is traditionally costly to maintain. SOA can provide a layer to reduce the number of integration points and decrease overall costs through the reuse of common services

### ***The business challenge***

In many banks, factors such as merger activity, mounting regulatory requirements, globalization and electronic payment have resulted in applications that have become, to put the matter starkly, virtually impregnable towers of verticality, much like adjacent skyscrapers. Because no other practicable options were available, the tendency has been to build new applications to meet new requirements – not to reconfigure existing ones.

In general, this has resulted in duplicate interfaces and applications; complex point-to-point solutions that are difficult to maintain and update; less flexibility, since the business logic is imprisoned in siloed applications; a lack of standards for integrating applications; increasing maintenance and improvement costs; and a lack of timely, consistent information across channels.

**A primary goal of using SOA to simplify payments is to enable banks to reconfigure existing IT assets when new regulations or customer demands arise – potentially avoiding the need to build or purchase new applications.**

Furthermore, regulations like the European Union Payment Services, Basel II, the Singapore Payment Systems Act, EU Credit for Consumers, US Check 21 and EU Settlement & Clearing are forcing changes in the way payments are made – paving the way for new competitors, adding more transparency to payment systems and expediting the adoption of standard payment protocols.<sup>1</sup>

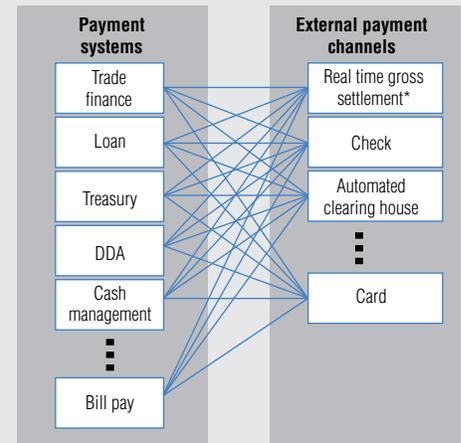
Armed with the choices and information provided by the Internet, customers are putting more pressure on banks to make payments faster, less costly and, increasingly, more customized. There is certainly an inexorable move toward electronic payments and invoicing, meaning that banks must follow suit. If they are tempted to resist, they could pay a heavy price: non-banks – owing mainly to the availability of standardized business processes made possible by SOA – are starting to invade the playing field.

The goal is not necessarily to build or purchase a new application each time a new regulation or customer demand arises; it is to be able to *reconfigure*, to the extent possible, *existing* IT assets to address these evolving requirements.

**How it works today**

Figure 1 shows a generalized view of the current payments situation. The tangle of lines among the enterprise systems and the external payments systems or channels vividly illustrates the problem.

**FIGURE 1. Current view of the banking payments domain.**



*Norw: Likely multiple channels, one per country. The UK system is CHAPS, US is Fed Wire, Singapore is MEPS+, etc.  
Source: IBM Institute for Business Value.*

On the left is a typical set of core banking systems that may originate or accept a payment; on the right are the different payment systems or payment channels. The implication is that the core systems, and the number of payment channels, can vary from bank to bank, as well as within the bank. Years of change and systems evolution have made the situation more brittle; a single change can have so many repercussions that banks become discouraged from trying to adapt.

This example, seemingly simple and straightforward at first glance, shows six internal connections linking to four external systems – resulting in 24 unique network connections. Each time a new internal system is added, four new connections must be created. Conversely, each time a new external system is added, you can create six new connections. But this is only part of the story.

Continuing our example, each of the 24 network connections must then support and maintain eight types of business transactions, consisting of approximately 160 message types. Many will recognize the types of transactions and message types in Figure 2 as something we know happens, but usually not directly in the context of the primary transaction.

Now, consider the math. In our partial example, we have 160 message types and over 24 network connections – and we haven't even begun to talk about complications like maintenance costs or changes required by the payment channels to keep up with technology changes. The sheer number of combinations and permutations of transactions and message types flowing over various network connections is daunting. What is needed is a system that can reduce the number of connections among all of the partners in the

payment process. The different core systems can then absorb the new way of making payments, and without impacting the flow of business.

**Integrating payment applications**

In the past, many banks attempted to integrate payment applications by installing a central payment hub or gateway to deal with a specific banking payment channel. These solutions eventually evolved to gateways supporting multiple, but still specific, payment channels, and included data transformation, message formatting, logging and so on. In many cases, these central solutions are now aged, and as inflexible as the systems they connect. Worse, they add an additional layer of fragile connections – further complicating our math example.

SOA provides a way to employ reusable services to conduct the different payment transaction types. These services can be independent of the core banking application systems and the payment channels they support. This approach is illustrated in Figure 3.

The layer of services supporting payments can also support any number of payment channels or systems without causing any change to the core enterprise systems originated or targeted by the payments. In effect, this layer of services absorbs, or buffers, changes made in the bank systems or external payment systems.

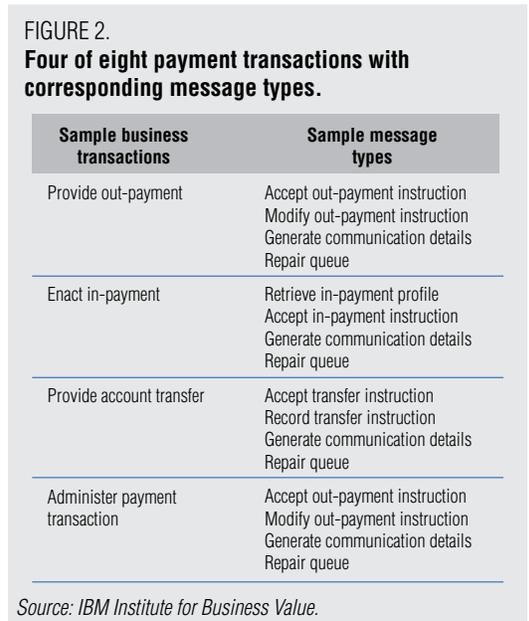
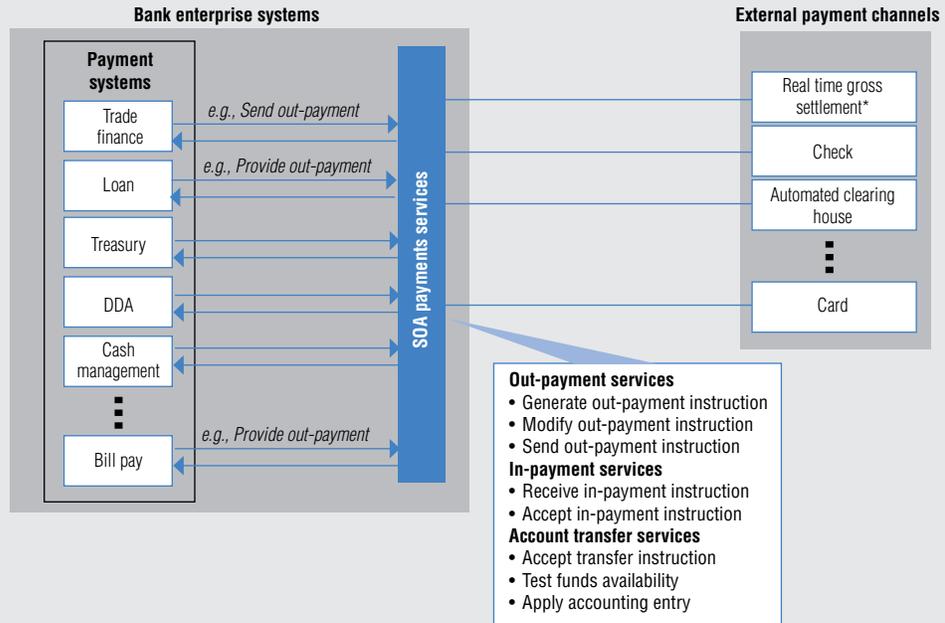


FIGURE 3.  
Proposed SOA services supporting payments.



\* Likely multiple channels, one per country. The UK system is CHAPS, US is FedWire, Singapore is MEPS+, etc.  
Source: IBM Institute for Business Value.

We can see the advantage numerically. In this example, SOA reduces the total number of network connections from 24 to 10, the total business transactions from 192 to 48 and, astoundingly, the total number of message types from 3,840 to 44. SOA not only decreases the number of connection points, it enables the *reuse* – an utterly central SOA concept – of common message types. This greatly increases the probability that the services created can be used by most, if not all systems, within the bank. Changes can be made in waves to minimize business disruptions.

### **The value SOA can bring**

The value returned to the bank can be significant. At its core, this approach sets the stage to significantly reduce costs with fewer interfaces, and fewer business transactions and message types to manage. Plus, the creation

of common message types can result in less duplication of effort and reduced systems maintenance costs.

Importantly, there are opportunities for new revenue sources, since new systems such as mobile payments can be integrated into existing systems. Current solutions often hinder the bank by rendering the current state inflexible and resistant to any requested changes. With SOA, the bank can easily add new payment channels and new applications to existing payments capabilities without upsetting business as usual. This is really what SOA is all about.

In terms of reducing operational risks, SOA can enhance monitoring, since more applications use a common approach to sending and receiving payments.

## Integrating multiple channels

Traditionally, banking applications are disconnected across the organization, making it difficult to optimize existing customer potential. SOA can provide an integration layer to enterprise applications, and an all-encompassing view of the customer relationship.

### **The business challenge**

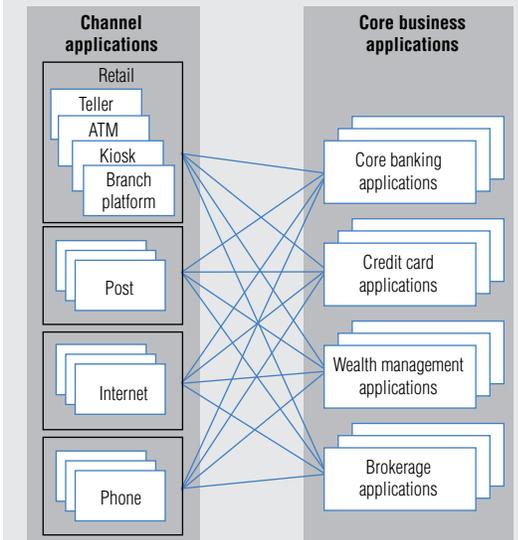
To optimize customer loyalty, profitability and growth, banks will have to capitalize on the potential of each customer relationship, and provide customers with the most attractive range of products and services. One of the biggest barriers here is the lack of integrated customer information – it is typically fragmented across channels.

Fierce competition among financial institutions – fueled to a great degree by the Internet – has resulted in a range of product offerings tailored to customer needs and to help reach potential customers, and based on the *entire* relationship the customer has with the bank. The development of these products will become, we believe, an increasing source of sustainable competitive advantage and, therefore, a way to extract premium pricing. Currently, to develop these products, banks must rely heavily on data-gathering systems that integrate applications within the bank. These interactions – assuming they exist at all – are costly to maintain (eating into the margins that the premium pricing would otherwise increase), inflexible, and prone to error.

### **How it works today**

As Figure 4 suggests, the tangled web of interfaces required – and the lack of available interfaces – impede the bank's realtime access to the required data.

FIGURE 4.  
**Banking channels' use of key bank application platforms.**



Source: IBM Institute for Business Value.

In many cases, each major service goes to market through the same set of channels. Though these channels might deal with the same products and services, there is often no integration among the applications supporting the channel and the applications supporting the product areas. For example, if a customer uses the bank's credit card services, he or she must reinitiate the relationship with the bank if applying for a mortgage, and then again for wealth management services. The bank cannot capitalize on the customer's current interest, or count on reaching the optimal price, because it cannot access all the information it needs. The result can be a dissatisfying experience for the customer, a redundant, time-consuming and costly process for the bank – and a missed opportunity that is hard to recover.

By integrating customer information across channels, SOA can help banks develop and leverage a holistic view of each customer to build customer loyalty and to offer the most attractive range of products and services.

**Information when and where needed**

To address this problem, channel applications – a retail branch teller or a Web-based home banking system, for example – need a consistent way to access core banking applications in the service area. SOA provides a standards-based approach.

Figure 5 below shows a less cumbersome way to integrate channel applications and service-area support applications using a single set of SOA services.

As with payments, there are technologies that can do this. What is different with SOA is the *services layer*. For example, in order for a retail branch platform application to get information about the total bank/customer relationship, the application must connect to all product systems, and will require a constant flow of realtime information from the core systems that can be updated and viewed across channels. As shown in Figure 5, that information would include:

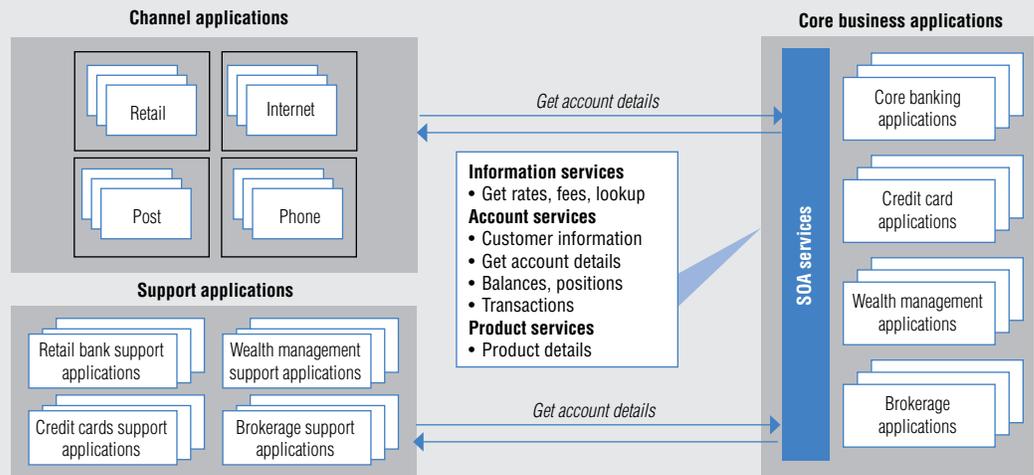
- Customer information
- Product information
- Rates and fees
- Balance details.

With SOA, a bank can employ different categories of services – customer, product, balance, history – and create a standard set of services to share information. A single “get balance” service, for instance, could be applied to any product where it would be relevant. Across multiple services, that amounts to a big conservation of resources, and huge gains in efficiency.

**Returning value with SOA**

The bank now has a *holistic* view of its customer. And because the SOA layer makes it easier to integrate applications, the bank can offer its customers more tailored products and services, at the premium prices the market will bear. Since information is shared in real time, control of the primary product remains with the

FIGURE 5. SOA Services supporting channel applications and other service-area applications.



Source: IBM Institute for Business Value.

application best suited to manage it. Each time a service or channel is added, it can connect to and access everything else through the SOA layer. This helps improve flexibility, lower labor time and costs, reduce risk, and optimize the value of each customer. It also permits the bank to pursue optimized pricing based on a customer's entire relationship with the bank.

### **Standardizing account opening**

Account opening is a core banking function that has become a major expense, and, ironically, a potentially significant barrier to business growth. While trying to maintain or even improve this service (after all, it is a customer's first real contact with a bank), banks must also attempt to reduce its expense – striving for that elusive goal: better service at a lower cost.

#### ***The business challenge***

The account opening process has been hamstrung by factors like legacy system constraints and duplicate efforts across product lines and channels; the maintenance of multiple interfaces among multiple account opening systems and applications across product lines and channels (perhaps the biggest single cost item); frequent disruptions and alterations resulting from mergers and acquisitions activity; and the proliferation of regulations such as The Patriot Act and “know your customer” practices, among many others.

The entire process has become painful for banks and customers alike. Pre-sales suffers from low closure rates, incomplete customer views, tellers' blurred customer focus, and a shortage of collaborative material to ease the process. The application stage is afflicted by complex forms, few uniform applications across similar products, errors due to the re-keying of information, and, again, no single

customer view. The verification stage lacks the benefit of digital imaging and, once again, offers no visibility into customer patterns and expectations in a timely or uniform way.

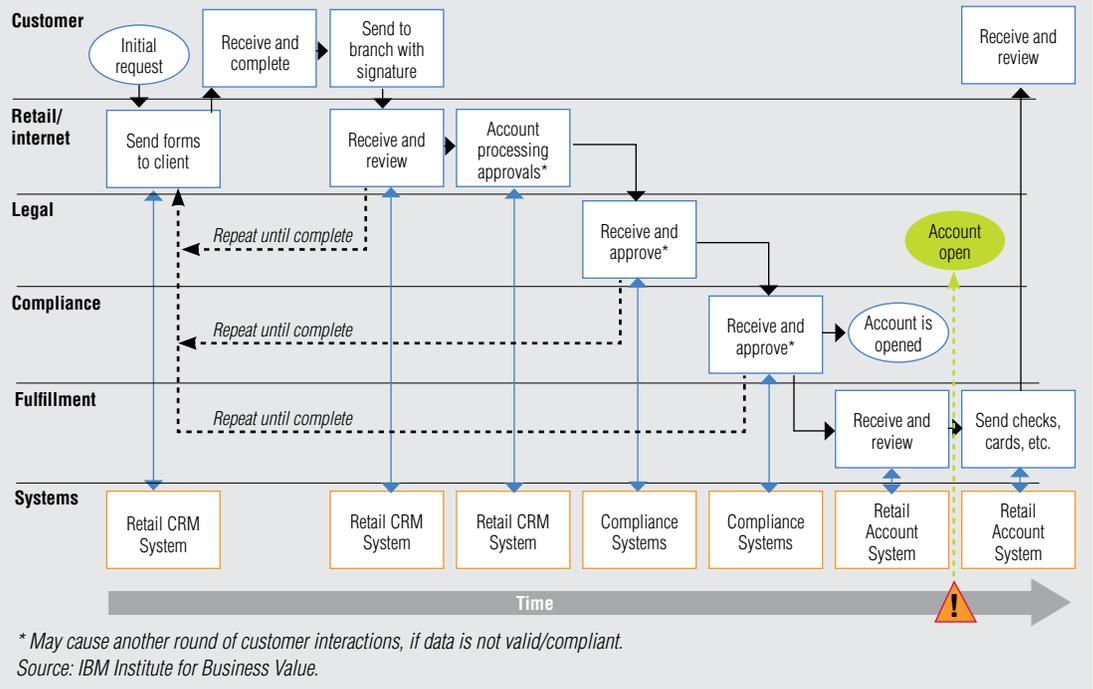
Addressing and fulfilling these requirements is hard, due to no digital signature capability, a lack of automated funding, the higher administrative costs of paper letters, and ineffective, disappointing follow-up for inactive accounts.

#### ***How it works today***

Let's first consider the players and systems involved. Remember that, in most cases, there is a core banking system for every product for which a customer would open an account. Also, as mentioned in the previous scenarios, there are a number of different channels often supported by multiple applications. Fulfillment is usually a separate organization. And customers deal with the different channels, not with fulfillment or other internal bank departments. It is easiest to grasp the problem and its current solution by looking at the process typically employed to open a new account, as shown in Figure 6.

There are some critical things to note in this process. First, the end-to-end cycle time is hampered by the need to access multiple systems, some legal considerations and the number of parties involved. Second, numerous activities are prone to errors, causing redundancies and further delays. This is complicated enough for any one business area or product line. Now, consider duplicating this process for the number of other products that a bank has to offer. Most likely, this same process is executed differently for each product and also, possibly, varies across each channel.

FIGURE 6.  
**General representation of the current account opening process.**



**SOA streamlines the account opening process; it provides a consolidated customer view and more efficient processing that can reduce bank costs and improve customer service.**

**Simplifying the process**

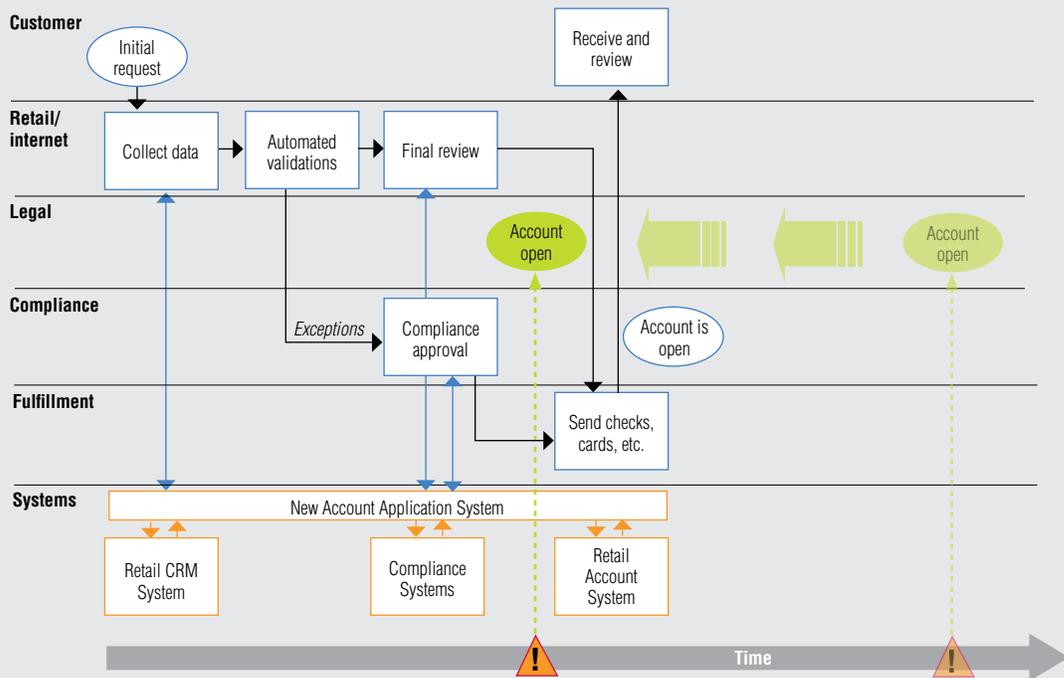
The account opening process is a classic example of a technology-enabled process (or, for some banks, the lack of one) impeded by the accumulated legacies of the fast-evolving technology landscape.

What is needed here is wholesale business process change – with flexibility built in to accommodate further change. It is easiest to change processes when systems are at the first point of contact – where the account opening is first requested, and when the bank can access the necessary information and systems in real time. Whether it is a CRM application or a new account opening application, any single application attempting to cover this task will require extensive systems integra-

tion capability *within* the bank's infrastructure. Shown in Figure 7 is the revised process, which assumes that the bank can achieve the level of systems integration needed to support the revised flow.

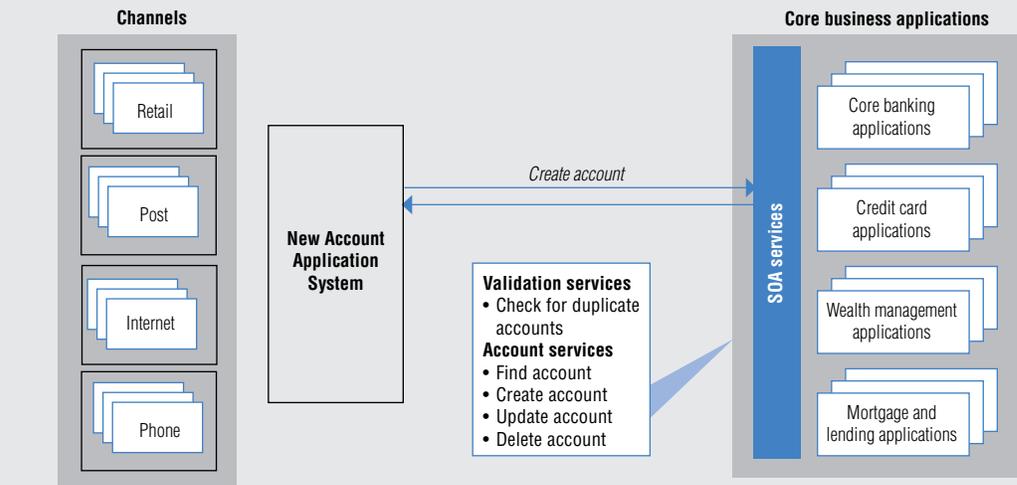
This new account application is possible only if it can access the systems required, such as electronic forms and compliance. This goes beyond the read-only access required before final review. Ideally, the new account application would use SOA services to actually create the account in the product system itself. How would we build such a system using SOA? Figure 8 shows how.

FIGURE 7.  
**General representation of a revised account opening process using an SOA-enabled application.**



Source: IBM Institute for Business Value.

FIGURE 8.  
**Building or integrating a new account application using SOA services.**



Source: IBM Institute for Business Value.

The bank would build a layer of services and use the services to access the account management functionality in the core business applications. A single set of services would be built. A service to find an account may actually have a different function in each core business application. However, there would be a single SOA service for each account management function.

In this example, we show a New Account Application System using these services. This does not always have to be the case. These services can be used by other bank applications directly. For example, the online banking application could use the SOA services directly. This type of implementation sets the basis for future reuse, and more important, IT flexibility.

### ***The value to the bank***

Banks can realize a significant return from this process and the systems used to create it. Above all, the revenue gains from focusing on the process can help justify the costs to build this reusable application infrastructure. The increased closure rates on new accounts can yield new revenue and broaden the relationship banks have with their customers.

There are numerous cost savings for the business, in areas like data collection and data sharing. There is also more flexibility for both the business and its IT environment, since a 360-degree view of the customer can be achieved with current core banking systems.

This is a remarkable set of benefits, and typical of SOA in that it offers better service at lower cost. Usually, technologies have offered one or the other, but not both. In this sense, SOA triumphs over the constraints of traditional economics.

## **Conclusion**

Banks must collaborate and technology must be part of that collaboration. SOA offers an approach to banking payments that is a progressive solution with lower cost of operation than today's alternatives. The inherent flexibility would position a bank for new payment channels and new payment sources and targets.

To support multiple distribution channels, a layer of SOA services allows more flexibility for change and greater product distribution, as channel applications and channel support applications are no longer tightly linked to core banking systems. An SOA solution can also enable the opening of an account for multiple product lines that is seamlessly integrated with multiple back-end systems. The benefits can include not only lower costs, but increased revenue and optimized customer relationships.

SOA is indeed revolutionary. By exploiting its capabilities internally, as well as with external entities of all kinds, institutions can forge new connections and support new levels of collaboration and innovation. There is simply no limit to the number of connections and configurations – with benefits that promise to reshape not only a business or an industry, but a whole economy – even the global economy. In this way, IBM believes, SOA is potentially as transformative as the Internet.

But precisely because of its range and power, SOA can be a little daunting to the organization that has yet to use it. Like anything else of this scale, it must be employed responsibly and intelligently – with a sense of vision, purpose and strategy. Through our own use of SOA and in thousands of SOA engagements across the world, IBM has gained a very good sense of how to proceed with SOA:

- Focus on a business problem, and use SOA to solve it. SOA is a means to an end – not an end in itself.
- If possible, start with revenue-generating capabilities. For banks, this might mean multi-channel integration or account opening.
- Start small. Use your first SOA project to “learn the ropes.” If it is successful, show it to other parts of the business to demonstrate what can be done with SOA.
- Begin to build new human capabilities. SOA requires some specialized skills that entail a learning curve. It is best to instill these skills now.
- Think long-term. The hardest, most prolonged, and most expensive part of SOA is building the initial architecture. Once that’s in place, additions or changes – new channels, back-office functions or business lines – can be made much faster and less expensively. Over time, the return on this initial investment can be dramatic.

Whether you build, buy or evolve to an SOA infrastructure, the time to start is *now*. SOA can help reduce the IT inhibitors to change allowing banks to collaborate more effectively within their own four walls, among each other, and with their customers.

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<sup>1</sup> For more information on these sample regulations, please see: European Union Payment Services (a collection of directives, regulations, and recommendations). [http://ec.europa.eu/internal\\_market/payments/index\\_en.htm](http://ec.europa.eu/internal_market/payments/index_en.htm); Basel II (refers to the Basel II Framework). <http://www.bis.org/publ/bcbs107.htm>; Singapore Payment Systems Act (both the initial regulations and subsidiary regulations). [http://www.mas.gov.sg/legislation\\_guidelines/index.html](http://www.mas.gov.sg/legislation_guidelines/index.html) and [http://www.mas.gov.sg/legislation\\_guidelines/payment\\_system/payment\\_act2006/PSOA\\_Subsiary\\_Legislation.html](http://www.mas.gov.sg/legislation_guidelines/payment_system/payment_act2006/PSOA_Subsiary_Legislation.html); EU Credit for Consumers (legislation addressing consumer loans). <http://www.europarl.europa.eu/oeil/file.jsp?id=225692>; US Check 21 (Check Clearing for the 21st Century Act). <http://www.federalreserve.gov/paymentsystems/truncation/default.htm>; EU Settlement & Clearing (as part of the EU Financial Markets Infrastructure). [http://ec.europa.eu/internal\\_market/financial-markets/clearing/index\\_en.htm](http://ec.europa.eu/internal_market/financial-markets/clearing/index_en.htm)

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