THE EVOLUTION OF VERTICAL IS STANDARDS: ELECTRONIC INTERCHANGE STANDARDS IN THE US HOME MORTGAGE INDUSTRY

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ABSTRACT

In contrast to horizontal IT standards, which concern the characteristics of IT products and apply to users in many industries, vertical IS standards focus on data structures and definitions, document formats, and business processes and address business problems unique to particular industries. This paper contributes to the small but important literature on vertical IS standards by presenting the case study of the evolution of electronic interchange standards, with a particular focus on Internet-era standards, in the US home mortgage industry. This industry is particularly interesting for a study of vertical IS standards because of the relatively low level of technology adoption for interorganizational interchange until very recent years, which makes the standards-setting process highly accessible for study.

Keywords: vertical IS standards, Internet standards, electronic commerce, standards-setting process, standards adoption, standards impacts, mortgage industry.

INTRODUCTION

Interorganizational commerce has always required standards—standards of weights and measures, standards of product description and quality, standards regarding payment and logistics, etc. The rise of electronic commerce led to the development of IT-related standards—telecommunications protocols, electronic data interchange (EDI) document standards, and increasingly business process standards such as those contained in the RosettaNet protocols. The effect of these standards on the dynamics of competition among the participants in an industry sector is an important research question.

In the Information Systems (IS) field, the importance of standards has long been recognized. Although there is much research on the technical details of IT-related standards, surprisingly little empirical research addresses the development, the adoption, and the outcomes of IT-related standards. (Notable exceptions include Damsgaard and Lyytinen 2001 and van Baalen, van Oosterhout, Tan and van Heck 2000.) Outside the IS field, much of the standards literature has examined *product* standards and taken the perspective of technology producers; by contrast, the concern in the IS field has largely been with the *use* of technology products by non-producer firms.

Technology product standards such as telecommunication protocols, Windows, and XML, have the characteristic that they are applicable in many industries; we call them *horizontal* standards. The key movers in the development of horizontal standards are technology providers and governmental agencies. The competitive marketing tactics of technology firms are likely to play a pivotal role in the adoption and use of technology product standards.

Not all standards are applicable to many industries, however. A second kind of standard—*vertical* standards—is needed to address business problems unique to particular industries. For example, when the chemical industry began to expand its EDI document standards for Internet-enabled commerce, standards developers took as a starting point the RosettaNet standards under development in the electronics industry, then customized them to unique chemical industry processes, such as the shipment of hazardous materials.

Vertical standards such as RosettaNet and CIDX (the chemical industry standards) differ from horizontal standards, not only in their narrower applicability, but also in their technical content. IT product standards focus on elemental levels of interconnection, such as telecommunications protocols; by contrast, vertical standards focus on data and business processes. Because vertical standards concern not so much IT but how IT is used, we refer to them as vertical *information systems* (IS) standards, in contrast to horizontal *information technology* (IT) standards. (Information systems are often defined as the applications of IT to business problems.)

The development, adoption dynamics, and outcomes of vertical IS standards, such as RosettaNet and CIDX, are likely to exhibit very different characteristics than those of horizontal IT standards. Whereas technology firms and governments are generally the leaders in horizontal standards efforts, their role in vertical IS standardization efforts is likely to depend on such things as the maturity of the industry-specific IT sector (which may in turn be a function of vertical industry size and structure) and the extent of regulation in the industry. Since those who stand to gain (or lose) most from vertical IS standards are industry players, those most likely to champion vertical IS standards development processes are industry players, key suppliers and customers, and industry associations. Adoption and diffusion of horizontal standards are more likely to reflect competition among industry players than competition among technology providers. And although all standards involve network externalities, collective action to adopt a new standard en masse is more likely to occur within a single vertical industry than it is across industries.

This paper contributes to the small but important literature on vertical IS standards by presenting the case study of the evolution of electronic interchange standards, with a particular focus on Internet-era standards, in the US home mortgage industry. This industry is particularly interesting for a study of vertical IS standards because of the relatively low level of technology adoption for interorganizational interchange until very recent years, which makes the standards-setting process highly accessible for study.

BACKGROUND

The US home mortgage industry today is highly fragmented, with thousands of mortgage bankers and brokers, although it is consolidating rapidly. (It is estimated that the top five lenders originate over 50% of residential mortgage loans today, and that the top ten firms service over 50% of such loans.) It is also highly vertically disintegrated (Jacobides 2001a), although some analysts claim that it appears to be reintegrating, at least at the top end of the size spectrum (Van Order 2000). Automation and IT-enabled standards appear to be playing an important role in both structural evolutions (Jacobides 2001b; Van Order 2000).

Because of vertical disintegration, most business processes in the mortgage industry require the efforts of more than one organization—a situation that appears to be natural for electronic interchange. But the industry has been slow to adopt technology, and interorganizational standards-setting initiatives have only made progress in the last fifteen years. Since the widespread adoption of Internet standards in the last five or so years, the pace of standards-setting initiatives and the level of standards adoption in the industry have noticeably increased.

Brief Industry Overview

There are two mortgage industry markets: the primary market, where borrowers obtain loans from originators, and the secondary market, where mortgages are sold by originators and bought by investors (Cummings and DiPasquale 1997). The key primary market processes are *origination* (including application and underwriting—which considers the borrowers' credit and property characteristics), *closing and recording* (legal transfer of the property), and *servicing* (receiving payments, managing tax and insurance escrows, monitoring delinquencies, managing foreclosures, and making payments to investors) (Cummings and DiPasquale 1997).

Today, more than half of all mortgages are sold in the secondary market (Van Order 2000). The secondary market has three major threads: 1) mortgage originators who hold loans in portfolio, 2) originators who sell loans directly to investors who hold loans in portfolio, and 3) originators who sell loans to a conduit who packages and securitize the loans and sells interests in the securities to investors (Cummings and DiPasquale 1997). Most frequently, the conduits to the secondary market for residential mortgages are government sponsored agencies (GSEs), especially FannieMae and FreddieMac. GSEs are private corporations that were chartered by federal government mandate to create and grow the secondary mortgage market (Cummings and DiPasquale 1997) through securitization. The GSEs have grown rapidly into major players: roughly 50% of the $6.3 trillion (2003 figure) in outstanding US mortgage debt for single family residences is either held in portfolio by the GSEs or is held by investors in the form of mortgage backed securities guaranteed by the GSEs (Cummings and DiPasquale 1997). The perceived and real power and privileges of these companies (for example, they are exempt from SEC reporting requirements) generates considerable controversy (McKinnon and Kopecki 2003).

Standardization and Automation in Underwriting

Mortgage lending was historically viewed as less readily automated than other types of credit decisions. Until the mid-1990s, the mortgage process was largely manual and decentralized: tens of thousands of underwriters employed by thousands of mortgage lenders subjectively reviewed credit reports and voluminous paper files against their own underwriting guidelines as well as those of conduits and investors (Straka 2000). Many industry analysts view the GSEs as the agents of change who spurred the adoption of IT and IT-based standards in the industry, triggering widespread economic consequences (Kersnar 2001; Raiter and Gillis 1997).

Prior to the mid-1990s, most lenders made their underwriting decisions on the basis of simple heuristics, such as "loan to value". Credit scoring was not a major part of the lending decision because, in the early 1990s, "virtually no institution was storing credit records on mortgage loans in an easily accessible medium" (in large part because the GSEs did not require credit information) (Straka 2000 p. 213). Impetus for change came from an empirical study completed by Freddie Mac in 1992, showing the value of credit scores for predicting mortgage default (Straka 2000). In 1994, Freddie Mac deployed a pilot version of its automated underwriting (AU) system, called Loan Prospector, which used statistical mortgage scoring (Straka 2000). Shortly thereafter, Fannie Mae introduced a similar system called Desktop Originator.

Since about 1998, AU adoption has been rapid: By 2001, AU adoption by mortgage bankers was reported at 98% (Punishill 2001); 58% of mortgage bankers used one of the GSE's AU systems as opposed to an in-house system or one from an independent vendor (Kersnar 2001). The GSEs have continued to expand their technology offerings. Today, they offer IT-based support for secondary marketing, servicing, and integration with business partners, in addition to their core AU technology. In addition, they have continued to expand the scope of the AU technology (historically confined to conforming loans) to all residential mortgage loans, and they have gradually extended access to AU technology (historically confined to mortgage bankers) to other industry players such as mortgage brokers and real estate agencies.

The impacts of AU in the industry have been major and continue to unfold (Jacobides 2001b). Before AU, borrowers could wait weeks for an approval decision from lenders, because the lenders often had to wait weeks to get an "accept" decision from one of the GSEs (in essence, a guarantee that the GSE would purchase the closed loan, an important consideration to many mortgage bankers who did not plan to keep the loan in portfolio). Today, lenders and borrowers can get these approval decisions within minutes. The Mortgage Bankers Association of America estimates that the cost of originating a loan has decreased by 50% in the ten years since AU came online (MBA, personal communication 1/28/2003)—probably because the need for human underwriters in mortgage banks decreased sharply. (In addition, the skill level of the remaining underwriters is reported to have declined, Punishill 2001.) AU-enabled credit scoring is said to have markedly improved the accuracy of underwriting decisions, reducing mortgage default rates despite a declining economy. (Critics worry, however, about the potential for discrimination from standardized underwriting rules.) The concentration of enormous volumes of data in the hands of the GSEs (FannieMae's database holds data about one-third of all US homes and one-fourth of all US home buyers, Posner and Courtian 2000) is expected to provide AU users with new sources of potential revenue and competitive advantage, such as the ability to "personalize pricing" (Punishill 2001), i.e., to price loans on the basis of prepayment risk, not just credit risk (Van Order 2000). As a result of these developments, experts expect sizable *additional* reductions in the cost of loan origination over the next few years (Posner and Courtian 2000), thereby further increasing industry competitiveness and consolidation.

The competitive fallout from these first-order effects has yet to be assessed. According to some, "it quickly became clear that … [the GSE's AU systems] would tend to 'level the playing field' between larger, more technologically sophisticated lenders and midsize to smaller lenders" (Straka 2000, p. 215). On the other hand, the possibility of risk-based mortgage loan pricing afforded by AU has yet to be widely adopted even by the larger, more tech-savvy lenders (Punishill 2001), suggesting that superior knowledge about IT use may yet become a key differentiator in the industry. Mortgage bankers are said to fear AU-enabled competition from mortgage brokers—the source of about 70% of mortgage bankers' loan volume (Jacobides 2001a). Another second-order impact is the declining power of mortgage bankers relative to the GSEs (Jacobides 2001b; Van Order 2000): AU lowers the value added by mortgage bankers and opens the door to their possible disintermediation. The recent extremely rapid consolidation (and apparent reintegration, Van Order 2000) in the industry could be a direct effect of underwriting automation and IT-based standards.

Although AU has had a tremendous impact on the industry in a very short time, the potential for even more change is clearly evident. Internal inefficiencies owing to the lack of systems integration can be found throughout the industry, and closing and recording processes are still lengthy, costly, and error-prone. Given the informational nature of the mortgage loan, it is theoretically possible to originate, fund, and record a mortgage loan nearly instantaneously. Additional standards-setting efforts in the industry aim to address these problems.

INTERNET-BASED MORTGAGE INDUSTRY IS STANDARDS

In addition to the GSEs, the Mortgage Bankers Association of America (MBA http://www.mbaa.org/) has been a major force for standardization in the mortgage lending industry. Founded in 1914, MBA is the leading industry association for companies in the real estate finance business, the largest segment of the US capital market. Its approximately 2,800 members cover all industry segments, including mortgage lenders, mortgage brokers, thrifts, insurance companies, etc. MBA represents the industry's legislative and regulatory interests and conducts educational activities and research for its members.

In the late 1980's MBA launched its "electronic data initiative", designed to support the automation of "interagency" mortgage lending processes (Opelka 1994). Working with FannieMae and FreddieMac, the MBA's first targets were paper forms such as mortgage applications and appraisal forms (Braitman 1990; "MBA Makes "Extraordinary Progress" in Effort To Streamline Lending 1988). In the early days of these efforts, EDI was the approach taken to facilitate data interchange (Slesinger 1994), but the emergence of Internet standards inaugurated a change in approach.

MISMO

In January 2000, the MBA, in partnership with FannieMae and FreddieMac, launched the Mortgage Industry Standards Maintenance Organization (MISMO http://www.mismo.org). MISMO was established to coordinate the development and maintenance of vendor-neutral Extensible Markup Language (XML)-based transaction specifications to support data sharing both inside companies in the industry and externally among the many participants in mortgage lending processes. Internal integration is as necessary as external integration, according to industry experts, since a typical mortgage lender may re-key data about a borrower's loan application as many as seven times prior to closing (and several times thereafter).

Today, MISMO has over 100 members, including both leading players from all industry segments and IT vendors that specialize in the industry. MISMO's scope is the entire real estate financing process including origination from application through closing and recording (including ancillary real estate services such as appraisal, insurance, and title), secondary marketing, and servicing. The organization promises three deliverables: the XML specifications architecture, a data dictionary of over 3,600 elements with business definitions and the corresponding XML data element tag names, and a reference data model to illustrate the relationships among data elements in the dictionary. At the same time, MISMO carefully restricted its focus to *inter*organizational processes, thereby hoping to avoid the conflicts and stalemates that arise when standards-setting efforts start dictating intraorganizational processes and data formats (MBA, personal communication 5/28/03). MISMO standards are publicly available online.

A key milestone in MISMO's history occurred in July 2001, when MBA announced that FannieMae and FreddieMac had agreed on a common format for their automated underwriting systems. This specification allows companies "to send the same 'base' XML data file to both FannieMae and FreddieMac for an underwriting decision, thereby saving users money when they are implementing their interfaces" ("News Release: Common Format Adopted for Automated Underwriting" 2001). Industry observers consider this event significant, because the GSEs had previously pursued proprietary technology initiatives, imposing a burden on companies that wanted to do business with both.

In March 2002, MISMO released its first full set of standards covering the entire process from mortgage application through to servicing ("News Release: Release of Version 2.1 Triples Data

Coverage in Residential Mortgage Industry" 2002). In the meantime, MISMO began tackling the problem of fully electronic mortgage financing, which requires electronic signatures.

eMortgage Standards

The passage of the Uniform Electronic Transactions Act (UETA) in 1999 and the Federal Electronic Signatures Act (E-SIGN) in 2000 made it possible to envision a mortgage lending process that produces legally binding mortgages entirely without paper. These laws provide that electronic signatures can be used wherever existing law requires a "wet" signature.

In January 2001, MISMO launched its eMortgage Workgroup. To accomplish fully electronic mortgages, the eMortgage Workgroup developed "SMART docs": Secure, Manageable, Archivable, Retrievable, and Transferable documents that lock data and document presentation into a single computerized file using the underlying data formats of XML (for data transfer) and XHTML (a combination of HTML and XML, for document presentation). SMART doc standards ensure that information is transferred in a form that is readable both by computers and by humans, thereby enabling the requirements for filing with county recorders' offices to be met along with those of the GSEs and investors.

End-to-end technology support would automate numerous steps now done manually, among them: electronic exchange of data instead of mail, fax, and courier transmission, data reentry into multiple systems, data validation, and data storage. eMortgage experts claim that a fully electronic mortgage process will streamline processes, prevent lost documents, and improve document accuracy, saving about $150 per loan, cutting processing time at least 20% (the cycletime for the close to record process is estimated to be eight weeks), and eliminating unpleasant surprises for borrowers at closing time.

In June 2001, eMortages got a big boost when FannieMae and FreddieMac agreed to support MISMO's XML standards: The GSEs had been independently developing guidelines and standards for Internet-based electronic interchange. Today, the GSEs claim to be strong supporters of all-electronic mortgages. In January 2003, MISMO released the first version of its eMortgage Guidelines and Recommendations to the industry ("News Release: MISMO Announces eMortgage Release 1.0" 2003).

Although the first electronic mortgages were purchased by the GSEs in the year 2000, to date only about 100 eMortgages have been closed. Industry experts expect that it may a number of years before fully electronic mortgage are common (Michels and Morelli 2001a). Despite the progress represented by the MISMO eMortgage standards, numerous barriers to adoption remain:

- Because identical digital copies of an electronic mortgage are likely to exist, who holds the authoritative copy? To address this problem, MBA recently released requirements for an eNote registry that would track the location and the owner or controller of electronically originated and closed mortgage notes ("News Release: MBA Announces Release of Industry eNote Registry Requirements" 2003).

- Even though XML is inexpensive and easy to implement, "having the system and programming expertise to convert paper documents to SMART docs requires more than simple XML skills" (Story 2003, p.74). Many small and medium sized lenders lack those skills. Today, few lenders are using SMART docs in all lending processes (Story 2003). At least one vendor alliance (e-Mortgage Alliance) has been formed to link applications throughout the value chain, but the eventual appearance of

outsourcers and ASPs may do more to mitigate this problem (Michels and Morelli 2001b).

- Fewer than 20 of the US's 3,600 county recorders can receive and record mortgages electronically, although 25 are in the process of converting and only some 250 major urban counties handle the majority of filings, somewhat reducing the scope of the adoption problem (Barta 2003).

- Many lenders are not convinced about the benefits of electronic mortgages (Barta 2003). The GSEs do not yet require electronic documentation (Michels and Morelli 2001a), and many in the industry appear to be looking to the GSEs to take leadership in this area (Michels and Morelli 2001b). The GSEs respond that electronic mortgages will stress the industry as much as automated underwriting did a decade earlier, and therefore they are reluctant to mandate adoption (Kersnar 2002). But observers point out that electronic mortgages do less to advance the interests of the GSEs than automated underwriting did, and therefore they expect the GSEs not to take such an active role in facilitating adoption of eMortgages (Kersnar 2002).

The MISMO Standards Development Process

The process MISMO set in place to guide the standards-setting process was apparently designed to maximize participation from all segments of the industry and to avoid domination by a few large players.

Membership and Governance

According to the MISMO Web site, more than 100 companies and more than 600 people are involved in standards activities. Membership in MISMO is voluntary and open to all, regardless of company size or the specific segment of the mortgage industry value chain within which a company operates. MISMO is subdivided into a number of Workgroups reflecting every aspect of the mortgage industry value chain, as well as groups focusing on foundational data definition standards. Subscribers to MISMO can join the Workgroups of their choice and participate in all activities except the leadership positions, which are filled in annual elections.

To ensure a fair and efficient process, Workgroups are required to follow published agendas. A code of conduct published on MISMO's website defines conflicts of interest and acceptable behavior, particularly with regard to potential violations of antitrust regulations. Members are reminded at each meeting that industry associations like MISMO are perfectly legal, but that discussions of such things as rates, terms, prices, and conditions of service are not legal. Members are encouraged to raise any concerns they might have about the direction of discussion in MISMO meetings.

A Governance Committee oversees the organization and gives final authorization for changes in the standards architecture after reviewing the recommendations of the relevant Workgroup. The MISMO Governance Committee reflects a balance between large and small players, as well as the breadth of the mortgage industry value chain. Seats on the governing committee, which is elected by the full membership, are provided to lenders, servicers, GSEs, insurers, credit reporters, and technology vendors representing different industry segments. In addition, the MBA has two non-voting seats on the committee, reflecting the Association's role as neutral facilitator.

Costs of participation are minimized by holding few in-person meetings, supplemented by the use of listservs, teleconferences, and electronic balloting. Hence, smaller firms are not kept out of the process by steep participation costs. MISMO holds three in-person meetings per year and periodic interim meetings. Email notifications of upcoming votes are sent out, and electronic balloting ensures that each company can influence election outcomes. MISMO operates on a "one company, one vote" process, both for elections to committee governance positions as well as for actual standards submissions and change requests. Moreover, the costs of using MISMO standards are minimized by making specifications freely available through downloadable documents. The MISMO web site offers free access to all MISMO participants.

Intellectual Property

MISMO gave considerable attention to the problems of opportunistic behavior around intellectual property rights (IPR). MISMO considered and rejected several IPR approaches used by other collaborative ventures (such as the "copyleft" license of the Open Source movement). Instead, MISMO opted for a royalty-free license approach to IPR. All participating companies must sign an IPR agreement that requires the company to pays for its own peoples' time on the project, to license any contributions to MISMO free of charge, and to allow MISMO to derive products from their contributions and make these products available to others (i.e., to sublicense them) via the Web or other means.

These provisions were expressly designed to prevent companies from pursuing a "submarine patent" approach, whereby participants file for their own business process patents while waiting for the technologies to reach a point where they can be implemented.[1] Then, once companies attempt to implement the standard, the opportunistic patent filer can claim royalties on what was supposed to have been an open and freely available standard. MISMO proactively implemented its IPR approach to prevent submarine patents from ever surfacing.

DISCUSSION

The MISMO standards effort suggests several important conclusions that need to be brought into congruence with the theoretical and empirical literature on standards-setting processes. Among our observations from this case are the following:

The Difference of Vertical IS Standards

Our analysis of the MISMO standards development process argues for the need to differentiate between horizontal *IT* standards (IT products and general standards) and vertical *IS* standards (industry-specific data and process standards). The former include protocols such as TCP/IP and representational formats such as HTML or XML that apply to many industry sectors, while the latter are relevant to a single industry, such as CIDX in the chemical industry or the MISMO standards in the mortgage sector. The former are likely to be driven by vendors in the IT and/or telecommunications industries and are unlikely to be tied to industry-specific products, business processes, or regulatory requirements. The latter are driven more by industry participants than technology vendors and integrate technical features with legal and business elements. It seems unlikely that much progress in vertical IS standards efforts can be achieved without significant development and penetration of horizontal standards. In the case of MISMO, vertical IS standards might not have emerged without the widespread take-up of TCP/IP and XML.

[1] Stix, G. (2002). Deep-sixing the submarine patent. Scientific American.com, September 13. http://www.sciam.com/article.cfm?articleID=000C4F59-8093-1D2B-97CA809EC588EEDF.

The Role of Major Organizational Players

The standards literature focuses heavily on the importance of network externalities and what they portend for the likelihood of collective action. In the case of automated underwriting, the GSEs played the role of resource-rich players who could provide a public good for all to use. In the case of MISMO standards, the MBA could not provide the public good, but it did facilitate the voluntary participation of many players, including small ones, and the MBA brokered the acceptance of MISMO standards by the powerful GSEs. By creating a governance framework emphasizing openness and equality, MISMO ensured than no one organization is in a position to dominate the standards development process, regardless of its market power. It remains to be seen, however, whether the market power of the GSEs or of mega-lenders with proprietary solutions will make a difference in MISMO standards adoption.

The Role of Individuals and Personal Relationships

MISMO's open and inclusive governance structure may reduce concerns by other industry players that MISMO standards are biased in favor of a company or industry segment. But this inclusive process does not imply that a large proportion of the industry is actively involved in standards-setting efforts. Rather, interviews with MISMO participants reveal that much of the work was done by a rather small group of regular members who come to all meetings, providing the continuity necessary to keep the process moving forward. Indeed, interviewees referred to this factor as the "same ten people phenomenon", pointing out that the effort depends critically on a small group of highly devoted people.

The "same ten people phenomenon" suggests to us that social relationships are key to the success of this standards-setting process. The formation of social bonds across company boundaries not only eased the process of information transfer, but also made it possible to achieve the compromises necessary to resolve impasses. Although the importance of personal relationships as a lubricant and governance mechanism in support of electronic transactions has been pointed out in prior literature (Kraut, Steinfield, Chan, Butler and Hoag 1999), the role of such relations in the standards-setting process has not yet received much attention.

The Role of IT Sector Maturity

Another observation concerns the relatively minor role played by large technology vendors in the MISMO standards efforts. The mortgage industry currently has no ERP analog—except for the suite of technologies offered by the GSEs. (The GSEs cannot be understood as technology vendors apart from their role as major industry players—as customers of some players and competitors of others.) Mortgage industry observers have speculated that one reason for the historically slow adoption of IT in the mortgage industry was the low level of maturity of the IT sector (Lebowitz 2001). This hypothesis deserves attention: The relationship between industry structure and IT sector maturity on the one hand and the emergence and adoption of IS standards on the other has been seriously underexplored.

In the case of the home mortgage industry, the low level of maturity of sector's IT industry is likely related to the historically extreme fragmentation of a now rapidly consolidating industry. However, given the time lag between industry structure changes and responses by the corresponding business services sector, we believe it is important to consider the effects of the sector's IT industry independently of industry structure.

The Scope of the Standards-Setting Efforts and Intraorganizational Conflict

Finally, the scope of vertical IS standards-setting processes appears to be important in the success of these efforts. MISMO deliberately avoided trying to develop standards for

"everything including the kitchen sink", because the attempt to standardize members' internal processes and data structures would likely entail *intra*organizational conflict.

Vertical IS standards often affect multiple stakeholder groups *within* the organizations that participate in standards-setting efforts—in the case of the mortgage industry, for example, originating units, servicing units, and legal departments may each view a proposed standard from different points of view. Managing the scope of standards-setting processes is a useful tactic for keeping intraorganizational conflict from affecting the successful completion of an interorganizational standard. A potential downside of this approach is that some participants may lack the level of internal systems integration needed to adopt or capture benefits from interoganizational standards (Markus 2000).

CONCLUSION

Much work remains to integrate the findings of this case with the theoretical and empirical literature on standards-setting processes. Nevertheless, our case has revealed numerous promising avenues of theoretical development and empirical research. We look forward to the opportunity to explore these directions in the future.

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Authors’ biographies

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