Issues and Concerns in Internet Based Financial Applications: An Example from an Auto Finance System

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Abstract

The Internet is an important resource for both business-to-business and business-to-consumer commerce. Its advantages over private networks are often overshadowed by concerns about using pubic networks for commercial transactions. We present a case study that describes adoption of an Internet-based auto finance system by a financial insitution and multiple auto dealerships. We discuss four issues that we needed to solve in order for the system to be accepted. These are: 1) the implications of the open nature of the Internet on existing business-to-consumer relationships, 2) security of enterprise data and systems, 3) ensuring connectivity across enterprises, and 4) the management of information assets generated by large volumes of electronic transactions.

1. Introduction

We present a case study of an Internet-based system that connects auto dealerships to financial institutions (FIs) for the purpose of obtaining financing on behalf of automobile purchasers. The system extends Internet-based business-to-consumer commerce in three ways.

First, the primary end users of the application are not the consumers themselves, but rather employees of one of the businesses involved, specifically of the auto dealership. Nevertheless, as the dealership personnel act as agents for the purchasers, this application is an example of how the Internet can be used to *enable* business-to-consumer electronic commerce.

Second, the system is not a World Wide Web (WWW or, simply, web) application. Rather, it uses the networks that constitute the Internet because they present a cost-effective, easy to access and ubiquitous means for communication among multiple parties. The Internet is utilized in the system for transferring data between an auto dealership and an FI, for software distribution and for system maintenance. The subset of the Internet known as the web can be used to present hypermedia documents (composed of text, image, video and sound) on computers equipped with Internet browsers, but lacks other capabilities required in our system (e.g., speed, aided interaction techniques). Therefore, the user interface component of the system is a personal computer (PC) application residing on a machine in the auto dealership. This made available a greater range of technology with which to implement the systems requirements.

Third, the business model instantiated in the auto finance system is not a simple business-to-consumer one. Rather, it creates a potentially multi-way relationship that involves a transaction between a consumer and one or more businesses (e.g., the FI, an insurance provider, the DMV) mediated by another business, in this case the auto dealership.

Although atypical in these respects, the auto finance system we present shares many important issues with the more typical business-to-consumer commerce. This paper discusses concerns that arose in the context of developing the auto finance system with auto dealerships and FIs which we believe are relevant to other electronic commerce endeavors. In particular, we deal with four issues.

First, using the Internet rather than a private network opens up to the entire community of FIs what had been intended to be an improved proprietary relationship between the first FI in our field test and their customer dealerships. Bank management could have been concerned about market share erosion under a system that essentially gave equal access to their competitors. This issue illustrates the changing relationships between businesses and their customers that are brought about by the Internet.

Second, the FI's previous experience with networks had not prepared them to place their business on a public network such as the Internet. The banking industry relies on highly secure private networks, such as SWIFT, which is responsible for clearing electronic money transfers among the world's largest banks [8]. Proposed use of a public, not secure network immediately raised concerns about unauthorized access to enterprise systems. Security issues

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surrounding the transfer of information were also important as the auto finance system involves transfer of both loan authorization information and sensitive consumer financial information. Finally, issues of authentication of the origin of loan applications also had to be resolved.

Third, concerns about maintaining end-to-end connectivity were raised by the marketing department responsible for maintaining dealer relationships. The reputation of the Internet as being less stable than private networks raised the concern that the FI's customers might not be able to complete business transactions reliably with the FI.

Fourth, the marketing staff recognized the value of the data generated by the large volume of electronic transactions between dealerships and the FIs. The Internet has enabled a new set of businesses to be created based on collecting, analyzing and reselling large numbers of electronic transactions to produce marketing analyses and forecasts [9, 17]. The creation of this new asset raised issues about data ownership and control.

In the remainder of this paper we focus on a discussion of these issues and a presentation of the solutions adopted in the three year project. The goal is to demonstrate that these concerns were addressed to the satisfaction of the FIs and auto dealerships with whom we worked and to suggest ways that similar concerns can be addressed in other Internet applications.

2. The Auto Finance Domain

The project that produced the auto finance system began with a single institution requesting our help in making the process of applying for an auto loan more efficient for their customers, the auto dealerships, and its processing easier for themselves. The FI was interested in using technology to provide better service to their auto dealership customers. Since auto dealerships in the United States have access to multiple FIs, they hoped to increase loyalty and thereby market share by providing faster decision time on loan applications and same-day funding of loans.

2.1. The FI's Point of View

The FI anticipated a solution based on a private network that would connect their best dealers (i.e., those with the highest volume of funded loans) directly to their loan decision system. The loan decision system includes a set of rules which are applied automatically to customer data to produce judgments about the credit worthiness of loan applicants. Under the existing paper based application process, only 12% of decisions were made automatically. The FI's goal was to double this percent.

A private network was necessary, in their minds, to protect their information assets and the privileged information exchange with their customers. In 1995, when this project began, use of the Internet for commerce was relatively new. Commerce had only been allowed since 1992 [11] and the web, an important force in spreading electronic commerce to consumers, had only recently begun to have an impact [11].

2.2. The Auto Dealers' Point of View

Our methodology for system development includes gathering information on all stakeholders in the application domain [7, 10]. We devoted a significant portion of our investigation to analyzing the situation from the point of view of the auto dealerships because their acceptance of the system was a prerequisite to meeting the FI's goals of significant customer usage.

We found two important points on which the position of the auto dealerships contradicted that of the FI. First, auto dealerships would not accept a system that could only be used for submitting applications to a single FI. It is difficult for a dealer to predict which FI will offer the loan that is most advantageous to themselves and their customers because loan program offerings change significantly and frequently. Factors such as consumer credit worthiness, dealer volume incentives and special manufacturer promotions vary often. Consequently the dealer's practice is to submit several applications for each customer and to accept the loan offer that meets the customer's criteria while maximizing the dealer's profit.

Deal consummation was at the heart of the other disagreement dealers had with the solution proposed by the FI. They were unwilling to accept a system that increased the efficiency of the financing application process without also addressing the contract component of the purchase process. Their experience indicated being able to complete a deal in a single customer visit to the dealership would secure more sales. In addition, the dealership did not receive their funds from the FI until the contract was complete. Therefore, processing contracts would have to be a component of any electronic system they would accept.

3. Characteristics of the Auto Finance System

The system is resident on an auto dealership's desktop system and uses the Internet for communications, software distribution and maintenance functions. We created a dynamic electronic application form that contained a core set of fields requested by a broad range of FIs and a set of optional fields that would be triggered based on requirements of particular FIs [7] entering the data once. The application was then sent via the Internet to all the FIs selected by the dealership, or faxed automatically if the FI

was not Internet equipped. If approved, contract parameters were returned to the dealer's workstation and automatically entered into the contract form. The contract data was in turn sent back to the FI, which caused the funds to be released to the auto dealership.

3.1. Why an Internet based application?

As we learned about the context in which our banking customer operated and researched the various stakeholders whose needs would have to be met for the system to be accepted, we concluded that any and all interested FIs would have to be able to participate in the auto finance system we were going to build. We found that in order to attract the large number of dealers that would make the system viable, the Internet would have to be an integral part of the solution. The use of a private network (e.g., leased lines, dial-up connections) would have effectively precluded opening the system to all interested FIs.

The FI would have preferred to use a private network and well established transfer protocols such as those embodied in EDI technology. For several decades, business-to-business commerce has been transacted using electronic data interchange (EDI) technology over private networks called value added networks (VANs) [6, 21]. EDI technology offers highly formalized procedures for transmitting routinized transactions such as purchase orders and invoices [6]. Transactions over EDI enabled networks have the advantages of leaving an audit trail and, because they are implemented on VANs, of being significantly more secure than the public Internet. However, their expense and difficulty of installation effectively limit commerce. It has been estimated that it costs a business $50,000 to add a single business partner to an existing internal company network or Intranet [15]. By contrast, an Internet connection is readily available and cheap, simply requiring availability of a modem-equipped computer and access to the network through an Internet Service Provider (ISP).

Cost and availability of access were two of the most important motivators in proposing that the system be based on the public Internet rather than a private network. Ubiquity and inexpensive access are now two well established characteristics of the Internet [2, 14], but these were less well established when this project began in 1995. As the project developed, it became clear that our expectations would be borne out and exceeded in this regard.

Ubiquitous, inexpensive service lowering the barriers of entry to the parties whose participation was crucial to the success of the system. Success, from the point of view of the FIs, was defined by having loan applications from all their high volume dealerships enter their system electronically. From the point of view of auto dealerships, acceptance of the system was contingent on the capability to send a customer's application to multiple FIs simultaneously. The cost to establish private network connections required to support these many-to-many interconnections would have been prohibitive to both dealers and FIs.

Extensibility of the application platform to allied products and services for the benefit of the auto purchaser was another goal to the system. The notion of "one stop shopping" is becoming increasingly popular in electronic businesses. The idea is to draw together in one virtual place all of the products and services necessary for the consumer to complete a given task. The credit bureau connection available from the loan application is an example of the way service coordination can improve the process of auto purchase. For example, if a customer is identified as having poor credit during the application process, additional information can be requested before the customer leaves the dealership. There are many models for such aggregation in traditional businesses (e.g., combination grocery, sundry and drug stores; cancer care centers).

Virtual spaces offer the same advantages as those (cost-effectiveness, efficient coordination among service providers) plus much more flexibility in extending the range of products and services offered. We had identified a number of other relevant services and products whose availability at the point of sale would be beneficial to the purchaser. Motor vehicle registration and insurance coverage are two example services. In our discussion with insurance brokers, for example, we found that they offer a variety of insurance products that customers rarely hear about because the must depend on the dealership to offer them. Since the return for the dealership is typically very low, they generally do not make the effort to sell these products. Integration of such services into the financing process can greatly lessen the dealer effort required to alert the customer to a potentially useful product.

3.2. Why Not a Browser Application?

Several critical features of the system placed technical requirements on the implementation that could not be delivered in a web application. First, recall that the solution to the dealers' requirement that a single application be used for all FIs led us to create a dynamic document [7] which would be constituted based on customer data (e.g., whether a consignor was necessary). Similarly, the methods we developed to increase data validity [7, 10] required consultation of a variety of databases at runtime, typically on a keystroke by keystroke basis. In both cases we needed to store information on a remote client. As client side plug-ins were not available when this project began in 1995, the only alternative would have been to store the supporting

databases on servers. However, the resultant performance cost would have been unacceptable to the user.

Involvement of a server would also have been the only alternative to satisfy the user requirement of saving partial results. It was important that information loss would not occur if the process of filling out an application were to be interrupted. Browsers' stateless designs [18] would have required partial results to have been saved on some server site that would have been part of the system, with a log-in required to restore the application to the screen. Considerations of privacy and data ownership which are discussed later, rendered this solution unacceptable.

Additionally, a server solution would have unnecessarily introduced a single point of failure to the system as unavailability of the application web server would have precluded all dealerships from entering data. The architecture that was adopted for system (see Figure 1) allowed dealerships to enter information as long as their private workstation was available. When completed, the application would be sent via the Internet to the FI. If any of the connections between the dealership's workstation and the FI's systems were unavailable, temporary storage and eventual forwarding would be handled transparently to both parties.

4. Committing One's Business to the Internet

Convincing the FI that the Internet was a viable alternative to private dial-up networks or leased lines was a gradual process, as we addressed concerns on a number of levels. For three of the four concerns we demonstrated that a technological response could be devised that would make the Internet based solution essentially equivalent to one based on a private network. The fourth issue was potentially more difficult as it concerned the FI's response as a company to the changing competitive landscape that the Internet was bringing about.

4.1. The Changing Relationships Between Business and Consumers

The proposal to base the system on a public network in order to encourage participation by other dealerships and, importantly, other FIs has to be looked at against the background of the changing relationships between consumers and business that has been engendered by the Internet.

The new relationships are still very much in flux as both sides grapple with the implications of the Internet. Changes in the balance of power between consumer and business are often judged to favor the consumer [4, 15]. The new facility with which consumers can deal directly with producers of goods rather than depending on layers of middlemen (distributors, retailers) to purchase goods is one enabler for the consumer to assume increased freedom of choice. The Internet also gives consumers the ability to easily identify others with similar goals with whom to form alliances for the purpose of negotiating with producers of goods and services [4].

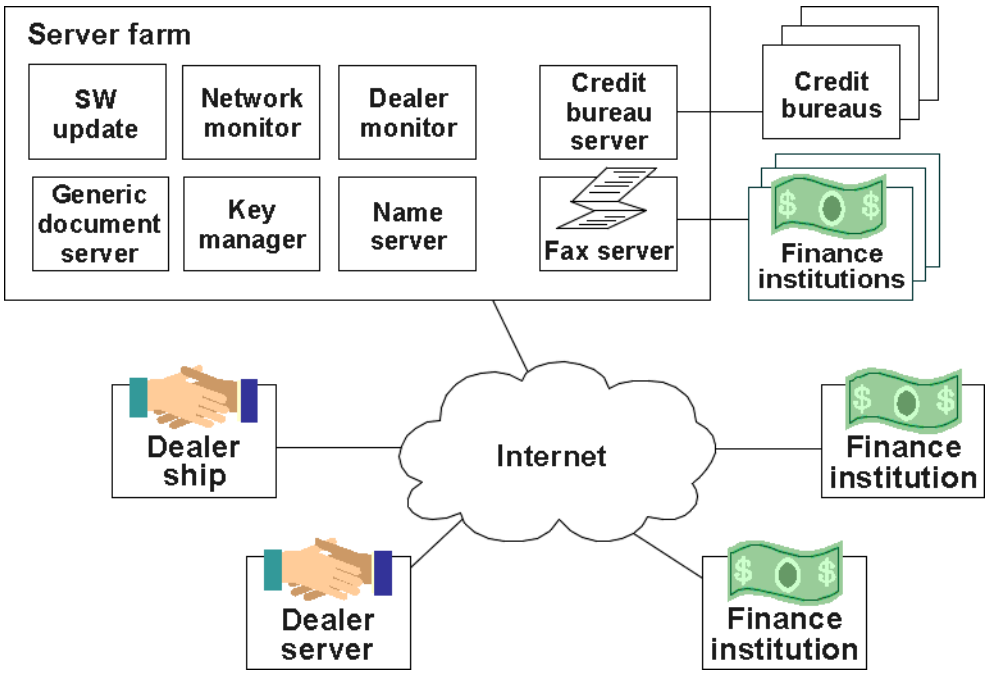

Figure 1. Overview of system architecture

However, the process of disintermediation, whereby the consumer is brought into closer relationship with the producer, has not created some of the expected advantages for consumers. For example, they are not benefiting from across the board decreases in prices that would be expected when middlemen are removed from a transaction [16]. The reason is that the Internet has created a dilemma for businesses as they work towards incorporating this new channel into their overall strategies. Businesses are attracted by the enormous size of the potential market the Internet represents, which is variously estimated to range between 50 million people [20] to as many as 90 million people [6] worldwide. They have responded by opening an estimated 400,000 businesses on the web [6]. However, they are cautiously approaching transactions with consumers through this new channel as they need to maintain good relations with their more traditional channels as well. One consequence of this is that prices are generally the same on the Internet as in traditional stores, especially when additional charges such as delivery are factored in [5, 16].

The ability of the auto dealers to maintain control over the loan process in the context of the loan finance system illustrates some of the tensions resulting from possibilities of changing relationships. The system presented the potential to transform an indirect loan market, with dealers reselling loans to consumers, into a direct loan market, where consumers obtain financing directly from the FI. However, the dealerships would not countenance a self service loan application system because the financing part of the auto purchase process represented a significant profit source for them. We had to accept that in order to gain their participation, the system could not disintermediate auto dealerships from the loan financing process.

In fact, rather than *dis*intermediation taking place, the potential for the development of an electronic marketplace at the dealership makes this an opportunity for aggregated intermediation. Discussions with insurance providers, for example, indicated that they would be interested in having auto dealerships offer some of their lesser known products to consumers. Products such as employment loss insurance have low penetration partly because they are not offered at the relevant point of sale which is the time of auto purchase. It would be expected that the dealership would benefit by becoming a reseller if additional products and services were to be sold at the point of auto purchase.

Another case where we see the effect of the Internet on relationships between businesses and customers is in the decision to make the loan finance system open to any FI. A system which made it equally easy for a dealer to submit an application to multiple FIs, which the dealers had made a precondition for their acceptance of the system, had the potential to erode the FI's market share. It is to their credit that they embraced the opportunities as well as the challenges that this situation presented them. Unlike the merchants who modified their web site content to thwart price comparisons by consumers [6], the FI concluded that efficient markets were inevitable and resolved to compete by strengthening their relationship with dealerships. Providing better customer service, which had in fact been the original motivator for the project, and providing dealers with a variety of volume based incentives, were seen as key ingredients to doing this. Thus, the dealers were central to the FI's strategy for maintaining and growing their market share in the new business-to-consumer environment enabled by the Internet. Selling to individual consumers, as would have been the case in a direct loan market, would have been less cost effective than selling to dealerships which could deliver large volumes of loan consumers.

4.2. Security Concerns

Many of the concerns that businesses and individuals raise when discussing commerce on the Internet can be traced to the mismatch between the original goals of the Internet and its present commercial uses. The Internet began as a research project by the U.S. Department of Defense Advanced Research Projects Agency (DARPA). They were seeking to develop technologies that would allow computers to continue communicating across networks even in cases of nuclear war [11, 13]. The focus was on creating the infrastructure with appropriate levels of redundancy that might be needed in order for communication to continue in spite of portions of networks being inoperable. The communication protocols that were developed were based on an assumption of mutual trust which underlie the free exchange of information [13] rather than on security measures needed for commercial exchange.

It was not until 1992 that the National Science Foundation (NSF), which had assumed leadership over the Internet that year, relaxed its Acceptable Use Policy to allow commerce to take place over its network [11]. With the ascendance of the WWW in 1994 [11] there was significant growth of commercial traffic on the Internet and the unsuitability of the Internet for commerce began to surface. Recent polls of businesses indicate that significant numbers of them still are reluctant to place their business on the Internet because of concerns of security [8, 11]. Similarly, individuals name privacy issues, which include improper acquisition and use of personal information (including credit card numbers) as the major reason for not participating in electronic commerce [20].

In our discussions with various departments at the FI and with the dealerships we identified three issues that we would need to address. The FI's greatest concern was penetration of their enterprise systems by unauthorized

persons. They worried that providing access to auto dealerships through the Internet for a limited purpose (delivery of applications) could result in penetration of their systems for unauthorized purposes by unauthorized individuals because Internet protocols are inherently not secure [13].

The second security issue concerned authentication of senders of application forms. Because the FI would authorize the distribution of money in response to receiving a contract, they needed to be certain of the identity of the originator. They pointed out that under current fax based procedures there are business controls that help them guard against someone masquerading as a dealer. Currently they hold a part of the funds they authorize until the paper contract is received several days later, confirming the legitimacy of the transaction. Once the paper contract is received, there is an auditing step done by the person who inputs the contract into their system. The auditing department at the FI voiced discomfort because all these steps were to be done electronically in our system.

The third concern involved privacy of the information that would be sent over the Internet. The application for financing contains both personal history (name, address, job history) and personal financial information (salary, bank information). The dealers raised a concern on their customers' behalf about sending the information over a public network. Pointing out that their current practice of faxing the application over telephone wires offers no protection as the information is not encrypted did not lead them to accept the security risks they attributed to the Internet.

The FIs also had privacy concerns. They were primarily concerned with the possibility of unauthorized aggregation of their approval/denial decisions embodies their marketing strategy. Armed with such knowledge, a competitor could use that information to mount a successful competitive marketing strategy.

4.2.1. Solutions to Security Concerns

There were two elements in our technological response to the security concerns the FI and the dealerships raised. First, we used "firewall" technology to address the FI's greatest security concern, namely, possible penetration of private bank systems through the Internet. We reviewed security management on each FI's network both for providing the appropriate security blocks and for being configured for maximum security. These systems, called "firewalls" [1, 13] were generally installed on a machine between the loan server and the FI's loan decision system (see Figure 2). The first function of the firewall was to stop unauthorized messages from moving past the firewall. Additionally, the firewall was used to provide tracking capabilities. A log entry was generated for any attempted entry into the system, enabling system administrators to monitor their security systems and determine if these need to be strengthened.

Second, we used encryption to address privacy and authentication issues. We used a private-private scheme which is a highly secure method of encryption that offers greater security than the commonly used RSA (from RSA Securities, www.rsa.com) which uses a public-private scheme. In the public-private methodology, the sender's encryption key is known publicly and all senders use that key. The decryption key is private, being only known to the receiver. By contrast, in our private-private methodology, each dealership-FI pair has a private key only known to them. Thus, a dealership that communicates with multiple FIs will have a different key for encrypting information to each FI. Further, a public-private key encryption scheme is less secure than the private-private scheme because it does not offer authentication as anyone can use the public key. In our scheme, since only one pair of "partners" can use the key for decryption, we can authenticate who the message came from. This prevents one dealership from pretending to be (that is, "spoofing") another.

In our implementation, the encryption took place at the dealership's workstation. The dialogue between the auto dealership and the FI operated in an asynchronous manner. The two parties did not need to be in dialogue in order for a loan application to be submitted. Once submitted, an application would be forwarded to a loan server at the FI (see Figure 2), and it would then be processed at the FI by the loan decision system. At the FI's side, the procedure was first to decrypt any communication received from the dealer. If the communication had not been encrypted or if it had been encrypted "incorrectly" (i.e., using an unknown or outdated key), the decryption process would render it invalid and cause it *not* to be placed in the FI's queue for forwarding to the loan decision system.

In effect, the scheme that was implemented in the auto finance system is very similar to that discussed in the literature as Virtual Private Networks (VPNs) [13, 14]. In a VPN, encryption of all messages is done at the network transmission IP level. In this way, a recipient can be sure that the channel is secure. Although our implementation (where encryption is done at the application level rather than at the IP level) did not prevent unauthorized messages from being originated, it did prevent them from being forwarded within the FI's systems. The effect was identical to VPNs since communication was asynchronous and all messages not encrypted in the expected manner were discarded upon decryption.

An encrypted distribution system for these keys using a single use key [13] was developed. Key distribution was handled under "one time" keys. Initial one time keys were created on the dealer machines and used to encrypt the initial key set when that machine came online. Periodically

a key set would be refreshed using a special one time key generated for that purpose.

In summary, our security response to penetration concerns focused on providing multiple barriers to entry and providing detection capabilities in addition to prevention capabilities.

4.3. Connectivity

Two issues concerning connectivity were the loss of information and the timeliness of information delivery. Our investigations with the auto dealerships determined that a very important requirement they had for our system was that they be able to obtain a decision and funding from the FIs during a single visit by the customer. Spreading the purchase process into multiple visits decreased both the probability of consummating a deal and the efficiency of the process. Dealerships set the maximum loan decision time at five minutes as they judged this to be the average time that they could convince customers to wait following completion of a loan application.

Arrival of the information at the selected destination was a prerequisite for a timely decision. Transfer across the Internet created new exposures in this area. By virtue of the Internet being a switched network, information packets are forwarded by many servers across many different phone lines in order to reach their final destination. Widely used communication protocols, such as Transmission Control Protocol over Internet Protocol (TCP/IP), ensure that the transfer between two points happens without loss [18], but cannot insure that the information gets to the final destination. While TCP/IP does provide return codes indicating successful transmission to the target machine, this only means that data has arrived at the communication buffers. Until the receiving application has successfully processed the data (or stored it on disk for deferred processing), it cannot for practical purposes be considered to have been transferred.

It was not enough to simply assure the data arrived at its final destination, it was essential that it arrive there quickly. Rerouting information to work around links that are down and problems resulting from insufficient server capacity are two major factors slowing down delivery of information. The Internet backbone has built-in redundancies that continue to be enhanced as capacity grows. However, getting to the Internet backbone occurs through a local ISP and the quality level among these suppliers varies greatly. Providers, especially those serving marginal markets, may not have the redundancy necessary to insure that a consumer's connection can be kept live for the desired duration. Difficulties with the consistency of service provided by local ISPs, referred to as the "first mile/last mile" problem [12], is a significant problem for any system that implements automatic connections to the Internet.

The auto finance system had a requirement that a connection between an FI and a dealership be made on demand in order communicate loan application decisions. In order not to tie up the dealership's line for long periods while a decision was pending, the connection to the FI was routinely dropped after a few minutes. In these cases, the FI had to be able to reestablish a connection with the dealership.

4.3.1. Solutions for Connectivity Concerns

We assembled a three-pronged response to address connectivity concerns. First we developed a "store and forward" mechanism to make sure that we would always have an existing copy of the information and that we would know where the application was in the path to its final destination. "Store and forward" worked across adjacent machines in our system network. Since we could not control machines outside of our own network, we developed completion criteria which depended solely on machines we can control. Referring to Figure 2, we can see that the dealer server and the loan server are considered adjacent machines in the network because they are only separated by machines which are part of the Internet and therefore outside of the system network.

"Store and forward" followed a three step procedure: 1) write an application file persistently to the disk of the sending machine, 2) attempt a communication with a receiving machine, 3) delete the document on the sending machine upon acknowledgment of a successful write to disk operation on the receiving machine. Again referring to Figure 2, the copy of the application file sent from the dealership's server was deleted on that server only when it received confirmation that the application file had been written successfully to the disk of the loan server.

The second component to our technical response was a software application we developed for ensuring that a connection across the Internet was available when needed. We developed this software, which we called NetMind, as a wrapper around dialing software to manage connections on an automated basis. The most common loss of connectivity came about because of a dropped line by the ISP; the "first/last mile" problem discussed above. NetMind would either attempt to reconnect or, if this failed repeatedly, dial a backup ISP. At the time we developed NetMind, no off-the-shelf software existed for on-demand connection to the Internet based on application control. Even today, with the latest dialers the process is not automated enough to handle the error reporting and recovery that we required.

NetMind also provided the bi-directionality that was needed to reestablish connectivity quickly to communicate funding decisions to dealers. When a decision was made, if the target dealership machine was not connected to the Internet, the FI's loan server would dial its modem, causing

NetMind to reestablish the connection to the Internet. With the target dealership back on line, the FI's machine could now send the decision. Thus, NetMind also provided connectivity under programmatic control.

NetMind also included monitoring function to tell whether a breach in communication was due to a problem with one of our own machines. If a problem of this sort was detected, NetMind would attempt to solve the problem, e.g., optionally rebooting the application or the machine.

The third component of our response was providing a system-wide monitoring function. We made use of an off-the-shelf product called NetFinity from Tivoli which provided monitoring in addition to maintenance and software distribution functions. NetFinity functions to alert a human that intervention is needed. The combination of NetFinity and NetMind allowed us to proactively determine when a machine was not operating correctly and then alert the dealership personnel (if necessary) prior to the problem affecting business operations.

These three tools were quite successful in addressing the concerns, real and perceived, of both the dealer and FIs as related to connectivity issues. The most relevant measure of our success was that over the life of the field test, over 70% of applications received a decision within three minutes.

4.4. Large Volume of Transactions Create New Assets

New businesses are being built based on the information products that can be generated by monitoring the large volumes of electronic transactions that occur on the Internet [3, 9, 17]. The data which is contained in these large volumes of transactions, when analyzed, endows the owner with a potentially powerful tool for market analysis, forecasting, and discovering general business intelligence.

A typical architectural approach in designing a system that connects multiple suppliers to multiple customers would be to interpose a proprietary system between the two. But this immediately raised the question of ownership of this potentially valuable data.

It was the marketing and legal departments within the FI that recognized the potential issues raised by funneling of transactions through a third party. First, they understood the value of the information that could be collected. Not only as data aggregates, as reflected in their decisions and terms, for understanding trends and analyzing market segments as noted above, but also as data on individual customers. Loan applications require both confirmed earnings information plus qualified financial history information. High quality financial information on an individual is valuable to other businesses that might be interested in selling products to the market segment to which that individual belongs. The marketing and legal departments realized that they could not claim ownership of these information assets because there would be opposition form other financial institutions that would need to be signed up for the system to be successful. But, they also opposed ownership by us, the developers and operators of the system.

Their opposition to ownership of this data by an information company such as IBM was not solely based on a desire to keep something that they felt was in part theirs. They certainly felt that they should gain monetarily from sale of this data if this occurred, but at the heart of the matter was the issue of trust. There was a tremendous amount of strategic information about a specific bank's marketing strategies contained in the aggregate of an FI's funding decisions. As a result, our partner could have been in an extremely vulnerable position if we were to own the information. Concerns about how the data would be used and who would have access to it were paramount in their minds. They felt that even if the data were to be sanitized, their competitors might be able to bring to bear market intelligence which would allow them to infer the identity of the lending institution.

4.4.1. Solution to New Assets Concerns

The critical component to the solution that assuaged the concerns of our FI partner was that we would not permanently store the information contained in the loan and lease applications, financing decisions or contracts. Instead, we would buffer the application and decision information temporarily as it came in (necessary to address issues in network connectivity) to convert to the appropriate protocol and format necessary to pass it on from the loan server (see Figure 2) to the FI's loan processing system. This solution had the additional technical advantage that we would not be inserting an additional single point of failure against which it would have been costly to protect the system.

Our solution, while addressing our partner's concerns, evades a host of interesting issues having to do with the potential uses of the newly created information. A variety of "benchmarking" types of questions can be addressed if one creates "super aggregates" of collected information. Thus for example, in our application domain, we could have aggregated information across a number of FIs rather than a single one. In this case, questions of revealing an individual FI's anonymity would not arise. Analysis of the resultant information would be useful for investigating important questions about system performance and operations [3, 19]. For example, an individual FI might want to compare their average time to provide a decision to the average overall

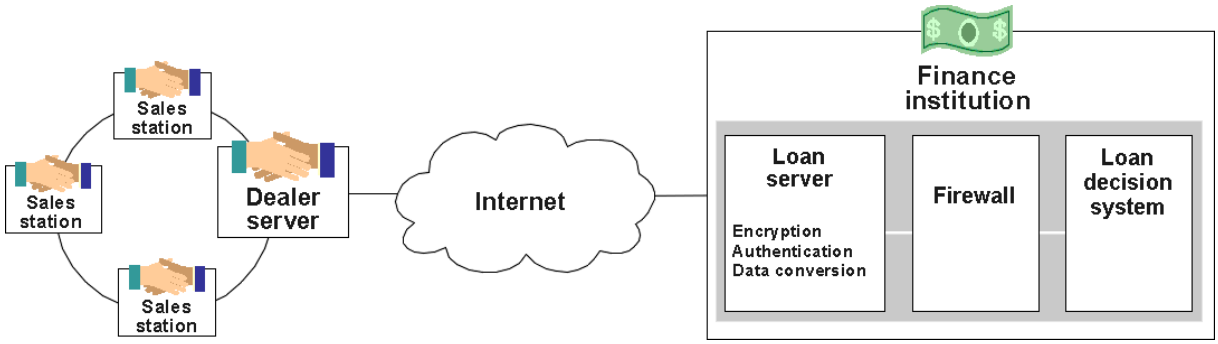

Figure 2. Detailed view of dealership and financial institution system architecture

participating FIs. The information would also be useful for investigating marketing questions having to do with customer preferences, buying practices, and demographics [17].

Means of regulating the collection and use of the information that transactions on the Internet make possible are currently being hotly debated. On the one hand, industry trade groups, many technologists interested in system performance, and marketing specialists often favor open access to such information. On the other hand, a host of public interest groups representing the interests of individuals are raising privacy issues [20]. A solution to these complex issues will likely depend on some combination of government legislation, self policing by businesses and adoption of privacy enhancing technologies by individuals [20].

5. Conclusion

The two year field test encompassed eighty dealerships and three FIs by its end. Functionality increased in response to the discovery of new requirements generated by a broadening user set. The system succeeded from both the perspective of the auto dealerships and the FIs. It enabled purchases to be consummated in a single day by enabling quick loan decisions (70% responded to within three minutes), electronic contracts and same day transfer of funds from the FI to the dealership. The electronic loan application process enabled the first FI that participated in this study to significantly surpass their goals for increasing the percentage of applications that could be evaluated automatically by their loan decision system.

The study demonstrates that the Internet is a resource that can be shaped. Clearly, it was not acceptable to either the dealerships or the FIs without additional technologies to safeguard resources and to insure that business transactions could be completed. As the Internet evolves, new technologies and standards are being developed that make the process of shaping the Internet to conform to business and consumer needs both more efficient and more effective.

Its is a cliché to say that the Internet creates many opportunities for both consumers and businesses. Our experience with multiple FIs pointed out the need for business processes and line of business transaction systems to be aligned with the Internet in order to enable the Internet resource to be exploited. The first FI we worked with was able to do this and consequently was able to embrace both the challenges and opportunities of this new market channel. Subsequent FIs who joined the project were less well prepared and consequently were either unable to take full advantage of the system (e.g., relying on faxed versions of computer created applications) or even threatened by it.

Finally, the Internet is establishing new ways of doing business. The relationships between business and consumer are still in flux because they pose significant challenges to both sides. It is clear that those who are willing and able to adapt will be the survivors.

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Acknowledgments

We gratefully acknowledge helpful comments on this manuscript from Stephen Boies, David Epstein, Susan Spraragen and three anonymous reviewers. The project on which this paper is based was a significant effort of many people, including Jeffrey Baker, Joanna Batstone, William Bennett, Christine Halverson, Stephen Levy, Douglas Lovell, Neil Lustig, Paul Matchen, Rich Thompson, Mike Ryan, and Tom Young. We also gratefully acknowledge Susan Mary Smith's research assistance.