

Who do you trust? Beyond encryption, secure e-business

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Abstract

Electronic commerce has added a new complex issue to international trade. It is based upon the assumption that buyers and sellers conduct business with very little information about each other. This paper is on the importance and development of trust in electronic commerce. The importance of these assets in commercial relations is discussed. The paper describes how reputation is protected as a legal asset and how laws or legal principles support trust relationships in trade. Finally, the importance of developing legal guidelines for trust and reputation as a counterbalance to the lack of morality on the Internet is discussed. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Electronic commerce; Law; Trust; Reputation

1. Introduction

In every business transaction, there is an element of chance. No matter how carefully the documents are drawn up, how thorough the background checks of the parties have been or how effective the legal systems in which the transaction are embedded the transaction is always a risk. The decision to transact despite the risk depends upon the potential profit of the transaction. At some point in the negotiating process, the businessman must decide whether or not to trust his counterpart and commit to the deal.

The law is an instrument used by government to secure and promote the economic base of a society. In the market economy one of the main areas of interest for government has been to promote the incentives for businessmen to enter into transactions with each other. This ideology is based upon the

traditional economic view stemming from Smith [15], who pointed out that if everyone acted in their own best interests the end result would be most beneficial to society as a whole. “Give me that which I want, and you shall have this which you want, is the meaning of every such offer; and it is in this manner that we obtain from one another the far greater part of those good offices which we stand in need of. It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest.”

The idea is that the individual goals of each businessman will collectively promote the wealth of the nation as a whole. The regulation of transactions is not through law but through the market mechanisms of trust and reputation. The trading parties whose actions do not support their original promises will develop an untrustworthy reputation and they will no longer be able to continue. With the advent of Internet-based electronic commerce the basic market rules named above still apply but the size and anonymity of the Internet make it more difficult for

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the businessman entering into a transaction to judge the trustworthiness of his counterpart.

The purpose of law, in this area, is therefore to strive to protect the ability of the parties to safely transact. Ensuring that the parties feel safe enough to take the business risks does this. To achieve this the law has struggled to create a level playing field. This paper is concerned with the development of secure electronic commerce. This is a goal that researchers and practitioners in the fields of law and technology have set as goals and yet neither is able to achieve a comprehensive and workable solution. Since there is no current international legal standard of Internet commerce, this paper does not argue the law of any particular nation yet draws examples from specific jurisdictions to clarify the author's point of view. This paper proposes a more individual approach to online security that is designed and managed by those who need it the most—the traders.

2. Information, reputation and trust

One of the main assumptions in the market economy is that all the parties involved in transactions have all the information they require. In fact, the assumption is that buyers and sellers in the marketplace are perfectly informed. This would imply that they know everything they need to know about the quality of the merchandise and the reputation of their counterpart. This assumption can easily be attacked since it presents a simplistic view of the marketplace. To be able to have all relevant information about the product (and all other products) and to know the character and reputation of the contracting party, both the market and the players on it must be well defined and well known to the players. Obtaining the knowledge referred to above is often connected to cost. This is because we assume that the information required can be found if only we are prepared to invest enough time or money to find it.

A simple example is determining the quality of the product. If the product is high quality, this will be reflected in the price of the product. Therefore, in the task of determining the quality of a product, the price plays an important role and is not costly to obtain for the buyer. While most common transactions follow this model, very many transactions in-

volve information that is wholly, or in part, difficult or impossible to obtain.

In his seminal article “The Market for Lemons”, Akerlof [1] looks at a more complex marketplace that takes into account the fact that buyers and seller cannot afford or are otherwise unable to evaluate the cost of information. He takes his examples from the notoriously complex world of used cars. From his example, we see that the seller knows what the buyer cannot—the true quality and value of the cars. In this scenario, the buyer must guess the value of the product, given enough time and opportunity, the buyer will eventually be able to evaluate the value of the car to a reasonably accurate degree. Unfortunately, time and opportunity are rarely available in an adequate supply in most transactions. This situation leads to the problem that many transactions take place at a great risk.

As long as people have traded with one another, the question of risk has always been there. The risk lay in the uncertainty of whether or not the contracting party will fulfill his obligations according to the terms of the contract. Despite the risks involved, trading has been both a vital and profitable activity. The risks involved have been limited by the introduction of certain mechanisms that can be described as social, legal or technical.

The social mechanism can best be described as the importance of trust and reputation. Trust and distrust are seen as being rational mechanisms in society [7]. This is supported by the fact that the actors, in social science, are often seen as being rational decision-makers and the use of rational choice in trust are based upon two elements. These are (1) incentives of the trusted to behave in a trustworthy manner, and (2) knowledge to allow the trusting party to make the decision either to trust or distrust his counterpart [12].

The rational actor trusts if s/he is granted adequate reason to believe that it will be in the counterpart's interest to behave in an expected manner. This behavior one may expect is dependent upon the time and situation at hand [12]. This is a negative view of trust in the sense that the person trusting trusts other people not to carry out certain action or to fulfill certain actions according to their own interests. This in turn includes the trusting person's judgment of the other person's interests. Some researchers are not

concerned with this negative view of the actors interests to be trustworthy but do include an expectation that the trusted will carry out certain tasks. Thus, expectation of action plays an important role in trust [4,8].

The trusting actor has reason to believe the expectations to be true. This belief is commonly supported by past experience and future incentives [3]. For Coleman [6], the incentives of the trusted are implicit. He claims that the trust relationship is a reciprocal one. It is mutually reinforcing for each truster. This is because each part in the relationship had an additional incentive to be trustworthy.

Luhmann [12], on the other hand, writes, “It must not be that the trusted will toe the line on her own account, in the light of her interests”. This is otherwise contrary to his opinion that the two parties in a trust relationship behave in a trust relationship due to the fact that the parties are probably going to meet again. One limitation to the definition of trust is that it is commonly seen as a three-part relationship (for example, see Refs. [3,12]). This is in the sense that A trusts B to do X. While A may trust B to do X, A might not trust B to do Y and so on. The phrase “I trust you” implicitly includes the phrase “to do X”.

There are certain points on which most writers agree. One is the fact that trust involves the transfer of power to another. Placing oneself in a position, which involves a certain amount of risk at the discretionary power of another. This position is inevitable or as Hume writes, “Tis impossible to separate the chance of good from the risk of ill”. Another point upon which there is a wide consensus is that trust is potentially the more productive option. So while distrust leads to more lost opportunity and costly safeguards designed to ensure fulfillment, trust leads to mutually beneficial interactions and cheaper transactions.

Coleman [6] writes that misplaced trust entails large losses, while forgone trust entails only a comparatively small loss. At the same time, forgone trust can entail enormous losses if it blocks a longer relationship. Long-term distrust produces an aggregate of lost opportunities, each one regular and predictable. Trust leads to an aggregate of some losses plus some real gains. In the aggregate, the gains may far outweigh the losses, so that the gains from trust far outweigh the savings from distrust.

Another mechanism for risk minimization is law. The law, in this case, serves two purposes: Firstly, thanks to its ability to carry out the threatened effect, it acts as a deterrent to for those who would violate the contract. And, secondly, the law has the ability to obtain compensation for the party who has suffered losses at the hands of an unfaithful contracting party. This compensation aims to place the damaged party in a position equal to his status prior to the contract. This compensatory effect is an inducement for the nervous party to take a business risk. At the same time, the law, in commerce, must be seen as a last resort if all else fails. The law commonly provides a reflection of the social rules of the place and time. The social rules and the law create, through their interaction, a dynamic yet stable environment in which trade can be conducted at a minimum of risk. Ultimately, the laws can be used to coerce the delinquent to fulfill his obligations. Unfortunately, in the long run, the law is an aggressive, expensive and non-productive alternative. Voluntary fulfillment of obligations is more efficient and cost-efficient in the long run development of trading relationships.

The third mechanism is technology. Increasing the stability of trade through better technology has been a common process in history. The greatest advance in secure commerce was the introduction of money, which quickly replaced barter as a cost efficient, low risk alternative. In trade offline, technology has been an important facilitator for trade. Secure credit card transactions, safe banks and stable currencies have all aided the development of trade. The best example of this mechanism can be seen in the action of international trade were particularly important merchandise is bought and sold in USD despite the fact that the business transaction has no connection with America. This is an example of the importance of the trust placed in a secure currency.

3. Trading in the age of internet

The problems facing online traders are similar to the problems offline. The advent of the online shop has removed the concept of the local market. The Internet has overcome the hindrance set by time and geography and has made it possible for a shop to have customers from the whole world requiring ser-

vice at any time of the day. The law has a built in feature and this is the fact that, as a system, it is only as strong as an authority's ability to enforce it. Enforcing law is limited today to the power of nation states and their ability to reach international agreements. The Internet effectively circumvents the ability of the nation state to enforce law. This makes law a toothless system.

The difficulty involved in attempting to assess the business risk the trader undertakes with each transaction is to be conscious of the fact that the contracting parties no longer share common moral values. These values are often associated with common physical boundaries such as geography, faith or politics. There are also large discrepancies with the content of the laws in different countries and the expense involved in litigating in foreign environments. These difficulties are of such a magnitude that the use of law in international situations becomes non-efficient.

Much of the effort, which has previously been involved in the creation of secure electronic commerce, has been the development of technological mechanisms for secure payment and identification. Unfortunately, while this work has indeed improved online security, it does not adequately increase the faith in electronic commerce.

The paradox can best be illustrated with the example of digital signatures where the technology has been improved to such a level that, from the technical point of view, a digital signature is probably more secure than a hand written signature. This is a great advance the problem still remains that the use of a digital signature does not guarantee that the message comes from the person signing it. This can be due to the fact that the institute issuing the signature has inadequate administrative routines, someone is using another's computer and signature or a hacker has broken into the system and misappropriated the signature.

There have been reports, which claim that electronic commerce is safer than offline trade [13,16] under Swedish law, credit card purchases over the net take place at the sellers risk and therefore are safe for consumers. Despite these facts, there is little trust among consumers for online trade. Attempts to overcome this major hurdle for electronic commerce have thus far been concentrated upon the development of technically secure mechanisms such as en-

ryption, digital signatures and secure socket layers. More recently, legislators have begun to work on altering present laws (and drafting new ones) to resolve the insecurity of the Internet.

4. The technology approach

The discussion and practice of security in the information and communication technology (ICT) has traditionally focused on the ability to improve security by attempting secure identification. The dissemination and use of sophisticated encryption technology has been pushed by a demand of online security. Until only recently, the United States forbade the export of 128-bit encryption technology, this theoretically meant that the computers in the rest of the world were only protected by 56-bit encryption. In practice, the technology was available. In the debate whether or not to allow the general public to use 128-bit encryption, a simple fact was often overlooked. There is no such thing as totally secure encryption. And while 128-bit is an improvement on 56-bit, the question should be compared to what? Stronger encryption does make information safer but it still cannot create a secure trading environment since the question remains: who is behind the keyboard?

The author is not against secure technology and encryption is important but to create secure trade environments, more interesting applications can be used. The following is an example of such an application.

Most people who use the Internet today are aware of the MP3¹ compression standard for audio. This compression method quickly became the de facto Internet audio standard and quickly became a serious threat to the balance of power in the music industry. The music industry² has worked hard to maintain control of its main source of income, the physical delivery of music.

¹ Short for Motion Picture Group-1/Level 3. The technology enables audio files to be compressed by up to 10 times.

² The Recording Industry Association of America (RIAA) has been particularly active; suing companies like Diamond Multimedia and Napster.

In the early days of MP3, files were simply placed on servers and were freely downloadable. The people involved in these activities have received “cease and desist” notices and been threatened with serious lawsuits if the files were not removed. The exchange of MP3 files became a risky pastime. The popularity of the MP3 format can be seen by the fact that in its heyday the term *MP3* was more popular than *sex* on search engines. The risks involved persuaded ISP’s to prevent their users from storing MP3’s openly on servers. This did not affect the demand for MP3 files.

This scenario is interesting since it led to two developments. The first is the trust-based transfer of MP3 files. The files were transferred between friends or recommended parties rather than being left openly accessible on the web. This is an example of community-based trust. This is a traditional method of ensuring trust. Such diverse groups as organized criminals; family businesses and early banking activities have successfully used the pattern. The advantage of this system is that everyone in the network can be trusted. This trust originates from the fact that they are either friends, friends of friends or share a common ideology. The side effect of this system is that the participants are a relatively closed group. Finding new partners is a more complex procedure. The disadvantage of the trusting relationship is the fact that the development of trust is complex and costly but once established, the system is cheap to maintain.

The second development is probably more interesting for those seeking larger groups to interact safely with. The Napster was launched in the end of 1999 and is an integrated browser and communications system provided by Napster, it enables music fans to find MP3 files. The files are not stored on Napster’s servers. The program is based upon a dedicated client–server environment that can be used to transfer MP3 files. Napster had created a parallel network dedicated to MP3 transfer. The program is downloaded from <http://www.napster.com>, upon initiation, the program searches the computer for MP3 files and makes them available to others. The user then has access to existing MP3 files stored on computers all over the Internet. The system is searchable through the Napster software but not through the traditional servers. The system does not

use identification devices but the users use untraceable aliases.

The American Digital Millennium Copyright Act (1998) contains an exception for *safe harbors*, this exception, simply put, means that the service providers only have a limited reactive responsibility. They only have a responsibility to remove material if they have been requested to.³ While the Napster, through its separate net, has effectively excluded the possibility of technical control through the use of search agents.

The technology used in the Napster can easily be adapted to be used in any environment where the transfer of goods or services in a secure environment is required for the creation of trust. The ability to use this technology coupled with a recommendation system would entail the development of trust in an affordable manner.

5. Trust and reputation alternatives

One approach to building a secure environment for electronic commerce can be devised by developing a system based upon interpersonal relationships rather than technology. The question becomes one of devising social control from within each player rather than attempting to control them externally. While conducting experiments such as the prisoner’s dilemma, game economists have shown that cooperation is the most profitable alternative for all parties involved. Unfortunately, cooperation is not the best alternative for the individual player (in certain cases, cheating the other player has the best effect for the individual). This is true if the game is played only once. Everything changes if the game is played repeatedly—especially if the game has an indefinite number of rounds.

Axelrod [2] proved that in a situation where an infinite number of rounds were played, the best result was achieved by using a strategy of “tit-for-tat”. This strategy involves mirroring the actions of the contracting party. In the prisoners dilemma game, this involved doing exactly what the opponent had

³ Another question is whether this is applicable to Napster since none of the music is on their servers.

done in the previous round. In such a way, cooperation is rewarded and uncooperative acts are punished, quickly and efficiently. This will lead to a situation where both parties realize that it is in their interests not to behave in a manner that is negative to both of them. While the idea of infinity is possible in the abstract, it is not particularly realistic in real life. At the same time, one can successfully argue that infinity is merely the inability to work out when the last round will occur. If we use this interpretation, we can see that people who regularly conduct business with each other will eventually (if not immediately) learn to behave in a manner that is beneficial to both of them rather than attempt to cheat their contracting part for short-term gains.

For anyone attempting online commerce, there is one central issue that must be assessed—risk. Risk is a personal appraisal of eventual negative future outcomes. As we have seen above, the efforts of legislators and technicians have not been able to remove the risk or the feeling that online commerce is fundamentally unsafe. The question of whether online commerce is safe or safe enough is fairly irrelevant since the common perception is that it is very often not worth the risk. This results in the lack of trade or a great deal of time and effort being used to obtain additional securities that may outweigh the perceived risks.

Since it is the will of corporations, governments and individuals to improve the perception of safety in relation to online trade, and despite the earlier efforts online trade is still perceived as unsafe, then a new course of action must be taken and since law and technology have proven inadequate a more social methodology should be used.

The proposed process is not completely foreign and consists of two separate stages. These stages have a common denominator in that they both involve the evolution of a more relationship-based approach to electronic commerce. Such approaches have been suggested previously (see, for example, Refs. [5,9,14]) and are commonly referred to as virtual communities. Canter and Siegel [5] decontextualized the virtual community and poked holes in the myth of the Internet as a community. On certain levels, they are correct since the Internet has grown beyond the ability to be defined as one uniform community. Rayport and Sviokla [14] were con-

cerned with the virtual community's ability to communicate with its members and saw it as an important marketing tool. In Hagel and Armstrong [9], the virtual community is all about building a collection of contact points to individuals. They define this address book as a community that can be capitalized, for their definition value of a community is determined by its size rather than its commonly shared values.

These approaches to the virtual community all have points of interests but they often fall short in explaining the true value of the community. The virtual community has been plagued by many definitions, the concept has almost as many definitions as its people who write about it. Despite this, the most popular component when attempting to define the virtual community is the fact that the members share common values or interests.

It is this dimension of common cause that can be of great interest to the online businessman attempting to minimize risks. Since the law is not a practical alternative, the trader must attempt to secure contract fulfillment without having to resort to the law. The trader must attempt to develop a sense of social morals and relationship with his contractual partner. The level of relationship between the buyer and seller increases the will of the parties to fulfill. Since the level of anonymity is inversely proportional to the desire to fulfill ones contractual obligations, the trader must attempt decrease the feeling of anonymity the customers feel.

The legal discussion on the rise of law on the Internet has spawned several more or less viable ideas (see, for example, Refs. [10,11]). These can be divided into two main groups: Those who advocate tighter government legislation and those who see that the Internet will create its own rules from the bottom up. The latter view includes the insight that Internet law will not (and cannot) be uniform but will grow from the different communities into a patchwork of specific laws from specific online communities.

At the same time, the whole concept of the Internet is one based upon the impossibility of control. It grew as a way of ensuring that the American defenses would not be able to be crippled with a single blow. This design has the effect of making any attempts of regulation seems a task comparable to Sisyphus'. The virtual community, however, offers

an interesting advantage to anyone who realizes how to harness their advantage.

The virtual community can create intimacy and social relationship between contracting parties who have never met. The nature of information and communication technology (ICT) has the advantage of being able to sustain relations while being less adequate in creating new relations or serendipitous meetings. The virtual community offers a possibility to create common social ground between traders in much the same way as guilds, religion and clans have done throughout history.

There are examples where the existence of a common goal between users has led to the development of an efficient trust environment where the members are able to transact freely and openly with little fear of repudiation or fraud. One such example is the organization around the development of the Linux operating system. While most software is created under the control of a corporate entity and released only when the system can be protected as an asset under the law, several programmers spread out over the world have developed the Linux operating system. They do not belong to the same legal organization and the result of their labor is freely given away. Their only common interest is to develop a better operating system. Within this group one often finds an ideological belief in the software development system known as *open source* and *copyleft*.⁴ Open source means that the program source code is made freely available, anyone who is interested can adapt the software to suit his own needs. There is only one rule in the copyleft movement and that is that the programmer must keep the source code openly available so that the development can continue. In this loose group of people, sharing a common goal the transfer of value in the form of labor, software and services is common. The ideology is so strong that the contracting parties very rarely consider the concept of fraud. But this group is not a simple-minded benevolent group. They have at their disposal a very powerful tool for maintaining social control. The ability to participate in larger online

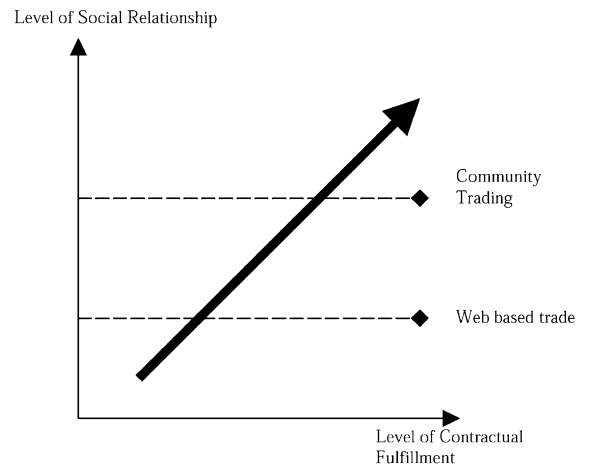


Fig. 1. Contract fulfillment expressed as social relation.

discussion groups and specialized web pages where interesting ideas can be discussed also acts as public forums for the transfer of information about others. Any member of the community who misbehaves will quickly find him or herself discussed openly in such a forum. If the behavior is serious enough, the member will simply lose all credibility and will eventually become unable to interact socially with the rest of the group (Fig. 1).

6. The reputation market

While the idea of virtual communities have proven to be successful, they are also difficult to implement in very large groups or in consumer sales. Setting up a relationship base between the buyer and seller, and sustaining it by regular personalized communication reduce anonymity and lack of morality. It is in this area the virtual community can be used to its best advantage. The greater the level of personalization and perception of personal contact, the more effective any such attempts will be. While large Internet-based companies cannot maintain personal communications with each individual customer, they can, with the aid of ICT, maintain an illusion of personal service and closeness. This can be done by the implementation of relatively simple mechanisms, such as allowing customers to communicate in their natural language, personalizing impersonal e-mails by signing with a name rather than a title, etc.

⁴ The best information about open source and copyleft is found online. See, for example, www.gnu.org, www.opensource.com and www.slashdot.org.

One good example of community building by a large Internet-based company is the communications form affected by Amazon.com, which started in 1995 and today have sold to 13 million people in more than 160 countries. The very size of this bookstore denies the hope of creating a common set of interests, let alone values, and yet the company communicates to its customers via e-mail signed by individuals. These e-mails are obviously machine-generated but they do create the illusion of a relationship, which in turn reduces the feeling of anonymity and improves contract fulfillment.

A more innovative solution is designed to enhance the possibility of a reputation market. The online auction firm eBay describes itself as "...the world's first, biggest and best person-to-person online trading community... Whatever you need, odds are you'll find it at eBay: there are over 2000 categories and more than 2.5 million auctions a day."⁵ In this marketplace, it is impossible to have perfect information about the contracting party or the merchandise. This would entail that the risks involved are very high compared to the potential returns. In an attempt to create a more trusting environment where the users feel secure in trading with anonymous parties, the firm has begun a reputation market.

The first step in the market is that all parties must be registered. The second stage is that all the users can send feedback on the parties with which they have transacted. This feedback is then used to create a rating system for each party. For each positive feedback, the user receives 1 point; for each negative feedback, 1 point is removed. This means that the prospective transactor is able to gauge the trustworthiness of his contracting part. Even if the total feedback is positive, the prospective contracting partner can check for any negative comments and therefore ascertain to some degree the nature of his trading partner.

There is also a punishment system. As in the real world, government is the license to use force. The user who receives too much negative feedback will eventually be excluded. This punishment is reminis-

cent of the old punishment banishment from a society. This is less effective in such a large open market such as this since it is almost impossible to prevent the user from returning with a new identity. This punishment is, however, extremely powerful if it can be combined with secure identification.

7. Conclusion

The advantages of electronic commerce to business are readily apparent and the concept of the prime mover advantage is well known. This means that companies must move their business onto open networks at an early stage to secure competitive advantage. This action does not come without risk and many businesses are looking at methods for reducing the necessary risks.

Businessmen cannot wait until online commerce becomes a trusted method of shopping prior to entering online trade. This means that they must be prepared to accept greater risks than necessary. Governments have realized the importance of supporting online trade and are actively developing regulations to reduce risks and promote secure trade. Unfortunately, both businessmen and legislators have been caught up in a fruitless discussion on the need for more secure online trade through technical standards and harmonization of law. This paper attempts to show that alternatives must be discussed and supported if trade online is to become secure.

An alternative, which must be investigated, is the increasing of trust and reputation by involving the customers through participatory virtual communities. The building of an environment in which the traders feel a personal relationship to each other or sharing some common values can become an essential component in reducing the consumer fears. The importance of common beliefs for trust can be seen in the development of the open source movement described above. The important factor is that it is possible to create trust through design and technology. Using common languages, personal touches and actual design to create a more trustworthy environment is an important success factor in electronic commerce today. The development of virtual communities around products, companies or trading parties works in the same way as medieval trade guilds.

⁵ www.ebay.com.

The Internet has taught us that enforcing obligations through law can be inefficient since enforcement costs may far exceed the profits. Also, any government, or organization, serious about electronic commerce would do well to see beyond the simplistic image of technology as encryption or security and attempt to develop technology usage as a support for interpersonal relations since it is in interpersonal relations where efficient contract enforcement can be achieved since those participating will feel that it is in their best interest to participate and to fulfill their obligations voluntarily.

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