

1stCONTECSI International Conference on Information Systems and Technology Management
21-23 June, 2004 USP/São Paulo/SP- Brazil

The Politics of Information Technology: Governance Structure in Clearing and Settlement Systems

Enock Godoy de Souza

MSc in Analysis, Design and Management of Information Systems, The London School of
Economics and Political Science

Rua Dona Antônia de Queirós, 462, ap 174, São Paulo, SP, Brazil

Tel: +55 (11) 3259 0119, +55 (11) 8195 3876

enock.godoy@acm.org, enock.de_souza-alumni@lse.ac.uk

Susan V Scott, PhD

Academic Director of the Moving Markets Research Project and Lecturer in Information
Systems at The London School of Economics and Political Science, Department of
Information Systems.

Houghton Street, London, WC2A 2AE, United Kingdom

Tel: +44 (0) 20 7955 6185

s.v.scott@lse.ac.uk

Abstract

The research presented in this paper investigates the characteristics of a particular clearinghouse/depository that operates in a horizontally-oriented governance structure in relation to its stock exchange partner. The choice of a particular governance structure for the relation between clearinghouse organisations and their exchange partners is a very contemporary theme as many countries around the world are reorganising their financial markets and Information Technology plays a major role in this reformulation by enabling the development of new organisational forms and supplying the infrastructure for these financial markets.

Keywords: Clearing and Settlement Systems, Governance Structure, Transaction Costs Theory, Clearinghouse Automation.

1. Introduction

Imagine how the settlement of securities transactions in the XIX century was conducted. If two businessmen wanted to settle a transaction involving shares, they would probably do it without any intermediary in a *direct settlement*. Direct settlement is a bilateral agreement between the parties and it is regarded as the oldest clearing arrangement (Moser 1999). However, it leaves the counterparties exposed; if one of the parties cannot pay its debts and then the other party incurs a loss of money, shares, or opportunity of trading.

Nowadays, the way transactions are settled in stock exchanges follows a much more advanced path, in which Information and Communication Technologies (ICT) play a major role (Lee 1998, Michie 1997). Modern stock exchanges use sophisticated information systems (IS) to provide an electronic market in stocks and shares, replacing the old paper-based trading, and leading to major changes in the market structure and the roles and activities of those involved (Smithson 1994).

In recent times, following the guidelines of the Bank for International Settlements (BIS) to reduce risks in the financial sector, Central Banks in developed and emerging countries have implemented new payment systems to improve their control over the transactions.

Each clearinghouse has emerged in a distinctive context that has shaped its structural arrangements and this has led to a debate about the way future links between stock exchanges, central depositories and clearinghouses should be organized. In the European Union (EU), this discussion has become particularly important to economic development of the Euro zone as stakeholders negotiate a potential consolidation of the clearing and settlement industry.

This article presents the main conclusions of a case study conducted at the Brazilian Clearing and Depository Corporation (CBLC - Companhia Brasileira de Liquidação e Custódia) in 2003. CBLC is the clearinghouse and central securities depository (CSD) responsible for clearing and settling the transactions at the São Paulo Stock Exchange (Bovespa). Bovespa is the biggest stock exchange in Latin America and its operations include equities and corporate bonds. CBLC is one of the nine clearinghouses that operate in the Brazilian Financial Market and its case is particularly interesting because it was originally part of Bovespa, in a vertical arrangement and only later evolved to a horizontal structure.

Another point of interest is related to the late developments at CBLC (around 2002), which happened concurrently and in compliance with the reformulation of the Brazilian Payment System (SPB) by the Brazilian Central Bank, which demanded to all financial institutions in this market to adjust.

1.1 Aims and Objectives

The research presented in this article aims to investigate the characteristics of CBLC and the horizontal governance structure that characterises its relationship with its stock exchange partner, Bovespa. The choice of a particular governance structure is influenced by social, economic, and technological factors, in a complex interplay (Avgerou 2002). Different stakeholders influence the shape of the financial securities transaction process: investors, investment management organisations, brokers, exchanges, custodians, and regulatory organisations (Toppen, *et al.* 1998). Consequently, technology is only one of the factors that influence the design of the governance structure.

The objective of this article is to illustrate the main issues related to the adoption of a horizontal governance structure between CBLC and Bovespa as well as to examine the main efficiency gains obtained and the extent to which they may be related to this particular governance structure. Hence, the research questions proposed are:

1. What are the factors that contributed for the emergence of a horizontal governance structure between Bovespa and CBLC?
2. What are the main efficiency gains achieved at CBLC and their relation with the horizontal governance structure?
3. What is the role of Information Technology in these efficiency gains?

1.2 The Relevance of this Research

Nowadays, many countries are still restructuring their Payment Systems and leading their stock exchanges, CSDs and clearinghouses to adapt to this new environment. Consequently, case studies illustrating these kinds of economic and social developments can be very helpful in order to give insights to those governments and exchanges interested in reorganising the way their financial markets operate.

Particularly in Europe, there is a debate concerning the appropriateness of the different governance structures as well as a debate regarding the consolidation of CCPs (See Culp 2002, The Giovannini Group 2001, 2003, Lanoo and Levin 2001). The importance of the proposed research to the field of information systems can be extrapolated to the broad

area of payments systems in general (Allen, *et al.* 1999, De Souza 2001, Schmiedel, *et al.* 2002). Although it is not recommended to generalise the expected results, the experience developed in the financial sector can be useful to academics and practitioners interested in investigating or developing clearing and settlement systems to support other physical or electronic markets (See Bakos 1991, 1998, Wigand 1996, 1997).

The CBLC experience provides empirical evidence to inform these discussions and stimulate further research about governance structures and new organisational forms (See Jones, *et al.* 1997, Smithson 1994), as well as to the literature about the IS infrastructure (See Ciborra 2000).

Finally, this paper is a case study about the reconfiguration of a clearinghouse in an emerging country. As most of the literature about IS in financial markets is focused on developed economies, this research helps to cover a gap in the literature and it is also relevant for academics studying the impacts of globalisation and IT in Developing Countries (See Avgerou 1998, Walsham 2001).

2. Methodology

In order to investigate the characteristics of the horizontal governance structure in clearing and settlement systems, we have conducted a single case study at CBLC. Yin (1984) and Benbasat, *et al.* (1987) state that a single case study is appropriate if it was previously inaccessible to scientific investigation, or it is extreme or unique. As shown in this paper, the changing governance structure between CBLC and Bovespa is a revelatory case (previously inaccessible) and distinctive.

Clearinghouses operate as intermediaries supporting the functioning of financial markets, thus we organize our discussion around themes associated with Transaction Cost Theory. This theory is appropriate because it provides us with concepts to support our analysis of market features such as uncertainty, information asymmetry, asset specificity, trust and opportunistic behaviour (Ciborra 1993, Malone, *et al.* 1987, Ouchi 1980, Picot, *et al.* 1997). Mishkin and Strahan (1999) classify the transaction costs as one of the two primary forces that mould the financial sector. The other primary force is asymmetric information (Mishkin and Strahan 1999), which is also covered by the Transaction Cost Theory (Ciborra 1993).

This choice of the Transaction Cost Approach implies the acceptance of its underlying assumptions. The Transaction Cost Approach views companies as seeking profit maximisation. It also assumes the existence of opportunism as endemic to human nature (Ghoshal and Moran 1996). Although the Transaction Cost Approach acknowledges bounded rationality (Ciborra 1993, Ouchi 1980, Williamson 1975), as a Positivist theory, it assumes that human action is intentional and, at least, boundedly rational (Orlikowski and Baroudi 1991). As a consequence, Transaction Cost Approaches have a tendency to de-emphasise social and subjective issues. In contrast, our intention is to use concepts from Transaction Cost Theory to help us identify issues that we then relate to their context using a case study approach. In so doing we extend the insights provided by the analytical categories derived from a Transaction Cost Approach by situating them in the broader debates about financial globalization and the social construction of financial institutions. The costs in the clearing and settlement industry are particularly difficult to assess. Problems related to the different types of securities traded, the scope of supplied services, the fact that some clearinghouses are part of greater companies, and the different accounting standards (Lanoo and Levin 2001) make comparative quantitative approaches complex. Consequently, considering the characteristics of the data, qualitative case study research emerged as the most sensible and suitable alternative.

The chosen way of conducting this research is through analysis of documents publicly available at the CBLC site together with semi-structured interviews to be carried out with different directors of the company. The interviews lasted for 30 minutes to 1 hour and the directors interviewed were responsible for the areas of Operations, Risk and Control, and Information Technology.

Owing to the confidentiality agreement signed with CBLC, only aggregate data is presented and all empirical evidences are addressed as anonymous CBLC. All interviews were performed at Bovespa/CBLC Building, São Paulo, Brazil. Table 1 shows the job titles of the interviewees as well as the dates of the interviews:

Job Title at CBLC	Job Title at Bovespa Serviços Plc	Date
Director of Operations	–	08/07/2003
Director of Control	–	10/07/2003
–	Director of Information Technology	10/07/2003

Table 1: Summary of the Interviews

The Information Technology Director is a Bovespa Serviços e Participações Plc employee. Bovespa Bovespa Serviços e Participações Plc is a wholly owned subsidiary of

Bovespa and its main function is to support CBLC and Bovespa. The IT function of CBLC and Bovespa are fully outsourced to Bovespa Serviços.

Finally, the Transaction Cost Theory is used in a qualitative analysis of the data gathered in CBLC. The governance structure choices in the relationship between CBLC and Bovespa are expected to have impacts on the issues dealt by the Transaction Cost Theory. For example, did the chosen governance structure reduce transaction costs for all the financial institutions (such as CBLC and Bovespa) and market participants concerned?

As the focus of this research is in the settlement phase, which is the last phase of the transaction (Picot, *et al.* 1997), the literature review does not focus on papers like Bakos (1991, 1998) that are more centred in the other phases described by Picot, *et al.* (1997): information phase, order-routing phase, and execution phase.

3. Literature Review

The Information Systems literature assumes that Computerised Information Systems (CIS) are an important theme that influences the shape of markets and financial markets. CIS are believed to influence the adoption of a particular organisational form through the reduction of transaction costs (Ciborra 1993, Malone, *et al.* 1987). As Michie (1997) states, both information and ICT play a major role in the stock exchanges. Advances in IT are associated with major changes in market structure (Smithson 1994).

The literature reviewed for this paper covers two major areas, which are considered relevant to this research: (i) Transaction Costs Theory and (ii) Clearing, Payment, and Settlement Systems.

3.1 Transaction Costs Theory

The Transaction Cost Theory is associated with new institutional economics and originates with the ideas of Coase (1937) and Williamson (1975), which analyse why organisations are structured as markets, hierarchies, or clans. The new institutional economics states that alternative forms of economic organisations, such as markets, hierarchies, and teams, are a matter of transaction costs (Ciborra 1993, Williamson 1975, 1981, 1985).

Malone, *et al.* (1987) and Ciborra (1993) argue that the use of CIS could reduce the transaction costs and hence influence the adoption of a particular organisational form. According to Mishkin and Strahan (1999), the reduction of transactions costs owing to the advances in IT is a paramount factor in transforming the financial sector. On the other hand, Cordella (2001) argues that some coordination costs are added because of the actual

investment in Technology, what could prevent the actual gains expected from the reduction of transaction costs.

In this article, the following aspects are considered to be relevant: uncertainty, small numbers, trust, information asymmetry, and opportunistic behaviour. For a deeper explanation about these concepts see Ouchi (1980), Williamson (1985), Malone, *et al.* (1987), Ciborra (1993) and Picot, *et al.* (1997).

3.1.1 Effects of Information Technology on the Transactions

Malone, *et al.* (1987), Ciborra (1993), and Wigand (1997) cite three main effects of Information Technology, which could improve and expand the functioning of markets through a better information processing:

- Electronic communication effect: Technology allows more information to be communicated in the same amount of time, at a much lower costs (Ciborra 1993).
- Electronic brokerage effect: Technology allows many potential buyers and sellers of a given good to be match in intelligent way (Ciborra 1993).
- Electronic integration effect: Technology allows more tightly value-adding stages of production and distribution across different organizations (Ciborra 1993).

Wigand (1996, 1997) added a fourth characteristic:

- Electronic Strategic Networking Effect: Information Technology and networks enable the design and deliberate strategic deployment of linkages and networks among cooperating firms intended to achieve joint, strategic goals to gain competitive advantage (Wigand 1996, 1997).

3.2 Clearing and Settlement Systems

There are many issues influencing the implementation of the clearing and settlement systems (CSS) and the debate about the most appropriate governance structure for this industry. The evolution of Financial Market is entangled with advances in ICT (Michie 1997, Smithson 1994). Other political forces influencing the restructuring of national and international payment systems are the Basle Accord and the BIS. The aim of this reorganisation is to decrease the risks associated with payments and settlements: *credit risk*, *liquidity risk*, and *systemic risk* (for a deep explanation about these risks, see (BIS 1997)).

This literature review is focused on the papers that deal with the structure of financial markets, risk, clearinghouse automation, and clearing and settlement systems. The paper of Pirrong (2001) deals with important issues, like the difference between investor-owned and

intermediary-owned organisations. Domowitz (2002) discusses the nature of intermediation in electronic financial markets, including exchanges, brokers and dealers. Schmiedel, *et al.* (2002) examine the economies of scale owing to consolidation or, alternatively, collaboration between firms. These papers are particularly relevant to the topic of consolidation of CCPs and the debate about whether CCPs are natural monopolies.

The report from BIS (2001) about electronic trading in financial markets is also highly relevant as most of the reorganisations in financial markets are triggered by their recommendations. One of the topics emphasised is *straight through processing* (STP), which is the link in the execution, confirmation, clearing and settlement of trades with market risk management and operational risk management procedures (BIS 2001).

BIS (1992) recommends that settlement systems for corporate securities should comply with the *delivery versus payment* (DVP) mechanism, in which the parties receive their assets/payments only after both of them had paid the clearinghouse. Owing to the nature of the DVP transactions, the settlement risks are minimised, because if one part fails to meet an obligation, the other part will not lose the principal. (BIS 1992).

The current debate in the payments literature is related to clearing and settlement systems. The unification of the European financial markets triggered a debate about consolidation with the objective of improving the market dynamics through a governance structure that could minimise the costs of transactions for all participants. However, most of the issues discussed in Europe are applicable in other markets as well.

The debate about consolidation is linked to expected gains of scale and scope, collateral compensations, decreasing in conflict of interests and improvements in risk management capabilities of the remaining clearinghouses. The question about consolidation comprises clearinghouses, central depositories (local and international) and exchanges. Clearinghouses are institutions that nets out mutual indebtedness between organisations (Lanoo and Levin 2001). Central depository provides settlement for securities, it can be local, which is called central securities depository (CSD) or international, which is known as international central securities depository (ICSD) (Lanoo and Levin 2001).

The first and second Giovannini Reports (The Giovannini Group 2001, 2003), focused upon clearing and settlement of cross-border securities transactions in the European Union and made a series of suggestions in order to improve the efficiency of the settlement as well as increasing the level of integration of the different national markets that form the European Union.

In general terms, the First Giovannini Report (The Giovannini Group 2001) focuses on the debate surrounding the main barriers to an integrated and efficient clearing and settlement in the European Union. The Second Giovanni Report discusses the consequences of the previous report as well as a discussion about the consolidation among European clearinghouses and custodians. The second report also suggests that consolidation is beneficial to the integration as well as to the transaction costs drawing attention to scale economies and network externalities (The Giovannini Group 2003).

There are two main kinds of consolidation that are considered in the report: the horizontal consolidation, which involves institutions providing similar services, and vertical consolidation, which comprises organisations providing different but complementary and integrated services (The Giovannini Group 2003). Stock exchanges and clearinghouses typically have the same owners and users and thus, the supply chain for financial transactions has historically had a tendency to be vertically integrated (Culp 2002). However, the horizontal/vertical dichotomy is too simplified and does not describe all the possible complexity in the clearing and settlement industry, as there are many governance structures that are not pure vertical or pure horizontal, but something in between.

In order to understand the impact of consolidation, it is also relevant to catalogue the different costs related to securities settlement: (i) Infrastructure costs; (ii) Indirect costs to users, which encompass back-office costs, interface costs, banking and financial costs, cross-collateralisation opportunity costs, failed transaction penalties and pipeline liquidity costs; (iii) Cost of intermediaries (Lanoo and Levin 2001).

Consolidation is expected to reduce costs for providers in investment terms (single infrastructure), operational terms (scale and scope economies) and by reducing the frequency of failed trades in cross-border/cross systems transactions (The Giovannini Group 2003). In contrast, there are also some shortcomings in the option for consolidation such as concentration risk, which is the risk that an institution became too important or *too big to fail* and its collapse could compromise the viability of the whole market (The Giovannini Group 2003).

Most new exchanges and other similar organisations have chosen to focus on trading and outsourced their clearing and settlement (Culp 2002). Other integration arrangements are also suggested in a discussion paper from the Bank of Finland, which recommends that smaller institutions could achieve the benefits offered by the two traditional types of consolidation through merges and alliances (Schmiedel, *et al.* 2002).

The legal environment is also considered an important topic in the debate about the consolidation of the EU market. The Giovannini Group (2001, 2003) and Schmiedel, *et al.* (2002) emphasise the importance of proper regulation in the effectiveness of the operative infrastructure in settlement systems. Another issue raised in the report relates to the competition between settlement providers and the pressure for innovation as well as a market free of restrictive practices (The Giovannini Group 2003).

In relation to the users, the expected benefits are related to diminishing the investments in being a member/shareholder of a clearinghouse or custodian, reductions in transaction, custody and back-office costs, and the improvement in liquidity owing to a better and more centralised collateral management, which is also expected to derive the reduction of the opportunity costs related to an inefficient use of collateral (The Giovannini Group 2003).

Finally, another important concept related to CSS is the one of central counterparty (CCP). Some clearinghouses can act as a CCP, which is an intermediary role between two sides of a financial transaction. Consequently, the clearinghouse becomes the buyer to every seller and the seller to every buyer, replacing the original bilateral obligations in a process called *novation* (Lanoo and Levin 2001).

4. The Case of CBLC

The CBLC is the institution responsible for clearance, settlement, collateral management and risk management of all transactions traded in the São Paulo Stock Exchange (Bovespa), and the *Sociedade Operadora do Mercado de Ativos* (SOMA), which is a wholly owned subsidiary of Bovespa, responsible for the administration of the Over the Counter Market - OTC, in Brazil (CBLC 2003).

The CBLC is responsible for the settlement of all the trades conducted on the Brazilian stock market and, according to the data available on July of 2003, CBLC's Fungible Custody Service accounts for the custody of over R\$ 204 billion (£ 40.8 billion pounds, approximately), representing more than 9.2 trillion shares of publicly-held companies, certificates of privatization, debentures, investment certificates, audiovisual certificates and shares of real estate funds (CBLC 2003). Picture 1 presents the figures for CBLC at the time of the research described in this article:

CBLC in Numbers

Settlements: Average Daily Volume	R\$ 788,3 (millions)
Average Daily Number of Trades Settled	38,496
Average Daily Number of Securities Processed	104,686,167,837
Volume held for safekeeping	R\$ 204,219,314,395.70
Quantity of securities held for safe keeping	9,291,988,221,520

Date: July/2003 (Data related to June/2003).

Source: CBLC - <http://www.cblic.com.br>

Picture 1: Figures for CBLC in June/2003

CBLC was founded in 1997, when Bovespa approved a corporate reorganisation which separated the original company in three parts: Bovespa, Bovespa Serviços e Participações Plc (a wholly owned subsidiary of Bovespa), and the CBLC (CBLC 2003). Initially, Bovespa and CBLC had the same owners. However, owing to the encouragement of its head office, the ownership changed in the last five years (CBLC 2003). In other words, the company started owing to a change towards a horizontal governance structure. At this moment, they are legally different institutions (Anon. CBLC 2003).

The ownership of CBLC is currently shared among different stockholders: brokerage houses, banks, Bovespa Serviços e Participações Plc, and Bovespa, which have a single golden share (Anon. CBLC 2003). This golden share allows Bovespa to prevent potential radical changes in CBLC, like a decision of stopping clearing its transactions (Anon. CBLC 2003). This is a particularly sensible issue as CBLC has the monopoly of the settlement of all Bovespa transactions and Bovespa is by far the main customer/partner of CLBC, in a situation of bilateral monopoly (See Ouchi 1980).

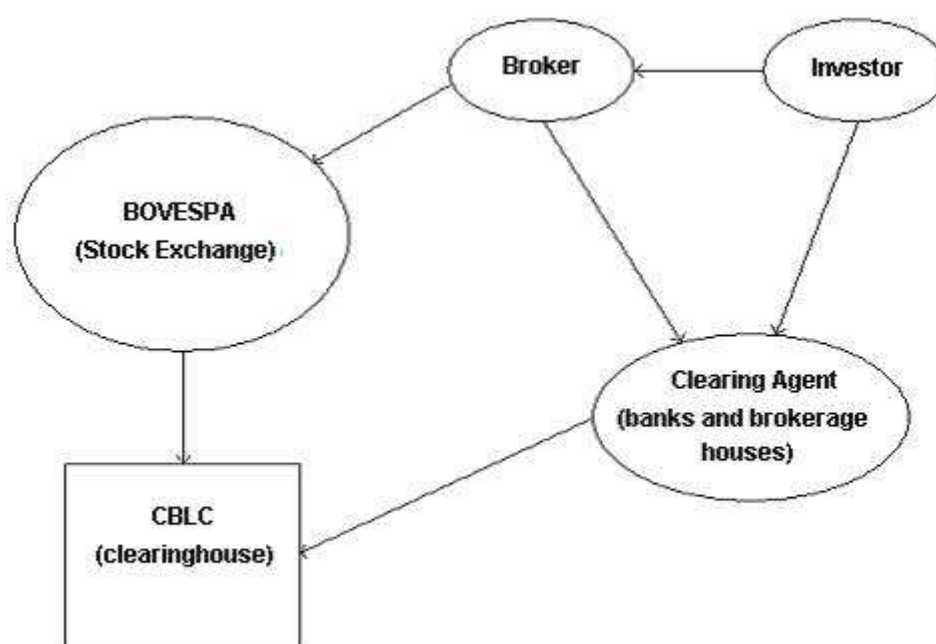
Although the ownership of CBLC and Bovespa are not the same, there are some intersections. These intersections happen in the board of directors and in the executive council as well (CBLC 2003). In practice, CBLC works as a separate company in relation to Bovespa, even though the stock exchange is its main partner. Hence, many services in CBLC, like legal, human resources, IT and accounting are supplied by Bovespa or Bovespa Serviços e Participações S/A (Anon. CBLC 07/2003). These services are all charged, as they are different and separate institutions.

The companies have different legal constitutions as well, which is described as a disadvantage for CBLC. According to the Brazilian law, clearinghouses must be public

limited companies (plc) while stock exchanges can be not-for-profit. Thus, owing to the fact that CBLC is a plc, it pays taxes while Bovespa does not (Anon. CBLC 07/2003).

Another distinction between the two companies is related to its members and the type of service they provide. One of the reasons behind the partition of trade and settlement services is that many brokerage houses are focused in trade only and some clearing agents are focused on settlement only. Consequently, the separation of trade and settlement met a market demand from those specialised organisations (Anon. CBLC 07/2003).

Picture 2 summarises the links that compose a full transaction, under the point of view of one investor:



Picture 2: A Summary of the links that compose a full transaction

During the research, the main reasons given for the imposed separation were: market demand, government pressure, the possible conflict of interests in the management of risk, and the need for independence (Anon. CBLC 07/2003). The government pressure reflects international recommendations for best practices in clearing and settlement and it is linked with the need for independence and better risk management.

4.1 The Brazilian Payment System – SPB

As CBLC operates in the Brazilian market, which had a radical reformulation in 2001-2002 (De Souza 2001), it is important to give an overview of the Brazilian Payment System (SPB). The SPB was developed by the Brazilian Central Bank in order to better control the transactions between all the participants in this market. Consequently, all

Financial Institutions needed reformulating their systems in order to comply with the new SPB.

Owing to the introduction of SPB, the Brazilian financial market is now regarded as reaching global standards as well as complying with international best practices. Consequently, it is considered one of the most modern in the world (Baptista and De Souza 2002).

One of the objectives of the Brazilian Central Bank in developing the SPB was to minimise its own risk exposure by settling all its payments in real time on a gross basis, following an irrevocable and unconditional Real Time Gross Settlement (RTGS, see BIS 1997). All the Deferred Net Settlement (DNS, see BIS 1997) systems were expected to be developed by private owned clearinghouses, which would be responsible for the risk management of its operations. Consequently, the risk is transferred from the Central Bank to the Market Participants, avoiding the loss-sharing scheme of *third party pays* (De Souza 2001).

The standardisation derived from the SPB helped to reduce the back-office costs by achieving economy of scale (Hills 2000) because the financial institutions need only one payment system to communicate with all clearinghouses and the Central Bank. The changes related to the SPB also implied supplementary benefits like the convergence of rules and procedures, which reduce the legal uncertainty and the information and transaction costs (Baptista and De Souza 2002).

5. Analysis of Data and Discussions

The interviews at CBLC suggested that the motivation for a move from a vertical to a horizontal structure included: market demand, the possible conflict of interests in the management of risk, the need for independence, and government pressure (Anon. CBLC 07/2003).

Market demand is explained as the necessity of separating the trading from the settlement, owing to the fact that some institutions are specialised in one or the other phase, although several institutions perform both tasks (Anon. CBLC 07/2003). This separation is believed to increase competition in the brokerage market because it allows small brokerage houses to execute huge operations on the behalf of their investors (Anon. CBLC 07/2003).

In addition to market demand, there is a second issue that is related to this separation: the possible conflict of interests in the management of risk. As many other stock exchanges, Bovespa is owned by its members (Anon. CBLC 07/2003), which are brokerage houses

whose interest is increasing the volume being traded. The settlement institutions, although sensible to the need of increasing the amount of trade, are much more concerned with the management of risk (Anon. CBLC 07/2003). Any potential conflict of interests between increasing trade and managing risk is greatly reduced with the horizontal structure as the clearinghouse has much more independence (Anon. CBLC 07/2003).

This reduction in the conflict of interests reduces the likelihood of a soft risk management policy and increases trust in the market governance. According to Bakos (1998), market transactions need certain levels of trust in order to protect intermediaries and participants from opportunism behaviour. Augmenting the perception of trust is likely to support a general trend toward reducing transaction costs (Adler 2001, Bakos 1998, Ciborra 1993).

Significant government pressure focused on the need to increase the reliability of market structure. The Brazilian Central Bank followed the recommendations of the BIS (De Souza 2001) and as a consequence, the Brazilian financial market is now regarded as reaching the global standards as well as complying with the international best practices (Baptista and De Souza 2002). Again, this also helped to increase the perception of trust and reduce transaction costs.

Finally, it is important to clarify the role of information technology in the process of the reorganisation of the governance structure of Bovespa and CBLC. According to the interviews, CBLC is 100% dependent on IT (Anon. CBLC 07/2003). The transaction volume was 38.496 transactions per day on average in June of 2003 (CBLC 2003). As a result, the interviewees regard as virtually impossible to clear and settle these transactions manually (Anon. CBLC 07/2003). However, this dependence did not make IT developments the driving logic shaping the reorganisation of Bovespa and CBLC, as the data illustrate that the main reasons for the separation were economic rather than technological (Anon. CBLC 07/2003).

5.1 Consequences of the Horizontal Governance Structure

The change from a vertical to a horizontal governance structure in the relation between CLBC and Bovespa is described as bringing several advantages to the functioning of the market (Anon. CBLC 07/2003). Although there are some disadvantages, on balance an analysis of benefits and weaknesses associated with the new governance structure favours the new model (Anon. CBLC 07/2003).

The reduction in potential conflicts of interest between the exchange (focused in maximising trade) and the clearinghouse (focused in minimising risks) is illustrated as one of the most relevant achievements of this reorganisation (Anon. CBLC 07/2003).

The better management of risk derived from the new structure increased the reliability of the market and decreased the uncertainty related to the settlement (Anon. CBLC 07/2003). The lower level of uncertainty as well as the high level of trust is likely to decrease the transaction costs (Adler 2001, Bakos 1998, Ciborra 1993). Furthermore, the standardization of legal practices has also supported a trend to reduce the costs associated with monitoring the counterparties (Ciborra 1993).

The risk management in CBLC is meets high standards of robustness and not only complies with the Lamfalussy standards (See BIS 1990) but also has a level of rigour that is considered above the standards used in markets in developed countries (Anon. CBLC 07/2003). As an example, the processes of novation and risk assessment are approaching real time. The alleged reason for this rigour is the need for counterbalance the image cost, i.e., the image of Brazil as an emergent market instead of a developed one (Anon. CBLC 07/2003).

The specialisation of the CBLC employees is also an advantage of the new governance structure. After the separation the company could attract and develop a more specialised workforce, which focused their attention in the core businesses of CBLC: custody, settlement, and risk management (Anon. CBLC 07/2003). This specialisation is expected to contribute to an increase in the overall quality of the service provided, including a better management of risk and other advantages owing to an increased focus on their core competencies (Peters and Waterman Jr. 1982, Prahalad and Hamel 1998).

Ultimately, an important advantage claimed by the supporters of the horizontal governance structure is the possible economies of scale and increase in the efficiency of the netting mechanism. However, in the case of CBLC, these gains are just potential, as Bovespa continues to be the most important market being settled, providing the majority of CBLC revenue (Anon. CBLC 07/2003).

Many efficiency gains usually associated with the vertical governance structure are also present in the company. As CBLC is originated from Bovespa, their systems used to be fully integrated even before the inception of the clearinghouse (Anon. CBLC 07/2003). Nowadays, although they are different companies, they are clients of the same IT department, which is part of Bovespa Serviços e Participações Plc (Anon. CBLC 07/2003). Consequently, the design of many business processes is equivalent to vertically integrated structures. STP

reduces manual intervention and it is likely to reduce back office costs, minimise the risk of errors and improve the effectiveness of risk management (BIS 2001).

The presence of organizational features associated with both horizontal and vertical entities makes classifying the relationship between CBLC and Bovespa complicated and requires us to nuance the current debate about organisational form in the clearing and settlement industry. The most that we can assert is that it is predominantly horizontal as it does not fit the stereotype of pure horizontal described by The Giovannini Group (2003).

The revised organizational structure does have some limitations, for example attention was drawn to weaknesses in the arrangement of tax expenses, which leads to duplication in some areas compared to the previous arrangement (Anon. CBLC 07/2003). The interviewees also emphasised the need for huge investments in Information Technology, in order to comply with the structure demands and provide the service level expected by the market (Anon. CBLC 07/2003). These two matters potentially have harmful consequences to the decrease of transaction costs.

5.2 Other Issues related to the Governance Structure and Transaction Costs

Improved risk management is cited as an important motive and consequence of the horizontal governance structure (Anon. CBLC 07/2003). Better risk management policies and capabilities reduce uncertainty by preventing further problems with market defaults (Anon. CBLC 07/2003). Consequently, the reduction of uncertainty helps to reduce the transaction costs (Picot, *et al.* 1997, Ciborra 1993, Malone, *et al.* 1987, Williamson 1975).

The relationship between CBLC and Bovespa is similar to a bilateral monopoly (See Ouchi 1980). However, as both companies are owned by their members and as many of them own shares in both organisations (Anon. CBLC 07/2003), goal incongruence and opportunistic behaviour are unlikely. This issue of ownership is also relevant to the relation between Bovespa, CBLC, and its members, because Bovespa and CLBC monopolise the services they supply to its members.

The ownership also affects the discussion about consolidation of CCPs, as there is a trade-off between scale and monopoly. In this case, the benefits of economies of scale are likely to be greater than the danger of a monopolistic behaviour by the CCP, owing to the fact that the customers are also the owners of the monopoly (Anon CBLC 07/2003). Consequently, the benefits of a better collateralisation could increase the liquidity of the market and thus reduce the opportunity costs (Schmiedel, *et al.* 2002) without increasing the

costs owing to opportunistic behaviour. However, as an extreme concentration could also create clearinghouses *too big to fail* (The Giovannini Group 2003), it is difficult to state that a particular arrangement is the optimal solution (Culp 2002).

5.3 The Role of Information Technology

Contemporary risk management is dependent on IT. The complexity of the algorithms implemented as well as the need for up-to-date information makes it infeasible to have a modern risk management service without computers (Anon. CBLC 07/2003). However, interviewees regarded the effectiveness of the information systems as bound up with the presence of specialised human resources (Anon. CBLC 07/2003), which need to manoeuvre the complex clearing, custody and risk management systems.

As the dependence on IT is so acute, the company need to make substantial IT investments in order to achieve the necessary standard of reliability and resilience (Anon. CBLC 07/2003). Although the CBLC has some economies by sharing its network and communication infrastructure with Bovespa, the investment in equipment, software, and maintenance is significant in relation to their costs (Anon. CBLC 07/2003).

The research identified the necessity for continuous IT spends associated with upgrading systems and hardware (Anon. CBLC 07/2003). Although the need to invest is indisputable owing to the volume of the transactions, there is no assurance that this will lead to lower transaction costs (Anon. CBLC 07/2003). This supports Cordella (2001), who points to the possibility that investments in IT may add new coordination costs.

It is important to notice that despite this lack of assurance in the role of IT as a means to reduce transaction costs, the investment in IT is considered mandatory, as it would be impossible to process this transaction volume manually (Anon. CBLC 07/2003). This complies with the concept of *mandatory changes* from the *Benefits Evaluation Ladder* (Farbey, et al. 1995).

Although the interviewees do not consider IT as a driver of change (Anon. CBLC 07/2003), it clearly plays a role in enabling the development of the conditions to manage the complexity of the clearing and settlement business. As this industry is considered to be 100% dependent on IT (Anon. CBLC 07/2003), it is inferred that it would not be feasible to expect the same volume of transactions as well as the same level of risk management in a world without computers.

The effects of IT suggested by Malone, *et al.* (1987) are expected to reduce the transaction costs (Ciborra 1993, Malone, *et al.* 1987, Picot, *et al.* 1997). The consequences of

IT in the case of CBLC are the better risk management, STP, real time risk assessment and novation, increased competition and strategic developments such as the use of netting mechanisms instead of bilateral settlements. The effects of IT that are expected to decrease the costs of transactions play a major role on the case of CBLC. Table 2 shows their consequences at CBLC:

Effects of Information Technology	Consequences at CBLC
Electronic communication effect	Better risk management due to more availability of information to the clearinghouse.
Electronic brokerage effect	Not applicable
Electronic integration effect	Straight Through Processing (STP). Real time risk assessment. Real time novation.
Electronic Strategic Networking Effect	Strategic developments such as the use of netting mechanisms instead of bilateral settlements. Increased competition (small brokers have access to and can trade for big investors)

Table 2: The effects of Information Technology and its consequences at CBLC

The majority of the effects listed above are not directly linked to the governance structure according to the data gathered. The two effects mentioned as connected to the move from a more vertical to a more horizontal model of governance are better risk management and increased competition (Anon. CBLC 07/2003).

6. Conclusions

The clearing and settlement industry has faced continuous reorganisations in recent years owing to the development of more consistent practices in order to manage risk and assure the proper functioning of the market.

The research revealed several reasons behind the structural change in the relation between Bovespa and CBLC. The transition from a vertical to a horizontal governance structure was motivated by the demands of the market, legal/government pressure, the possible conflict of interests in the management of risk, and the need for independence (Anon. CBLC 07/2003). The market demands relate to a need for separate two different businesses, which could be performed by different types of organisations: the trade and the settlement (Anon. CBLC 07/2003).

The main efficiency gains achieved by moving towards a horizontal governance structure relate to a reduction in potential conflict of interests, the improved risk management capabilities, potential scale economies and collateral management, increased competition in the brokerage business and more specialised personnel in the clearinghouse (Anon. CBLC 07/2003).

Some of the efficiency gains in this case are not directly linked to the chosen governance structure (Anon. CBLC 07/2003). Consequently, although the horizontal governance structure offers identifiable advantages for the Brazilian context, it is not possible to assure that it is the only, optimal, or 'best' choice for all markets based on the outcomes of this research.

In relation to IT, it seems to be an important enabler of the reorganisation of the clearing and settlement business. However, the main drivers for this reorganisation are not technological but political and economical (Anon. CBCL 07/2003). Hence, although IT is vital for this business it does not have a leadership role in their developments.

6.1 Implications

As the case of CBLC shows, the simplicity of considering only the pure vertical or pure horizontal structures is not enough to describe the richness and the complexity of the environment where clearinghouses operate. The hybrid governance structure of CBLC can offer not only the advantages usually attributed to the horizontal governance structure but also many of the benefits of the vertical one.

It is also not possible to assure that Information Technology will necessarily lead to lower transaction costs (Cordella 2001). In the case of CBLC, the need for huge investments in technology together with the need of continuously upgrading the systems and the hardware (Anon. CBLC 07/2003) make it very difficult to assure that the costs of transaction really decreased. As Thakor (1999) stated, financial services firms devote considerable resources to information technology, but only a few firms feel that they are getting a sufficient return on their investment. The fact that many of the benefits expected are more qualitative than quantitative makes it even more difficult to assess the benefits of IT (Hirschheim and Smithson 1988, Smithson and Hirschheim 1998).

6.2 Limitations

The first limitation of this research is related to the nature of the transition in CBLC. As CBLC and Bovespa consciously have chosen to reorganise themselves in order to turn

into a different governance structure, it is quite conceivable that their directors are naturally predisposed to support this new governance structure.

The second limitation is related to the length of the research. Although it gathered historical data in order to provide an adequate context to the case study, the interviews were taken in a short period of time, what could bias the research by simplifying the complexity of the transition between a vertical towards a horizontal governance structure. Besides, it should be helpful to conduct interviews within brokerage houses and investors as well.

6.3 Further Suggestions

An interesting area for further research on financial markets in developing countries relates to the analysis of the image costs or reputation risk management associated with the market perception about the reliability and solidness of its institutions. As the CBLC case shows, some organisations in emerging countries need to perform much more rigorously in order to counterbalance the image of their countries (Anon. CBLC 07/2003).

Finally, as this paper criticises the simplicity of classifying governance structures only as vertical or horizontal, further work developing a more comprehensive taxonomy could be very useful to the field of clearing and settlements in the financial markets.

7. Acknowledgements

This article presents the main conclusions of a case study conducted at the CBLC, as the research component of a Master of Science in Analysis, Design and Management of Information Systems conducted at the London School of Economics and Political Science (LSE). This research is also part of the Moving Markets Research Project: Strategic Developments in the Clearing and Settlement Industry, which is located at the LSE, in the Department of Information Systems.

We would like to express our gratitude to CBLC, especially to Dr. Margarida Afonso Baptista, Mr. Leandro Alves de Souza, and Mr. Antonio Augusto Barbosa Camargos.

8. Bibliography

Adler, P. S. (2001) "Market, Hierarchy, and Trust: The Knowledge Economy and the Future of Capitalism", *Organization Science*, **Vol. 12 (No. 2)**, pp. 215-234.

Allen, F., J. McAndrews and P. Strahan (1999) "E-Finance: An Introduction", *Working Paper Series - The Wharton Financial Institutions Center*, pp. 01-36.

Anon. CBLC (07/2003), Anonymous Aggregate Data from the interviews conducted at CBLC in July 2003.

Avgerou, C. (1998) "How Can It Enable Economic Growth in Developing Countries?" *Information Technology for Development*, **Vol. 8**, p. 15–28.

Avgerou, C. (2002) "The Socio-Technical Nature of Information Systems Innovation" in *Information Systems and Global Diversity*, Oxford University Press, New York, pp. 50-71.

Bakos, J. Y. (1991) "A Strategic Analysis of Electronic Marketplaces", *MIS Quarterly*, **Vol. 15 (No. 3, Special Issue: [Strategic Use of Information Systems])**, pp. 295-310.

Bakos, J. Y. (1998) "The Emerging Role of Electronic Marketplaces on the Internet", *Communications of the ACM*, **Vol. 41 (No. 8)**, pp. 35-42.

Baptista, M. A. C. and L. A. De Souza (2002) "A State-of-the-Art System". in *Latin Finance, Latin Banking Guide & Directory (August 2002)*.

Benbasat, I., D. K. Goldstein and M. Mead (1987) "The Case Research Strategy in Studies of Information Systems", *MIS Quarterly*.

BIS (1990) "Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries (Lamfalussy Report)." *Bank for International Settlements*, Basle.

BIS (1992) "Delivery Versus Payment in Securities Settlement Systems." *The Committee on Payment and Settlement Systems of the Central Banks of the Group of Ten Countries - Bank for International Settlements*, Basle.

BIS (1997) "Real-Time Gross Settlement Systems" *The Committee on Payment and Settlement Systems of the Central Banks of the Group of Ten Countries - Bank for International Settlements*, Basle.

BIS (2001) "The Implications of Electronic Trading in Financial Markets" *Committee on the Global Financial System - Bank for International Settlement*, Basle.

CBLC (2002) *Procedimentos Operacionais da CBLC – Companhia Brasileira de Liquidação e Custódia*, São Paulo, Brasil.

CBLC (2003) *Brazilian Clearing and Depository Corporation* Last accessed: 31/07/2003 Last updated: 31/07/2003 Address: <http://www.cbhc.com.br>.

Ciborra, C. (1993) *Teams, Markets and Systems: Business Innovation and Information Technology*, Cambridge University Press, Cambridge, UK.

Ciborra, C. (2000) *From Control to Drift: The Dynamics of Corporate Information Infrastructures*, Oxford University Press, Oxford, UK.

- Coase, R. (1937) "The Nature of the Firm", *Economica*, pp. 387-405.
- Cordella, A. (2001) "Does Information Technology Always Lead to Lower Transaction Costs?" in *The 9th European Conference on Information Systems, ECIS*, Bled, Slovenia,
- Cornford, T. and S. Smithson (1996) *Project Research in Information Systems: A Student's Guide*, Macmillan, London.
- Culp, C. L. (2002) "Clearing: A Risk Assessment". in *Futures Industry Magazine*, July/August 2002.
- De Souza, L. A. (2001) *Sistema De Pagamentos Brasileiro: Nova Estrutura E Seus Impactos Econômicos*, Editora Saraiva, São Paulo, Brasil.
- Domowitz, I. (2002) "Liquidity, Transaction Costs, and Reintermediation in Electronic Markets", *Journal of Financial Services Research*, **Vol. 22 (1/2)**, pp. 141-157.
- Domowitz, I. and B. Steil (1999) "Automation, Trading Costs, and the Structure of the Trading Services Industry", *Brookings-Wharton Papers on Financial Services*.
- Farbey, B., F. Land and D. Targett (1995) "A Taxonomy of Information Systems Applications: The Benefits' Evaluation Ladder", *European Journal of Information Systems*, **Vol.4 (No.1)**, pp. 41-50.
- Galliers, R. D. (1997) "Reflections on Information Systems Research: Twelve Points of Debate" in *Information Systems Research: 'an Emerging Discipline'*, (Stowell, F. ed.) McGraw-Hill, London, pp. 141-157.
- Ghoshal, S. and P. Moran (1996) "Bad for Practice: A Critique of the Transaction Cost Theory", *Academy of Management Review*, **21 (Issue 1)**, pp. 13-47.
- Hills, B. (2000) "Common Message Standards for Electronic Commerce in Wholesale Financial Markets" *Bank's Market Infrastructure Division*
- Hirschheim, R. A. and S. Smithson (1988) "A Critical Analysis of Information Systems Evaluation" in *Information Systems Assessment: Issues and Challenges*, (Bjorn-Andersen, N. and G. B. Davis eds) Amsterdam, North Holland.
- Jones, C., W. S. Hesterly and S. P. Borgatti (1997) "A General Theory of Network Governance: Exchange Conditions and Social Mechanisms", *The Academy of Management Review*, **Vol. 22 (No. 4)**, pp. 911-945.
- Katz, M. L. and C. Shapiro (1985) "Network Externalities, Competition, and Compatibility", *The American Economic Review*, **Vol. 75 (No. 3)**, pp. 424-440.

Kauffman, R. J., J. McAndrews and Y.-M. Wang (2000) "Opening the "Black Box" of Network Externalities in Network Adoption", *Information Systems Research*, **Vol. 11 (No. 1)**, p. 61–82.

Lanoo, K. and M. Levin (2001) "The Securities Settlement Industry in the Eu" *Centre for European Policy Studies*. Brussels.

Lee, R. (1998) *What Is an Exchange? The Automation, Management, and Regulation of Financial Markets*, Oxford University Press, Oxford, UK.

Levecq, H. and B. W. Weber (2002) "Electronic Trading Systems: Strategic Implications of Market Design Choices", *Journal of Organizational Computing and Electronic Commerce*, **Vol. 12 (No. 1)**, p. 85–103.

Malone, T. W., J. Yates and R. I. Benjamin (1987) "Electronic Markets and Electronic Hierarchies", *Communications of the ACM*, **30 (Number 6)**, pp. 484-497.

Michie, R. C. (1997) "Friend or Foe? Information Technology and the London Stock Exchange since 1700", *Journal of Historical Geography*, **Vol. 23 (No. 3)**, p. 304–326.

Mishkin, F. S. and P. E. Strahan (1999) "What Will Technology Do to Financial Structure", *NBER Working Paper Series, National Bureau of Economic Research*.

Moser, J. T. (1999) "Origins of the Modern Exchange Clearinghouse: A History of Early Clearing and Settlement Methods at Futures Exchanges" *Federal Reserve Bank of Chicago*, Chicago, USA.

Myers, M. D. (1997) "Qualitative Research in Information Systems", *MIS Quarterly*, **21** pp. 241-242. MISQ Discovery, archival version, June 1997, <http://www.misq.org/misqd961/isworld>. MISQ Discovery, updated version, <http://www.auckland.ac.nz/msis/isworld>.

Orlikowski, W. J. and J. J. Baroudi (1991) "Studying Information Technology in Organizations: Research Approaches and Assumptions", *Information Systems Research*, **Vol. 2 (No. 1)**, pp. 1-28.

Orlikowski, W. J. and S. Iacono (2001) "Research Commentary: Desperately Seeking the "It" in It Research - a Call to Theorizing the It Artifact", *Information Systems Research*, **Vol. 12 (No. 2)**, pp. 121-134.

Ouchi, W. G. (1980) "Markets, Bureaucracies, and Clans", *Administrative Science Quarterly*, **v. 25** pp. 120-142.

Peters, T. J. and R. H. Waterman Jr. (1982) *In Search of Excellence: Lessons from America's Best-Run Companies*, Harper and Row, New York.

Picot, A., C. Bortenlänger and H. Ré HRL (1997) "Organization of Electronic Markets: Contributions from the New Institutional Economics", *The Information Society*, **13** pp. 107-123.

Pirrong, C. (2001) "The Macrostructure of Electronic Financial Markets", *Working Paper Series - College of Business Administration, Oklahoma State University*.

Power, D. (2002) "IT and Institutions in the Structuring of European Finance: Urban Impacts", *Economic and Industrial Democracy*, **Vol. 32 (No. 3)**, pp. 335-356.

Prahalad, C. K. and G. Hamel (1998) "The Core Competence of the Corporation" in *Strategy*, (Montgomery, C. and M. Porter eds) HBR Press, Boston, pp. 277-299.

Remenyi, D. and B. Williams (1996) "The Nature of Research: Qualitative or Quantitative, Narrative or Paradigmatic?" *Information Systems Journal*, **Vol. 6**, pp. 131-146.

Schmiedel, H., M. Malkamäki and J. Tarkka (2002) "Economies of Scale and Technological Development in Securities Depository and Settlement Systems." *Bank of Finland Discussion Papers*.

Scott, S. V. (2000) "It-Enabled Credit Risk Modernisation: A Revolution under the Cloak of Normality", *Accounting, Management and Information Technology*, **Vol. 10** p. 221–255.

Smithson, S. (1994) "New Organizational Forms for an Information Rich Society". in *International Conference on Information Technology (ICIT94)*, Kuala Lumpur, Malaysia, 9th-12th August.

Smithson, S. and R. A. Hirschheim (1998) "Analysing IS Evaluation: Another Look at an Old Problem", *European Journal of Information Systems*, **Vol. 7 (No. 3)**, pp. 158-174.

Stalder, F. (1999) "Global Financial Markets and the Bias of Networks" in *Readme! Ascii Culture and the Revenge of Knowledge*, (Bosma, J., P. Van Mourik Broekman, T. Byfield and e. al. eds) Autonomedia, New York, pp. 104-110.

Thakor, A. V. (1999) "Information Technology and Financial Services Consolidation", *Journal of Banking & Finance*, **Vol. 23** pp. 697-700.

The Giovannini Group (2001) "Cross-Border Clearing and Settlement Arrangements in the European Union" *The Giovannini Group* Brussels.

The Giovannini Group (2003) "Second Report on EU Clearing and Settlement Arrangements" *The Giovannini Group* Brussels.

Toppen, R., M. Smits and P. Ribbers (1998) "Financial Securities Transactions: A Study of Logistic Process Performance Improvements", *Journal of Strategic Information Systems*, **Vol. 7** p. 199–216.

Walsham, G. (2001) *Making a World of Difference: It in a Global Context*, Wiley, Chichester.

Webster, J. (1995) "Networks of Collaboration or Conflict EDI and Power in the Supply Chain", *Journal of Strategic Information Systems*, **Vol. 4 (No. 1)**, pp. 31-42.

Werthamer, N. R. and S. U. Raymond (1997) "Technology and Finance: The Electronic Markets", *Technological Forecasting and Social Change*, **Vol. 55**, pp. 39-53.

Wigand, R. T. (1996) "An Overview of Electronic Commerce and Markets". in *Annual Conference of The International Communication Association*, Chicago, May 23-27.

Wigand, R. T. (1997) "Electronic Commerce: Definition, Theory and Context", *The Information Society*, **13** pp. 1-16.

Williamson, O. E. (1975) *Markets and Hierarchies: Analysis and Antitrust Implications*, The Free Press, New York.

Williamson, O. E. (1981) "The Economics of Organization: The Transaction Cost Approach", *American Journal of Sociology*, **87 (Number 3)**, pp. 548-577.

Williamson, O. E. (1985) *The Economic Institutions of Capitalism*, The Free Press, New York.

Yin, R. K. (1984) *Case Study Research, Design and Method*, Sage Publications, Beverly Hills, California.

Yin, R. K. (1993) *Applications of Case Study Research*, Sage, Newbury Park, Ca.