

The 2nd Social Study of IT workshop at the LSE  
ICT and Globalization  
22-23 April 2002

## Electronic Trading and the Transformation of Futures Exchanges in Global Work Times

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### Abstract

Our paper provides insights into the evolving temporal features of global work by examining the transformation of traditional futures markets facilitated by e-trading. This study allows us to examine the temporal features of leaders' strategic response to processes of globalization as well as changes in traders' work. We highlight the connections and mutual implications between work (industrial) and global times, which have the potential to facilitate or hinder the transformation process. The strategic response of the different exchange leaders' is influenced by the tempo of uncertainty and the emergence of past/present/future relationships, which leads to a unique appropriation of e-trading associated with the process of 'glocalization' across their markets. Furthermore, with the development of a virtual pit community, new levels of 'flexibility' are increasingly required of traders in accessing several markets across multiple zones. In this process, time boundaries shift and expand and there may be increased social risk for some traders with particular skill sets and traditional forms of expertise.

**KEY WORDS:** Electronic Trading, Strategy, Time, Globalization, Work, Transformation.

**ISRL Categories:** EL09 Globalization of IS, UF INFORMATION TECHNOLOGY ADOPTION

## INTRODUCTION

This paper examines the temporal features of global work times through our analysis of the transformation of traditional futures markets enabled by the emergence of e-trading. In financial markets, the widespread adoption of electronic trading infrastructures facilitates functional integration and interdependence in the development of new international financial systems (Castells 1996, Leyshon & Thrift 1997). As our study highlights, the associated transformation towards e-trading can be a major challenge for managers of traditional dominant exchanges who have been slow in adopting a strategic response to counter new entrants who conduct business electronically (Deise, Nowikow, King, and Wright 2000).

The importance of relating transformation to changes in temporal features of work-life can be traced to E.P. Thompson's (1967) landmark paper where he argued that with industrialized life, work life shifted from temporal features of task orientation to that of timed labour. With task orientation, work-life was governed by the rhythms, routines and timings of nature and specific tasks, whereas during industrialization time and work became pre-occupied with the link between industrial production and its organization to the time of the clock (Adam 1995).

Our contemporary work-life is often characterized by the shift from machine technology to information and communication technologies (ICTs) and knowledge, and involves the rapid globalization of markets in the new global information economy (Zuboff 1996). This transformation is revolutionizing the workplace with profound changes in the nature of work (Bell 1973, Zuboff 1988), yet there is little empirical work to provide an in-depth understanding of how IT and transformation is related to ongoing changes in temporal features of contemporary work life (Barley and Kunda 1992, Adam 1995).

Earlier literature on IT and organizational transformation (Applegate 1994; Hammer and Champy 1993; Scott Morton 1991) has been criticized for having an underlying deterministic logic with IT as a causal agent being described as a driver or force (Robey 1997). Other studies do not support this deterministic logic but rather highlight the contradictory outcomes of the transformation process associated with IT (Barley 1986, Orlikowski 1993, Robey and Sahay 1996). More recent work (Orlikowski et.al. 1996, Barrett and Walsham 1999) has highlighted the importance of examining the inter-related levels of transformation associated with IT and changes in the nature of work. That is, how increased levels of globalization facilitated by IT are interconnected with profound changes in personal identity. Whilst these studies implicitly recognize the importance of time and space in their theoretical developments, they do not explicitly explore the temporal features associated with e-trading and work transformation.

Indeed, IS research on time is sparse. Recent work has focused on how IT speeds up business processes (Lee 1999), or affects temporal aspects of organizational work (Orlikowski and Yates 1999; Barley 1988). Other research in the organizational and strategy literature has recognized the importance of time in enhancing our understanding of organizational processes of strategy formulation (Das 1987, 1991, Butler 1995, Lee and Liebenau 1999), though it still remains one of the least researched. However, as Mosakowski and Earley (2000) emphasize in their review of temporal dimensions of strategy,

there is a need for researchers and managers to adopt a global multifaceted view of time as they need to confront “their implicit temporal assumptions and view their expanding world through different temporal lenses” (P. 808).

As such, our study explores the underlying temporal features associated with the emergence of e-trading and transformation across traditional futures exchanges in global work times. In so doing, we examine the implications for managers in developing a strategic response to processes of globalization as well as for traders’ biography in their work life. In the next section we develop our temporal perspective of ICT, strategy, and global work times, and this is followed by a discussion of our research methodology. In the fourth section, we present our in-depth longitudinal study of electronic trading in the traditional London and Chicago Futures Markets. The final section draws on our temporal perspective in analyzing the transformation, and concludes with some key findings on the temporal features of global work times.

## **ICTs AND PROCESSES OF GLOBALIZATION IN GLOBAL WORK TIMES**

In this section, we elaborate a temporal perspective for examining the strategic approaches by actors to electronic trading in the transformation of global futures markets. Drawing on Adam (1990, 1995, 1998), our approach seeks to appreciate the connections and mutual implications between *multiple ‘times’* inherent in (industrial) work time and global times associated with ICTs, such as electronic trading. Furthermore, we argue that it is through on going actions and practices that the connections and relations between these times are dynamically constituted and potentially altered. Actors draw on these multiple temporal structures, which constrain and enable different strategic actions (Orlikowski and Yates 1999), and have implications for leaders’ response to the transformation of futures exchanges enabled by e-trading. In the following subsections, we start out by summarizing the temporal features of (industrial) work times to reflect traditional pit trading practices. This is followed by a discussion of processes of globalization facilitated by e-trading as a precursor to examining the uniqueness and complexity of global times.

### **Work Times: The Time-Money-Power Link**

In work (industrial) time, the distinctiveness of clock-time becomes visible being conceived as money and power tied to work and economic exchange. The assumption is that a market economy depends on the (human) creation of a time that is abstract, commodified, decontextualized and disembodied from events (Adam 1995, 1998), and as such there are important connections between clock-time, money, speed and efficiency. As exemplified in financial markets, including stock and derivative exchanges, speed of communication is important where time is related to money with a few seconds being critical in winning or losing a deal (Adam 1998). As such, the valorization of speed and flexibility needs to be appreciated in relation to the economic principles of profit, efficiency, and competition.

Clock-time is also an important organizing device allowing for the structuring of social and work life. It is a commodity/resource to be sold and exchanged on the labor market (Adam 1990), and through this commodification of labour time, the control of time has become an integral aspect of industrial life (Adam 1994). This control of time is exemplified in techniques such as just-in-time which control the rhythm and tempo of work by speeding up, slowing down, or re-arranging the duration and sequence of activities. Such ‘flexible’

organization of time suggests that work processes can be cut up and re-assembled for greatest possible efficiency.

Adam also notes that the time-money-power link has often connected time to relations of power for quantitative formless resources like money (Giddens 1981, 1995). This hegemonic view, she argues, suggests that any time which is not readily translatable into money tends to be associated with a lack of power and vice versa. The commodification and control of time therefore seeks to eliminate 'unproductive time' and devalues what does not fit with its hegemonic logic. As a result of this prominence of commodification and control, work (industrial) time can be best conceptualized with reference to relations of power.

The temporal features of work time such as those of futures trading in traditional pit environments are increasingly influenced by ICTs such as e-trading and processes of globalization which are representative of global work times. As such, we now examine the role of ICTs in processes of globalization before exploring the complexity and uniqueness of the temporal features in global times in the final sub-section.

### **ICTs And Processes Of Globalization**

The emergence of global processes would have been inconceivable without the development of IT and telecommunications (Henderson 1989), and the driving forces of globalization are to be found in the dynamics of technology, communication, and the global diffusion of risks including financial ones (Held and McGrew 2000). Analyses of globalization have been vast and diffuse, with little consensus about the specific form of globalization or its appropriate analysis (Adam 1995). We locate our social science based analysis on the distinctiveness of globalization in the development of electronic communication and globally networked money markets. Giddens (1990) defines globalization as:

'the intensification of world-wide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa... what happens in a local neighbourhood is likely to be influenced by many factors-such as world money and commodity markets - operating at an infinite distance away from that neighbourhood itself' (P. 64)

This new level of interconnectivity plays out in our financial markets where problems in one market have inescapable and often unpredictable effects on the rest of the markets worldwide. The influence of these instantaneous effects of communication along with the simultaneity of networked relations no longer functions to the principles of clock time and mechanical time (Adam 1995).

This dynamic inherent in the process of globalization highlights the importance of the local-global dialectic. Rather than viewing globalization as involving linear convergence or a unilateral, one-dimensional analysis, the local-global dialectic counters this McDonaldisation thesis and argues that the local must be understood as an aspect of the global instead of being mutually exclusive (Beck 2000). Similarly, Giddens(1991) highlights the local/global dialectic whereby the local both feeds into and shapes the global, and the global constrains and enables the work done at the local level. This new emphasis on the local suggests that globalization always involves a process of localization (Robertson 1992) and may best be

thought of as 'global localization'. In contrast to a static uniform perspective, this view of 'glocalization' is as a contingent dialectical process in which contradictory elements are conceived and deciphered in unity. Beck (2000) emphasises that globalization does not only mean 'delocation' but also implies 'relocation'. As such, local specificities are globally relocated and thereby redefined and represented.

This local-global dialectic also penetrates to the level of the personal (Adam 1995) and as such it is important to understand how globalization is being spelt out in people's lives. Beck (2000) suggests that we all live more and more in a 'glocal' manner belonging to several places at once and that ICTs bridge time and space; creating proximity over distances, and distances within proximity – absence at the same place.

### Global Times

Adam (1995, 1998) explores the influence of technology on the development of global times, and suggests that the key temporal features of global time are: *simultaneity, instantaneity, uncertainty, and implication*

Early technological innovations such as the wireless and more recent ones such as electronic trading have created a *global present* and promoted a sense of global connectedness amongst people isolated by distance. They allow almost simultaneous sending and receiving of information, and along with other communications innovations changed the relationship between time and movement across space. As such, *simultaneity* and *instantaneity* seemingly replaced succession and duration of industrial (work) time; the present extended spatially to encircle the globe becoming a global present (Adam 1995). With the use of electronic trading events in one financial market have instantaneous effects on other markets across the globe and are largely beyond the control of those involved.

This lack of control associated with a global present contrasts with the features of industrial (work) time and suggests globalized *uncertainty* about *the* future. Such uncertainty poses barriers to effective action as our traditional capacity to predict and control are now insufficient. For example, Adam (1995, 1998) notes that the time lags of cause and effect of nuclear power and its associated threats are unpredictable spanning nanoseconds to millennia. These non-linear, networked processes along with the simultaneity of global information and environmental effects constitute a global risk that defies and renders our risk calculation (and management) ineffective.

Each individual is *implicated* in and responsible for those globalized processes and their effects without being able to rely on conventional modes of control. In this way, the implications of globalized uncertainty highlight not only the local but the personal dimensions associated with processes of globalization. Our everyday lives are increasingly influenced by events that take place on the other side of the world but our local activities can themselves be globally consequential. Each of us adopts and actively manages 'risk positions' in our personal and professional life in coping with uncertainty (Beck 1992).

However, these features of global time do not replace the rationalized, decontextualised features of (industrial) work times but as we shall highlight in our case there are important connections and implications between them. For example, Adam (1995) highlights that the rational standardization and commodification of work time also plays a key role in the

process of globalization. In particular, the globalization of clock-time involved the rationalization of time into standard time, global time zones, and world time. Furthermore, as power was integrally connected to time and money in (industrial) work time so power relations are deeply inscribed in the dynamic of contemporary globalization. They express the expanding scale on which power is organized and exercised. The processes of globalization constituted by ICTs can involve the reordering of power relations between and across the world's major regions (Held and McGrew 2000), and there is the potential for vastly expanded control as well as for democratizing traditional power relationships.

However, Adam (1995) also argues that the temporal features of global time cannot be encompassed by classical theories based upon a separation of past, present, and future and linear causality. The strategy literature on time has highlighted the way in which strategic action is influenced by the relationship between past, present, and future (Clark 1985, 1997, Ramprasad and Stone 1992, Masakowski and Earley 2000). For example, Clark (1985) shows how managers reckon about events (as another important 'chronological code' with time viewed as being in events) by 'editing' their past decisions, anticipating the next business season and deciding on what would be appropriate in the present season. More recently, Butler (1996) suggests that we experience time in the present, but only by relating ourselves to a past and a future. The past is understood by codes (recipes, repertoires), which are a series of events and decisions that become sedimented through the codifying of our experience. However, Adam (1990) draws on Mead's (1934) concept and develops this P/P/F relationship using the concept of emergence. She suggests that the connections and relations between the past/present/future are dynamically constituted and potentially altered. Only *emergence* in the present has a reality status, the past and the future being real only with respect to their relation with the present. The past changes with respect to our experiencing it in the present and the meaning we give to it. Each emergence irreversibly affects everything else, not just the meaning of all past and future but all of present reality and its possible futures (Adam 1990).

Our temporal perspective takes seriously this concept of emergence in appreciating how actors adopt strategic responses in the transformation of futures markets by drawing on the relationship between past, present, and future in a dynamically constitutive fashion as well as multiple interconnected temporal structures (global time and work times). To recap, these structures recognize both the time-money-power link reflected in the rationalized, decontextualized features of work time and the colonization with time exemplified by global time. They include the rationalization of time zones, one world time, ICTs as an electronically constituted global present and global future, and globalized uncertainty with implications for individual agency.

## RESEARCH METHODS

We adopted an interpretive longitudinal case study approach (Orlikowski and Baroudi, 1991; Walsham, 1995; Zuboff, 1988) to examine the emergence of electronic trading and the transformation of global futures exchanges. This phenomenon was recognized as being important at the beginning of the study when a number of critical incidents related to electronic trading became apparent. The reversal of the decision by the traditional London International Financial Futures Exchange (LIFFE) to expand its physical trading floor ('pits') in July 1998 was our first clue. We quickly learned that this was related to the loss by LIFFE

of its prized Bund contract to the rapidly growing German electronic exchange. Later that year, the criticality of electronic trading was further reinforced when it was announced as the theme of the Futures Industry Association conference, which hosts the largest gathering of industry participants worldwide.

We selected an in-depth longitudinal case study to observe and collect data on changing circumstances, perceptions, and actions over time, and as they occurred through in-depth interviews, direct observation, and analysis of documentary material. We discuss below the details of the research process:

### **Data Collection**

Our research sites were the traditional London and Chicago futures exchanges, namely London International Futures Exchange (LIFFE), the Chicago Board of Trade (CBOT), and the Chicago Mercantile Exchange (CME). These exchanges accounted for in excess of 60% of the world's trading volume in futures contracts at the start of the study. As Table 1 shows, we started our longitudinal research in London in August 1998, and this was followed up by fieldwork in the Chicago markets. Sixty-five interviews were conducted with traders across these global markets. Our semi-structured interview questions examined a number of themes including the timing and response of exchanges towards electronic trading, the technology architecture of the trading engine, the competitive and cooperative strategies exchange leaders were adopting in managing the change in global futures markets, and implications for traders' work-life.

We also attended panel sessions of key industry conferences in London, Chicago, and Frankfurt, which increasingly focused on the emergence of electronic trading in these markets. They were very useful in not only deciding and making contacts with key informants for the research but as a way of comparing, contrasting and further developing our understanding of the key themes emerging from the research. The questions following the panel sessions of industry sessions provided a good balance of the different 'voices' in the markets which were often polarized by some participants being aggressively supportive of electronic trading or others challenging the effectiveness of e-trading in providing liquidity in increasingly volatile markets. Yet others debated the continued role of exchanges and brokers in this changing landscape of the market.

Apart from traders, we also interviewed independent software vendors in these markets, which were particularly important players in the implementation of their strategy for the new millennium. As well, during our inter-phase analysis, we identified further participants in the Market to interview as suggested by the high-level themes in our data. So, for example, issues of governance of the exchanges, regulatory issues of electronic trading, the increased importance of the clearing business, and the proliferation of alliances emerged as key additional themes. As such, our interview questions in subsequent phases were modified to additionally focus on these issues and our interviewing sample was extended to include managers in clearinghouses, regulatory bodies, and alliance partners.

As Barley and Kunda (2001) note, mixing observation with real-time interviews is important when studying work practices and their changing nature over time. As such, we took the opportunity to observe pit-trading activities in Chicago exchanges, nervous that the difficult and limited access to the trading floor (which was shortly thereafter closed to the public because of vandalism) in London that previous summer would likely also be the norm before long in Chicago. Observation of the Chicago pits provided us an opportunity to

understand the language of hand signals in pit trading and its culture. This not only helped us to become much more familiar with the trading environment and implications for traders, but allowed us to compare and assess our observation notes with our participants' views interview transcripts concerning the expected benefits and drawbacks of electronic trading. We also observed traders in their homes and in trader arcades doing electronic trading and were fortunate to have veterans educate us as to the new dynamics and the rules of the games of these virtual pits. Finally, in addition to these methods of observation, current organizational documentation from exchanges, brokers, clearing houses, regulators, as well as conference materials were studied and analysed. A strategy of historical reconstruction was also adopted in the study to understand and unearth key events, strategies, and practices within the exchanges. Studying historical documents and newspapers, as well as asking key informants with a long history of the exchanges to assist in the historical reconstruction achieved this strategy.

### **Data Analysis**

Both researchers had a similar theoretical background, were experienced in previous projects on IT strategy and implementation, and had together attended the interviews and developed an intimate knowledge of the project. They used this to their advantage working together on data analysis, which followed an inductive process using the open coding technique (Strauss and Corbin 1990; Strauss and Corbin, 1998). Each researcher did initial coding and conceptualization by carrying out a careful (re)reading of, and reflection on, empirical data. Through a process of discussing our initial difficulties as well as confirming the meanings seen in the data, key concepts, themes, and issues emerging from the data were identified and subsequently sorted into categories. Interview transcripts were examined to identify participants' statements that reflected interpretations surrounding the adoption and use of electronic trading in futures markets, and their subsequent strategies and actions. Our clustering strategy involved shifting the level of focus from micro to middle-focus and macro in order to see if a critical mass collects around a theme. Particularly in the early stages of interrogating and patterning the data, we were careful with the naming of the themes that were emerging, and what we associated them with. We were conscious that this process could significantly influence how one links the themes and treats them in the future. The main themes were used as a starting point to develop a more elaborate picture of the data landscape. We went through a process of working towards a more detailed organization of our data. This was a dynamic process involving the pruning and/combining/addition of the themes and helped us in managing the analysis. After each phase of analysis, we concluded how our data collection strategy should develop based on emerging themes from the data. We also followed up the literature so that we could explore how the themes and their associated meaning compared and contrasted to key conceptual/theoretical and management issues.

## **THE EMERGENCE OF E-TRADING AND THE TRANSFORMATION OF FUTURES EXCHANGES**

Our study of electronic trading in traditional futures exchanges offers a potent example of processes of globalization and provides insight into the temporal features of global work times. Though this industry has a relatively long history of development and use of electronic trading, the speed and nature of change towards e-trading in traditional exchanges in recent years has been dramatic with the leaders' response viewed as critical for their



survival. Futures exchanges are self-governing membership associations, which serve as an umbrella for member firms and provide efficient price discovery. Traders in colourful jackets assimilate new information from satellite links feeding DVD screens on the walls of the exchange and trade in open auction through a system of open out-cry (OO), backed by hand signals in physical trading 'pits' (marketplaces). Though confusing and bemusing to the uninitiated, this price discovery process facilitates fair and efficient market prices. Another economic function offered by these exchanges is risk management. Hedging allows farmers to protect their business from adverse conditions in an uncertain world (CBOT 1996), which may otherwise negatively impact their profitability.

Since the very first electronic trading initiative, Globex, was conceived and developed by the Chicago Mercantile Exchange, a number of purely electronic futures exchanges (some growing rapidly) have evolved. Despite these developments, electronic trading initiatives on major traditional futures markets in London and Chicago were (for a long time) limited to the margins and regarded as a supplementary, after-hours mechanism. A popular rationale for this rests in the traders' faith that open outcry is the only way to ensure liquidity, and to cope with the large volume of trades that may occur as a result of periodic fluctuations in the markets (Managing Director, Strategic Director, London Clearing House 1998).

The next sub-section outlines the sequence of developments, which led to the genesis of CME's Globex initiative. This is followed by an examination of two critical competitive electronic trading events, and the strategic responses of London and Chicago exchange leaders. The case concludes with a discussion of the impact of these electronic trading developments on traders' work lives.

### **Colonizing Time Zones through Trading Innovation Strategies**

Prior to the development of the first major electronic trading system in futures markets in the early 1980's, the chairman of the Chicago Mercantile Exchange (CME) was already concerned with maintaining dominance in his Exchange's futures contracts (e.g. Eurodollar contracts) across time zones. As he noted, potential competitors from Asia and London were emerging who threatened the future of his exchange's products in Asian time zones:

" I knew that we couldn't copyright anything, and I knew that in 1984, 1983, that now Asia was going to build a Eurodollar market, London was going to build a Eurodollar market. In fact, LIFFE did. LIFFE opened in 1981. By 1982 they had a Eurodollar market, and I thought they were, I found out they were in a better position from a time zone point of view than we were because of the way things were Asia could wait a couple hours and use the London market, and the London market lasted long enough into our day and Asia closed, so, in fact, they captured Asia. We would be left with just North America." (Chicago Market leader 1998)

Since the Eurodollar contract was just an idea that could not be copyrighted, the Exchange leader sought to maintain control and ownership of the contract across time zones. This led to the development of the "mutual offset" between the CME and the Singapore futures exchange SYMEX who listed the CME's Eurodollar contract. This trading innovation introduced *time structuring* in futures trading. Specifically, this strategic arrangement between the exchanges allowed trades started in the United States to be offset and completed in Singapore, and vice versa. As such, the 'mutual offset' allowed the stretching of trading

practices across time zones, and was successful in thwarting LIFFE's attempt to start a Eurodollar market. In effect, LIFFE's market for Eurodollars died before it got started. In addition to maintaining CME's dominant power relations in the Eurodollar market across all time zones, it helped solidify their partner, Singapore, as being 'the beacon of markets in Southeast Asia'.

By 1986, however, the leaders of the CME could now visualize a future where globalization was upon them greatly facilitated by the computer and electronic trade. This made popular the rhetoric that "markets moved with the sun" and brought into question the widely proclaimed age old view of 'Open Outcry Forever'. Electronic trade was starting to demonstrate that it could create sufficient liquidity and this suggested the need for exchanges and their visionary leaders to experiment with possible futures.

### **Development of Globex to Transfer Markets across Time Zones**

The *mutual offset*, while successful in maintaining the CME's dominance and extending trading hours of the Eurodollar, was always viewed as a risky if not dangerous trading scenario. Market leaders were uncomfortable with transferring their product to other markets and relying on 'absent others' to complete trades:

"So the idea of transferring your product to another time zone can be done and works and has the effect. Now how do you transfer? The ultimate way to transfer is not to transfer, but in fact transfer your market. Okay. If I could open my pits in Tokyo and then later in London, then I don't have to deal with anybody. Just be my market traveling across with the sun. How do you do that? Oh. Globex. That's how you do it. So, Globex was born to transfer and not make any more mutual offset deals. The hell with those things because you know those are dangerous by comparison, those aren't your markets, you're dealing with partners, you know. Globex is yours.." [Interview 1998]

So, the strategy of developing an electronic trading system, Globex, was born to retain control by transferring their own market to time zones, and in so doing facilitate '24 hr trading' across global markets. The underlying philosophy of Globex as a 'unified theory of trade' was to enrol key global exchanges, CBOT, CME, and LIFFE and allow them to maintain existing structures of domination in their established products across all time zones. The chairman of CME at the time put it this way:

"We said to the world, look, we only want what's ours. You come join Globex. Put your product, that will open after your business day is closed, on Globex. You'll pay us a little fee, but we won't trade your product. That is, we will trade your product but it will be your product. A cross exchange arrangement for all exchanges in the world. That's the unified theory of Globex."

Despite this initial and somewhat bullish optimism, significant challenges, delays, and eventually lack of participation by key partners ensued. These challenges stemmed largely from disagreement on governance rules guiding the development of the e-trading infrastructure:

"I think we got into very complicated governance structures where we felt that the Mercantile Exchange or Reuters were really in control of our future destiny ... and that

did not sit well with us or our members ..... the GLOBEX System I think became a very, very complicated governing structured with ... you know ... who gets admitted ... who does not get admitted ... and so on ... and you know the governing structure probably more than anything led to the demise of our participation in GLOBEX.” (LIFFE Interview 1999)

Another set of governance challenges developed between traders and the leaders pushing the development of Globex. The traders’ powerful status as owner/members of these mutual exchanges resulted in low levels of support for the e-trading initiatives. In fact, for almost a decade after the initial development of Globex, electronic trading was relegated to an ‘after hours’ trading option amongst all the major exchanges in London and Chicago. It remained the ‘political impossible’ (Former CEO of CME 1998) because, as one interviewee put it, ‘Turkeys don’t vote for Christmas’ (MD, Strategic development, LCH 1998). E-trading was perceived by many to threaten their own livelihood and monetary value and by default their voice and power in the running of the exchanges. Despite the development of smaller electronic exchanges in the late 1980’s and 1990’s, open outcry remained the dominant ‘truth’ for futures trading in these major traditional markets throughout this period.

#### **Timing of Market Responses to the Loss of the Bund Contract at LIFFE**

The loss of LIFFE’s key Bund contract to the electronic Deutsche Terminborse (DTB) exchange which offered traders a more competitively priced trade execution was widely heralded as spectacularly unforgettable:

“ It’s the snowball effect.... once it begins to go..... we, as an exchange we saw the Bund go..... it went sort of 70/ 30 that night, then it went 60 / 40 and then it went in a period of about a couple of months and it’s quite phenomenal when it happens, you see your business disappear.” (LIFFE Interview 2000)

This surprise loss appeared to defy the law of markets, which suggests that once significant liquidity of a benchmark product had been established, it would remain dominant in that market. Though astute observers appreciated that politics played a key role in this loss, nonetheless, the focus of attention was leveled at the threat of e-trading. LIFFE’s strategic response in July 1998 was to start the process of dismantling their mutual governance structure in favour of a ‘for profit’ entity, and to implement a state-of-the-art e-trading system, LIFFE CONNECT. The system’s ambitious goal was to establish technological superiority trading complex hallmark products such as short-term interest rate contracts (STIR), a feat which was previously believed to be unachievable.

The loss of the Bund contract not only shocked LIFFE but also rang warning bells across the industry globally. In Chicago, leaders at both the CME and CBOT carefully studied, with some dis-ease, the ‘surprise loss’ and migration of the Bund. They were critical of LIFFE’s slow response and lack of proactivity though they appreciated that this was easier said in hindsight. The critical mass process of e-trading occurred in an unprecedented non-linear manner:

“ The migration of the business of the German Bond business from London to DTB did not happen overnight. This was a seven or eight year process ... where DTB’s market share was five and ten and fifteen percent ... they got up to about thirty percent of market share which is now ... now they have the critical mass ... and once they have achieved that critical mass .... as soon as they got fifty percent of the market it was all over ... and I think that the fault I suppose ... and again this is in

retrospect ... is that LIFFE had seven or eight years to see that coming to react ... and they did not react ...." [Head of Operations CBOT 1998]

" Critical mass goes this way. The competitive market has 20 percent market share, that's okay. When it has 30 percent, one starts to take notice of their competitors. At 45 percent you've already lost. The reason it has moved from 30 to 45 percent because of cost efficiencies being recognized, is it's not being carefully monitored... .Before you know it, in no time, it goes to 70 percent. Game over. In a way, you can't ignore reality. You can't wait until such time as you've underwritten proof that your competitor is better than you. You have to recognize this long before it reaches critical mass. "[ex-Chairman CME 1998]

Though Chicago exchange leaders appreciated the non-linear networked processes of critical mass adoption of electronic trading, they were unable to adopt risk positions to manage the emergence of electronic trading within their own exchanges. There were many stakeholders dominating the exchanges' governance structures for which it represented upheaval or redundancy, and members continued to vote against expansion of electronic trading. A senior exchange strategist was undecided as to whether it was one's strategic approach to managing your competition or the governance structure of a traditional exchange that was the paramount challenge, with different stakeholders having incongruent visions about possible futures:

" The reason for it (lack of responsiveness to e-trading) is perceived to be the traditional membership ... ownership structure and confidence in your position in the market place ... where you let your competitor get too much of a foot hold ... Eh ... and again I don't know ... I think it is more governing structure... . You know that those are the things that are difficult in managing the exchange is to convince your members the change is in their best interest." [CBOT Interview 1998]

Despite such experiences in the European markets, open outcry remained the trading approach of choice by Chicago exchanges. A key industry leader confirmed that the deeply embedded structures and practices by members of exchanges were making it difficult for the exchange leaders to manage change in a proactive strategic manner:

" The new economics of virtualization and the evolving roles of exchange members are posing hard choices for US exchanges. They are historically heavily rooted in providing the environment and the opportunity for members to trade and their tendency to respond to members' demands rather than staking out strategic leadership positions to propel change in futures markets." [CBOT Interview 1999]

As such, it became evident that both exchange politics and nationalism would continue to influence the development of the exchanges and their products as much as electronics and economics.

### **Proximity of Local Competition Catalyses E-Trading Developments in Chicago Markets**

It would take another significant threat from a locally based firm to catalyze the move by Chicago exchanges to electronic trading. In 1998, a New York based brokerage company, Cantor Fitzgerald, launched an electronic trading system designed to compete directly with the trading facilities offered at the CBOT. In the wake of the Bund being stolen from under LIFFE's nose, and an appreciation of the non-linear nature of critical mass adoption, the CBOT Board members decided to take no chances:

“ I think as we looked at CANTOR & Fitzgerald coming up ... it was our position ... don't let them get any market share ... so we had this debate ... OK Let them have 10% and then we respond ... eh ... but I think that our board and strategy committee made the decision ... NO ... move forward with our competitive response NOW ... in effect ... when we actually announced we will begin trading electronically” (CBOT Senior Manager 1998)

As such, the CBOT responded to this rude wake-up call, proclaiming that they must be 'competitive and visionary to remain the industry leader... [and will] make a pre-emptive strike on any entity that might emerge as a competitor'. The CBOT membership voted overwhelmingly to prioritize the development of electronic trading, and provide 24hr side-by-side access to their after hours electronic trading system, Project A. In an interesting political move, however, they ensured that their computerized trading system had the capacity to both execute electronically *and* route orders to open outcry in the pits via a hand held device given to brokers. Not only was this more palatable to anxious members but it was legitimated as client relationship management and providing client flexibility. The slogan 'let the customer decide' was made popular in an Internet era of customer 'click loyalty' and the past context of client 'rebellion' against LIFFE, which many viewed as another significant reason for the flight of the Bund from London to Frankfurt.

As the CME chairman noted, the leaders attempted to influence members' attitudes towards rapid adoption by drawing on both past and global (at a distance) threats:

“And in one respect LIFFE 's experience with EUREX electronically stealing the product was one of those things that happened to us that helped us greatly to be able to say 'Look over there, look what is happening over there- **But by the way** if you look at the electronic markets ... and LIFFE ... . and Paris shutting their trading floors... pretty big things”

Consistent with our concept of emergence, the local 'backyard' threats in the present revised the meaning of the global past events of LIFFE and lent a new urgency to CME 's future. The present CME chairman explained:

“Last Aug (1998) was - LIFFE was about to go out of business ... .. and just to give you a sense of despair here because it was pretty bleak over there- People in April(1999) after local threats emerged- said ' how long is that going to take” and I said ' You know, it is going to be 4 ,5 or 6 months ..' and they said 'we'll be dead by the third quarter' ... there were so many newspaper articles that every day were saying 'will the exchanges close?'..'What is their future?' People were saying 6 to 8 weeks.”

Actors at all levels shared this urgency and concern for a future across both London and Chicago exchanges as e-trading was now being accepted as here to stay as a key trading approach across all exchanges, or a global future in our theoretical discourse.

## Managing Uncertainty Through Alliances and Technology Acquisition

In managing globalized uncertainty exchange leaders adopted risk positions by forming alliances and developing technology acquisition strategies. Chicago and London exchanges deemed alliances to be necessary if they were to extend distribution and expand offerings in offering a truly global futures market that met traders' demands. In particular, CBOT formed an alliance with their electronic exchange competitor EUREX on a 'non-compete' basis to ward off the possible future of the European-based EUREX exchange entering the US market.

The alliance would allow them to *buy time*, and save financial resources at this critical point while CBOT repositioned themselves strategically in the face of serious competitive threats:

“And also another major aspect of the business alliance (between Eurex and CBOT) is financial resources. Do we have the money to spend \$200 million to develop the latest and greatest right now? No. So this allows us time to market and saves us a lot of money in getting, maybe not the latest technology. That is the idea, let us get out there quick. And we are facing real competitive threats let us establish ourselves.” [Interview 1999]

Meanwhile, the CME launched 'Globex 2' with the Paris exchange, based around the French MATIF's electronic trading system NSC. In 1999, they subsequently formed an alliance with LIFFE. Unlike the CBOT-EUREX alliance, the primary objective of this alliance was a defensive strategy to colonize the future against other potential non-exchange competitors.

The current senior policy adviser of the CME explained:

“(Ours was) Not primarily defensive. Ours was defensive in terms of futuristically. We recognized that creating this strength between us it would be very difficult for a competitor to come in. But there wasn't the immediacy of that competition that we were concerned with as was the CBOT and Eurex... In this case we are just saying by doing this we fend off any potential competitors of some future year.”

As the chairman of the CME noted, other market participants such as brokers and investment banks sought to manage a globalized uncertain future by hedging bets, investing in a number of joint ventures on multiple technological platforms:

“I was talking to a very senior person at Goldman Sachs at an investment bank but that they- they need to buy these- they call them defensive pieces of like competitor. They buy 20 M \$ of this technology electronic system. Then they buy 23 M\$ of this one over here and it looks great. They are doing so good they can afford it. But the reason they are doing it this way is that they have to keep placing bets across different platforms. There is **such** uncertainty at **every** level of **every** market that no one knows what is going to happen. Therefore, by definition if you are going to survive, you have to have multiple bets?”

As such, exchange leaders adopted a number of reinvention strategies in managing their risk position for survival. These strategies had significant consequences for the identity of their exchanges as geographic monopolies as well as on trader work life and expertise in global work times.

## Consequences of E-Trading and Globalization on Trader Work-Life and Expertise

E-Trading and the process of globalization extend to the level of trader's work-life. A senior Director in the UK Futures industry highlighted the importance of these oft-overlooked social implications of technology:

“ I think very seriously about ... the social implications of technology. I mean you can go on and on and on about stress now, well, I don't think, you ain't seen nothing yet. I mean the 24-hour, seven-day week office is right here and if people, you think domestic upheavals and stress are bad now... With 24 hours trading... . People (already) do get stressed but they don't switch off, they carry on regardless because the drivers of money and short termism and employment all those sort of things, everything is much more ruthless in corporate life now.”

While the extent to which '24 hr trading' would become a reality was debatable, the longer opening hours of exchanges was a reality. In addition, we met a number of younger traders, graduates of prestigious colleges, who would often work electronically from midnight to six in the morning trading in foreign markets and then in the Chicago pits for a few hours the following day. Not only were these traders trading in multiple places and markets but they were increasingly 'flexible' in their work habits which were dictated by the time zones, opening and closing hours, and the expanding hours of operation of these markets. As the senior Director of the UK futures industry association noted, in these times there are connections to earlier work (industrial) time but also a distinctive pace implicated by technology, which has its own associated stress.

“ Don't forget we started with long hours because well over a hundred years ago people were working.. seven days a week and in the most appalling conditions... .it isn't just that the conditions are necessarily different; actually market conditions are an awful lot better in many ways. It's the pace which people are now expected to work and it's the pace that technology now demands that you work because, it is so immediate, it demands an instant response... mobile phones are now doing absolutely everything, poor you, you know waking up at three o'clock to trade and it's going to get worse... therefore it becomes more stressful because you don't have time to think.. there's no pausing in the process of things. “ (Interview 2000)

While the new intellectual breed of trader, particularly in Chicago, may start out trading in both pit and electronic markets, there was more of a marked transition for those who only ever knew the pit-trading environment. As this trader, who had successfully made the transition from pit trading to the screen highlighted, the basic underlying skill still involved getting a feel of movement of prices. However, time was a critical element as was the type of knowledge involved which was now embrained rather than being embodied:

“ I think time is probably the biggest requirement. You have to be patient and in time you develop a feel for the movement of prices on the screen and you get a message from them. ..as you do in the pit. But there is a difference. The average trader in the pit relies very much on his eyes and body language and feel. You can't rely on that upstairs in an electronic environment. You have to learn technical analysis fundamentals. Not to say they don't learn that on the floor. They don't use it, they don't depend on it as heavily.. You have to create some thought process,

some opinion process in your mind... .Right now (in screen trading) what I am doing is reacting to price movement and technical analysis which I couldn't do when I was in the pit"

There were key implications for traditional pit traders as to whether they could adapt and thrive in the evolving electronic markets. A senior manager at the CME who started in the pits and was now an active e-trader highlighted that trader adaptation depended on expertise linked to their existing trading techniques:

" Local traders are all different. There is the one that trades the smallest increment of trade... buys and sells thousands of times a day with very little risk. That trader will have a very difficult time in an electronic environment. Another trader trades larger increments... he takes a position based on price movement. That trader will be able to learn how to do the same with other utilities on the electronic environment. Then there is the trader that has a system. Let's say he is a spreader. He spreads between two months. These guys will have much less problem transferring their knowledge because the same theories apply... price movement and differentials". (Interview 1999)

The ability for traders to successfully transition to electronic trading was even more critical at LIFFE, which had successfully implemented its technological platform, LIFFE Connect, and closed all its pits within 18 months. The transformation of the Chicago markets was less dramatic with the development of a hybrid market of pit and electronic trading coming into effect by the end of the research in 2000. Nonetheless, it was expected that the pits would close; the market players and customers deciding how and when the exact date of this transformation would take place.

## **TEMPORAL FEATURES OF E-TRADING AND TRANSFORMATION OF FUTURES MARKETS**

In this concluding section, we highlight what our study of e-trading and transformation tells us about the temporal features of global work times. In so doing, we draw on key concepts of our temporal perspective to analyze the transformation towards e-trading in London and Chicago markets.

### **The Rationalization and Colonization of Time in Global Work Times**

Our study shows how the rationalization of clock-time in work times has implications for and extends into global work times as leaders seek to colonize time zones through systems of expertise (e.g. mutual offset and Globex), which involve the time structuring of futures trading. These strategic responses have sought to protect their futures products as geographic monopolies and to reinforce the time-money-power relationship across global work times. This suggests that time zones do not merely act as an objective global structure, which threatens to limit the trading practices of an exchange. Rather, leaders' of exchanges can reckon about the potential challenges brought about by IT and globalization and develop systems of expertise that can create new global structures for trading. While this suggests that some of the temporal features of work times persist and extend into global times, there are a few novel features of global work times, which should be appreciated.



Specifically, while in work times the temporal features of timed labor time is seen to dominate or even replace task orientation, in global work times such a duality seems inappropriate with increasing evidence of a reconnection of task to clock time. While task orientation in pre-industrial time was linked to stable markers such as the sun and other daily time-space paths, technology and processes of globalization are reconfiguring time and linking it to the globalized uncertainty of the market. In futures markets, we see how traders with the advent and increasing pervasiveness of e-trading need to be 'flexible', stretching and re-zoning their own trading day in which they jump time zones to operate in markets where the cream of profits in the markets can be derived.

### **Time Lag of E-Trading Adoption and Conflicting Strategic Times**

The case highlights the different 'strategic times' of actors within and between exchanges concerning the adoption of e-trading and the opportunity for conflict if one of the sets of actors' time-money-power relationships are endangered. This involves politics and bargaining where there is incongruence over visions of possible visions (Butler 1995). For example, the time structuring characteristics of Globex could not be negotiated amongst the system participants and this led to conflict and political challenges over its governance. The inability to bargain effectively and reach a reasonable compromise led to distrust of Globex by some members who revised their past strategy of joining Globex and subsequently abandoned the initiative.

Another example of this conflict was evident with traders who perceived the time structuring of electronic trading to adversely affect the *longue duree* practices of Open Outcry trading, whose successful past had provided them with money in the form of seat ownership and the associated position of power. The time structuring of e-trading was perceived by the local traders (as owners of these mutual exchanges) to be in conflict with the more natural (yet technology fused) work practices of pit trading. It threatened to effectively sweep away the work and work life of local traders, the 'market makers', so vital to the liquidity of futures markets, and would demand a shift away from the lay skills of quick-witted 'barrow boys' in the pit, toward the rarefied rational-scientific expertise of graduates. As such, the case highlights the difficulties for electronic trading in becoming a global future by all actors across exchanges.

Our case also illustrates the usefulness of the dynamic concept of emergence of past/present/future relationships in global work times and the novel feature of e-trading involving non-linear critical mass adoption in appreciating how e-trading eventually became a global future. The supplementary after hours use of e-trading operating at the margins of these traditional exchanges shifts to side by side trading when a local event directly threatens the exchanges. For LIFFE, the loss of the Bund contract dramatically changes their strategy of e-trading adoption. Through this spectacular loss, leaders at CBOT and CME became attuned to the non-linear critical mass effect of the Bund loss but the exchange leaders are only able to make this understandably present for the local members at a later date when Cantor Fitzgerald poses a local threat to their trading.

In summary, in global work times, local events in the present can revise the meaning of global past events and gradually lead to an acceptance of e-trading by traders as a global future. This process was catalyzed by the global risk perceived by leaders of the temporal features of e-trading involving uncertain time lags and non-linear networked processes of

critical mass adoption. Gradually, Chicago leaders were able to convince/enrol members that future scenarios would likely threaten their markets if a shift to e-trading did not occur as this was a global future for all exchanges.

### **Localization of E-Trading Strategies in Processes of Globalization**

Our case goes beyond illustrating that e-trading becomes a global future for Chicago and London exchanges and provides insights into the strategy associated with each exchange's adoption of e-trading. It recognizes the inadequacy of unilateral 'one-dimensional' analyses and that the dialectic of globalization always involves processes of localization. The different exchanges adopt a combination of adaptive and proactively shaped strategies of e-trading.

Following the loss of the Bund contract to the pure play e-trading exchange EUREX, LIFFE re-defined and represented their 'after-hours' e-trading as LIFFE CONNECT in a pure e-trading environment which led to the rapid demise of the pits in London. This suggests that LIFFE's localization of e-trading both involves an adaptive strategic response but with a strong shaping element. This strategy may seem counter-intuitive but in a somewhat ironic manner is made possible by the high levels of uncertainty linked to the loss of their most valued high volume product. They also sought to shape the futures exchange business by leveraging their technology success into a technology company and using their expertise in markets to develop new B2B marketplaces in other vertical industries. In contrast, at the CBOT and CME exchanges their version of e-trading moved from 'after hrs' e-trading to side by side e-trading alongside pit trading, which at least for now continues as the governance structures start to be dismantled. The continued use of pit trading is viewed as important and legitimated under the guise of providing options for customers and 'letting the customer decide'. Though the e-trading strategies at these Chicago exchanges may have a number of surface-level commonalities, there are a number of nuances that distinguish CBOT e-trading from CME e-trading. Firstly, their strategies under uncertainty are quite different. The level of exposure and risk for CBOT relates to the direct competition from Cantor Fitzgerald in the wake of the Bund loss and key challenges for its e-trading system being able to scale to manage significantly higher volumes which would be the case particularly if the pits were eventually closed. As such, their response was largely a reactive and protective one, developing a non-compete alliance with their key competitor to buy time in an effort to survive.

The level of uncertainty at CME was less than at CBOT with the threat of a direct competitor not yet visible on the horizon. Furthermore, their Globex system was scalable and was being developed as Globex 2 with other exchanges wanting to participate. Though their e-trading strategies both involved a side-by-side arrangement there were some key differences. The CME strategic response was also reactive but sought to shape the future. For example, CME proactively sought to develop new products and create new markets by leveraging and blending their pit and e-trading abilities. Furthermore, in an effort to stave off further scenarios of competition in the future, they worked with other non-exchange partners to develop new B2B markets in other vertical industries.

### **Globalization of Market Trader Biography**

What does e-trading in global work times mean when spelled out in the trader's lives? Whilst there may be some convergence, as we have stressed before the localization process

whether it be LIFFE e-trading, CBOT e-trading, or CME e-trading will take place in different ways. The trader in these traditional markets is increasingly no longer tied to a particular place. Indeed, it could be argued that for some time the trader has been tied not only to a life on the pit floor but on the phone and the satellite news feeds which drip off the LCD boards of the exchange floor. The use of hand-held devices has also been a precursor to e-trading in starting to break the ties to the pit floor. As Beck (2000) notes, we all live more and more in a 'glocal' manner where people belong in different worlds and are tied or 'married' to several places at once. He refers to it as a sort of transnational place polygamy where people change and choose place.

With the increasing pervasiveness of e-trading, the association of the trading pits with community will likely break down and this has implications for the relationships between traders and the nature of expertise. In the virtual pit, the trading relationships are no longer based on co-presence, the skills of the trader change, and the rules of the trading game are re-defined. For traders at LIFFE where strict implementation dates were adhered to in phasing out the pits, the transition between trading at a tiered eurodollar or soyabean pit to a virtual pit with people spread geographically across time and space involving anonymity will be quite different. Learning about other trader's objectives and playing the trading game will take place in different ways. The wider participation made possible with this virtual pit brings new challenges of trading across time, space and culture. Traders with a more limited set of skills who carry out basic 'in and out' strategies of 'tick trading' will have little room for growth or for that matter even exist. Their skills cannot match the timing of computer-triggered trading whose built in algorithms re-present the absent-other system designers.

With such speed and nature of change, trader life becomes displaced. The Chicago e-traders we met who started close to midnight to participate in the Asian markets represented a new elite college professionals using technical analysis and raw acumen that contrasted with the street smart Barrow School boys. They would start in the after hours market in Chicago, catch the start of the Asian markets and depending on the day would catch a few hours of the close of the European markets. Some of these traders would then catch a nap so as to participate in the pit trading of the Chicago markets. So, the trader becomes married to several markets scattered across time, space, and culture.

Furthermore, trader skills and expertise are shifting to adapt to different marketplaces. For example, the skills of trading in a pit get relocated and redefined/re-presented from physical cues as eyes and body language, order flow, and noise in getting a feel for movement in price to further reliance on intellectual skills such as technical analysis to get a feel by creating a thought process for the price movement. So, as Beck (2000) might argue it is not so much that the pit and its inherent trading skills and games are delocated but that the local specificities are globally relocated into the virtual pit. This is not a smooth process without casualties as there is conflictual renewal with changes as to who can effectively participate and in what ways. The losers will be those whose skill sets and expertise is no longer viewed relevant or valued in this brave new world where systems of expertise may undermine their local ways of trading.

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## SUMMARY OF INTERVIEWS

<b>Location (London Futures Market)</b>	<b>Dates interviewed (Phase 1)</b>
Project Manager, LiffeConnect, London	August 1998
MD IT Strategy, London Clearing House, London	August 1998
Manager Director, Independent Software Vendor, London	August 1998, July 1999
Capital Markets Editor, Financial Times Newspaper, London	August 1998
Futures and Options Manager, Large International FCM, London	August 1998
Joint Head of Capital Markets, Large International Bank, London	August 1998
Managing Director, Information Technology, Liffe, London	August 1998
<b>Location (Chicago Futures Market)</b>	<b>Dates interviewed (Phase 1)</b>
Local Trader and Managing Director of Small Local Trading Company , Chicago	October 1998, October 1998
Executive Vice President, Planning and Operations CBOT, Chicago	October 1998
Director of Marketing, Electronic Trading Systems, CBOT, Chicago	October 1998, October 1998, August 1999
Managing Director, Electronic Trading Order Routing CBOT, Chicago	October 1998
Manager Visitors Center, Chicago	October 1998
Chairman and CEO Major trading company ,(Former CEO of CME), Chicago	October 1998, August 1999
<b>Location (London Futures Market)</b>	<b>Dates interviewed (Phase 2)</b>
Vice President Derivatives, Major International FCM, London	July 1999
Director, LiffeConnect Project, London	July 1999
Independent Consultant, Capital Markets, London	July 1999
Chairman of International Petroleum Exchange, London	July 1999
Chief Executive, Financial Futures and Options Association, London	July 1999
Member Liason Officer, London Clearing House, London	July 1999
Managing Director, Large Brokerage Company, London	July 1999
Managing Director, Trader Arcade, London	July 1999
Head of Financial Regulation, HM Treasury, London	July 1999
Vice Chairman of Liffe, London	July 1999
Member Liason Manager, EUREX, London	July 1999
Head of Derivatives Trading, Large	July 1999

International FCM, London	
Managing Director of Clearing, Large International FCM, New York	July 1999
Gay Wisbee and Six Others FSA	July 1999
George Cox Independent Technology Adviser to LIFFE	July 1999
<b>Location (Chicago Futures Market)</b>	<b>Dates interviewed (Phase 2)</b>
Local Trader and Managing Director, Brokerage, Chicago	August 1999
Manager of Marketing, Electronic Trading Systems, CBOT, Chicago (Former trainer on Project A)	August 1999
Angelo Russo	
Chairman & Chief Executive, Chicago Mercantile Exchange	August 1999
Senior Policy Advisor, CME	August 1999
MD, Strategy, CBOT, Chicago	August 1999
Chief Executive, Environmental Derivatives Company, Chicago (ex-Chairman CBOT)	August 1999
<b>Location (Chicago Futures Market)</b>	<b>Dates Interviewed (Phase 2)</b>
Bill Jenks	November 1999
Carl Royal	November 1999
Gerry Roberts	November 1999
<b>Location (London Futures Market)</b>	<b>Dates Interviewed (Phase 3)</b>
Head Futures, Large Investment Bank	June 2000
FSA Regulator	June 2000
CE LIFFE	June 2000
MD, FOA Association	June 2000
Project Manager, LIFFE CONNECT	June 2000
<b>Location (Chicago Futures Market)</b>	<b>Dates Interviewed (Phase 3)</b>
Leo Melamed	October 2000
CBOT Clearing Assistant General Counsel	October 2000
CBOT Director Risk Management	October 2000
Manager of Marketing, Electronic Trading Systems, CBOT, Chicago (Former trainer on Project A)	October 2000
Project Manager, Electronic Trading Systems, CBOT, Chicago	October 2000
MD, Strategy, CBOT, Chicago	October 2000
Regulator CFTC	October 2000
President, Chicago Mercantile Exchange Clearing House	October 2000
Chairman & Chief Executive, Chicago Mercantile Exchange	October 2000



**Biographies:**

**Michael Barrett** holds a faculty appointment in information systems at the Judge Institute of Management, University of Cambridge, where he also earned his Ph.D. His current research interests examine the relationships between IT, globalization, and changes in the nature of work. Recent projects include the implementation of electronic trading infrastructures in global financial markets, E-Learning, global outsourcing arrangements, the role of IT in managing global audits, and the adoption of web assurance mechanisms.

**Susan Scott** is currently a lecturer at The School of Economics where she pursues research focusing of the role of information systems in the transformation of financial services. She is involved in taught courses on IS issues for social scientists, and inter-organizational information systems. Her background includes degrees in African History and Politics (SOAS), Analysis, Design and Management of Information Systems (LSE), and a Ph.D. in Management (Cambridge).

