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Information and Communication Technology diffusion, collective rationality and form selection in the Australian stockbroking industry

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ABSTRACT

Stockbroking firms have adopted information and communication technology (ICT) to improve their competitiveness and responsiveness to shifts in market conditions. This paper adopts an institutional approach to the Diffusion of Innovation (DOI) to examine the diffusion of ICT and associated changes in organizational structure in the Australian Stockbroking Industry. From an institutional perspective, changes experienced by a firm can be viewed as a process of individual adaptations running in parallel to the evolution of the business environment. The ability of the industry to adapt to ICT enabled change lies in the existence of resources and capabilities that managers build using organizational capabilities and the dynamics of industry structure. The logic behind this approach is founded on the notion that intensity in competition and rapid technological change has made organizational boundaries less permanent, which has resulted in firms networking and pooling their resources. To explore these networks and the concomitant institutional power relations, an adaptive framework of ICT is proposed. In this framework, to gain legitimacy, the interacting firms mimic each others practices thereby developing a standardised set of operating procedures.

Keywords

Information and communication technology, organizational change, institutionalism, stockbroking, organizational forms

INTRODUCTION

Many businesses are searching for approaches and models that will allow them to use Information and Communication Technology (ICT) to grow and prosper. Using ICT has been trialed in several organizational forms; traditional brick and mortar brokerage houses, virtual or e-brokers at the peak of the e-commerce bubble in the late 1990s, and finally the rise of hybrid brokers working in parallel with the virtual brokers. While the use of ICT has changed the way stockbrokers perform their functions, in principal the functions themselves have not changed. Stockbrokers still (1) act as information brokers by passing information between buyers and sellers; (2) broker transactions between financial institutions and buyers; and (3) advise both buyers and sellers.

The development of the Internet and Internet-based trading has transformed the way firms operate in the Australian stockbroking industry, particularly since the 1990s. The stockbroking industry is a prime example of a sector that has been profoundly impacted by the use of ICT (Bloch and Segev, 1996; Shankar, 2002). This has been achieved, firstly, by using more traditional applications such as Stock Exchange Automated Trading Systems (SEATS) and The Clearing House Electronic Subregister System (CHESS) (Shankar, 2002) and, then, by adopting Web-based applications that enable consumers and corporations to obtain information, advice, and compare prices. The elimination of the middlemen has resulted in stockbrokers having to adopt new innovative forms to survive the long-term changes of the industry.

Although one cannot deny the influence of Internet on the operations of the stockbrokers, it is safe to assume that, it is possible for a new technology to be widely acquired but only sparsely deployed among acquiring firms. When this happens,

the cumulative adoptions will vary depending on industry as well environmental characteristics. The use of cumulative acquisitions as the basis for diffusion modeling can present an illusory picture of the diffusion process when diffusion is not uniform. This leads to potentially erroneous judgments by vendors and prospective adopters about the robustness of the diffusion process already observed, and the technology's future prospects. Therefore to have a more accurate picture of how innovations are diffused and what factors influence the rate of diffusion, one needs to look beyond the classical notion of DOI based on a determinist approach to industry change, and instead explore interorganizational linkages as well as the notion of strategic choice with regard to interorganizational networks and the mutual influence of firms and inter-firm networks on the uptake of technology. The logic behind this approach is founded on the notion that intensity in competition and rapid technological change has made organizational boundaries less permanent, which has resulted in firms networking and pooling their resources. This means the extent and depth of DOI is not as straight forward as one might hope; rather, it is influenced by a number of internal as well as externally-induced factors. To explore these factors and the concomitant institutional power relations, an evolutionary framework of ICT is proposed. In this framework, to gain legitimacy as part of the industry and exist, interacting firms mimic each others practices thereby developing a standardised set of operating procedures.

This paper aims to make a contribution to previous literature by providing a conceptual framework for the relationship between firms and organizational-industry levels of innovation uptake. Within the above mentioned agenda, both classical DOI and an evolutionary approach to DOI are examined to explore the dynamics of industry structure, as stockbroking firms experiment with the ICT.

DIFFUSION OF INNOVATION

Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas. Rogers (1983) defines diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system. Rogers (1983) also states that diffusion patterns are influenced by characteristics specific to the innovation and the adopter as well as being influenced by opinion leaders. The Individual Innovativeness theory (Rogers, 1983) states that individuals who are predisposed to being innovative will adopt an innovation earlier than those who are less predisposed. On one extreme of the distribution are the Innovators. Innovators are the risk takers and pioneers who adopt an innovation very early in the diffusion process. At the other extreme are the Laggards who resist adopting an innovation until rather late in the diffusion process, if ever. Rogers (1983), reveals three important ways in which the adoption of interactive communications differs from that of previous innovations. 1) A critical mass of adopters is needed to convince the "mainstream" to adopt the new change. 2) Regular and frequent use is necessary to ensure success of the diffusion effort. 3) Communication technologies are tools that can be applied in different ways and for different purposes and are part of a dynamic process that may involve change, modification and reinvention by individual adopters

Once innovation is diffused in an industry, the resultant change in industry structure is associated with the development of new inter-firm networks (i.e. systems of relations between groups of firms that go beyond simple market exchanges and enable organizations to enter long term relational contracting without the fear of opportunism). Rogers (1991, 1995) further suggests that inter-firm networks or cliques of firms occupy a position and operate parallel to the influence of markets and, therefore, have an advantage in managing transaction costs. These advantages include lowering the chances of opportunistic behaviour on part of the firms in the industry and also promoting trust and protocols that safeguard trust and the cohesive relationships of firms in a value network. This is especially the case when the networks consist of a set of stable long-term relationships between small numbers of firms developed before long term relational contracting can emerge.

One point that Rogers fails to mention is the notion of strategic choice. In addition the DOI approach put forward by Rogers (1995), neglects the fact that firms tend to experiment with a number of structural options, whilst also conforming to the overall macro protocols that manage an industry. There is a conscious attempt to harmonize personal as well as industry needs and 'interests'. Once the overall industry interests are met, firms tend to differentiate themselves from others based on the available resources in the industry (Havemann, 1993a). Thus diffusion of innovation is not always a 'one way', push mechanism in the sense that the way industry is run is always pushed down the chain of command and adhered to by all the members. Rather in some cases and especially with the usage of IT, smaller firms can shift the balance of power to themselves and thus the players in the network need to change their role and strategy from a push to pull (McMaster, Vidgen, & Wastell et al, 1999).

Evolutionary diffusion: The process of selection and imitation

Organizational evolution and evolutionary DOI focus on the development of organizational forms over time. According to Hannan *et al.* (1989), controlled change is problematic due to the unpredictability of the future environmental states. The arguments of relative inertia and/or uncontrollability of organizational change imply that every match at a given point in time between the environment and organizational form can be considered on average as a series of selections from a number of

options (Boon *et al.*, 1995:p.267). In other words, the environment is very specific in its selection and retention. Regulation and protocols in the institutional context are reflections of entry barriers that each industry develops to control the inflow of newcomers. Through the process of selection, firms and industries become locked into distinctive governance structures, and which means that the process of change experienced is different from that which would be experienced under the hierarchical approaches of rationalist economics. This is because the:

- The nature of firms as economic actors, and in particular the degree to which they are diversified or focused, depends on their position in the power hierarchy of the industry.
- The extent to which firms are involved in obligation networks, joint ventures and associations or compete as individuals depend on the role of networks and to what extent the firm is able to change or rather differentiate itself (Whittington, 1998).

Once the form has been selected, in order to survive and innovate, each firm occupies a position in a web of strongly complementary technical relationships that give rise to networks where issues such as compatibility and standardisation become essential. This in turn gives rise to incremental technical improvements. This process is continuous and once the forces that influence these dynamics are identified, they can later be used to identify issues that explain the changes as a result of ICT evolution. Therefore, diffusion becomes spread through mimicking the practices of others. This is in line with the institutional approach of Havemann (1993a) where practices become diffused through organizations as they gain more legitimacy. The conceptual framework to analyse the industry dynamics in the stockbroking industry can be seen in Figure 1 below.

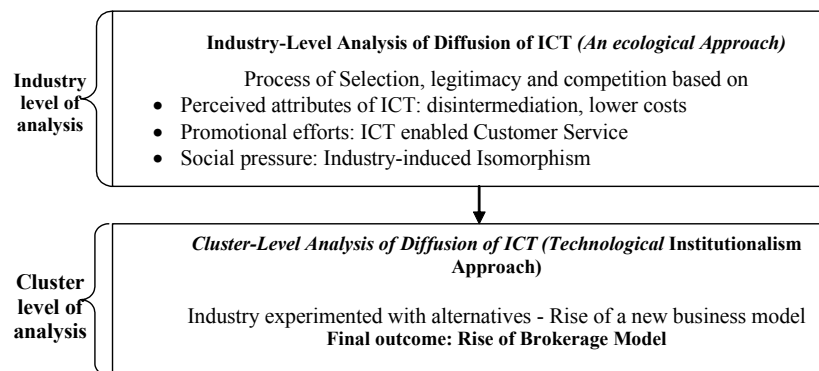


Figure1: Industry dynamics - industry and cluster levels

As figure 1 indicates, the evolutionary approach looks at the diffusion at two levels. First an industry level emphasising on the macro aspect of inter-firm dynamics and later develops the argument to encompass the cluster level of analysis. The term 'cluster' refers to a structure where the stock brokers act as intermediary between the demand and supply side of the market.

The change in the industry after the initial selection mechanism takes a more institutional approach. Institutional theory adopts an open system perspective: organizations are strongly influenced by their environments. But not only are competitive forces and efficiency-based forces at work, socially constructed belief and rule systems also exercise enormous control over organizations – in the way that they are structured and how they carry out their work (Scott, 1990). As belief systems and norms vary over time and place, institutional concepts provide a means to study organizational emergence and change. Institutional theory is usually regarded as an explanation of the similarity (isomorphism) and stability of organizational arrangements in a given population or field of originations. Institutional theory contains insights and suggestions that, when elaborated, provide a model of change that links organizational context and inter-organizational dynamics (Haveman, 1993a).

In researching institutional theory and the study of organizations, Zucker (1977: 727-728) and Meyer and Rowan (1977: 346) described institutions being socially constructed templates for action, generated and maintained through ongoing interactions. From this perspective, actors create institutions through a history of negotiations that lead to 'shared typifications' or generalized expectations and interpretations of behavior (Lyyntinen, 2002). The patterned relations and actions that emerge from this process gradually acquire the moral and ontological status of taken-for-granted facts, which, in turn, shape future

interactions and negotiations (Myer and Rowan, 1977). Institutional theory is based on the notion that organizations must convince the industry and its members that they are legitimate entities worthy of support in order to survive (Meyer and Rowan, 1977). To gain this legitimacy, organizations create protocols about their operations, through the perpetuation of symbolic and ceremonial activities and stories about their activities (Haveman, 1993b). Organizations, concerned with survival and their legitimacy, take on forms to conform to socially accepted notions of what is appropriate (Haveman, 1993a).

THE AUSTRALIAN STOCKBROKING INDUSTRY

By the late 1990s, most Australian stockbrokers were automated and had begun to use computers to replace floor traders. Traditionally, floor traders take phone and computer orders from the brokers, and negotiate trades with stock specialists at trading stations on the trading floor. Nowadays, the Internet orders placed by the clients are first processed and authorised through the stock brokers' computer system before being put automatically on the stock exchange's computer system (Aitken, et.al, 2000). In Australia, Commsec, E-Trade, Westpac and Merrill Lynch-HSBC (Australia) Ltd are major Internet stockbrokers. This list is by no means exhaustive because various investment houses also offer exclusive stockbroking services for private clients. Most of these brokers offer Internet financial summaries, in addition to personalised investment services (Shankar, 2002).

Before today's extensive use of Internet, traditional brokerage houses that operated on expensive brick and mortar delivery platforms dominated the retail brokerage market. These firms charged high prices to the customers, but offered relatively little convenience. With the advent of the Internet however, came the new breed of brokerage service providers, who have made stockbroking a commodity (Burgess, et.al. 2001). The online brokers empower clients to trade online, and offer the customer benefits through increased convenience and greater access to information at significantly reduced costs. In 1987, the Australian Stock Exchange (ASX) initiated a system called SEATS, which was a system that first allowed a limited range of computer based trading in the ASX. This was active computer use in the industry prior to Internet. This major change was followed by CHES being implemented in two phases in 1994 and 1997, respectively. CHES is intended to transfer the title or legal ownership of securities between buyers and sellers. At the same time it facilitates the transfer of money for these securities between the CHES participants, e.g. stockbrokers, institutional investors and settlement agents (Shankar, 2002; Yang, et.al, 2000). The computerisation of the stockbroking has freed the brokers of a small number of contracts and has allowed them to join bigger entities and, thus, have access to far more information than before.

In this regard, the implementation of CHES caused several difficulties for brokers. They lead to:

- A need to invest a great deal in IS/IT access transactions within their organizations;
- A need to learn the skills necessary to take advantage of the possibilities in the new business environment; and
- A need to formulate a strategic business model that would allow them to not only survive but also to grow and prosper.

THE PROPOSED FRAMEWORK

The ASX, as the main governing body in the Australian Stock Market, requires that existing and new entrants in the stockbroking industry be a member of CHES. Membership of CHES means adhering to a number of other legal requirements imposed on the members within the industry. This is in addition to the institutional or group requirements that industries and networks have. Once the members of the industry adhere to these rules they are allowed to be different i.e. differentiate themselves within the existing requirements and boundaries and to compete to gain competitive advantage over their peers.

A review of the literature (CCLC, 2003; Zimmermann and Koerner, 1999; Smits, et.al, 1998; Aitken, et.al., 2000; Shankar, 2002; ASIC, 2003; ASIC, 2000; Sahut, 2003) suggests that industry factors affect the diffusion of ICT in the stockbroking industry acting both singularly and in concert. These factors include the:

- Then extant technology (presence of SEATS and CHES and the rules that accompanied with membership of CHES).
- Trigger for the introduction of the ICT (in the mid 1990s ICT was first used to speed up the transaction and also in the long term to be used for international stock trading); and
- Inter-firm relationships (an organization's ties to other organizations can either broaden or restrict its awareness of environmental trends and may also expose it to various adaptive responses employed elsewhere in the industry. Depending on its structure, an organization's network can thus either ameliorate or exacerbate the uncertainty created by environmental changes and affect the organization's ability to successfully adapt).

The framework in figure 2 addresses the role of dominant players in the industry, but at the same time acknowledges the possibility of firms internally adapting to change in the short and long-term. This conscious, dynamic survival is the main characteristic of the argument for partial equilibrium set forth by Hannan *et al.* (2003), in which organizational survival becomes a consequence of internal as well as external adaptation based on a mixture of imitation and innovation. Once organizations have changed in such a way that they are deemed suitable for the new environment, they can remain in the environment. On the other hand, organizational disappearance (death) represents a mechanism of externally induced selection processes through a reassignment of resources, thus provoking the death of less-adapted brokers (Tushman et.al., 1998; Dobrev, et.al. 2000) (Figure 2 below).

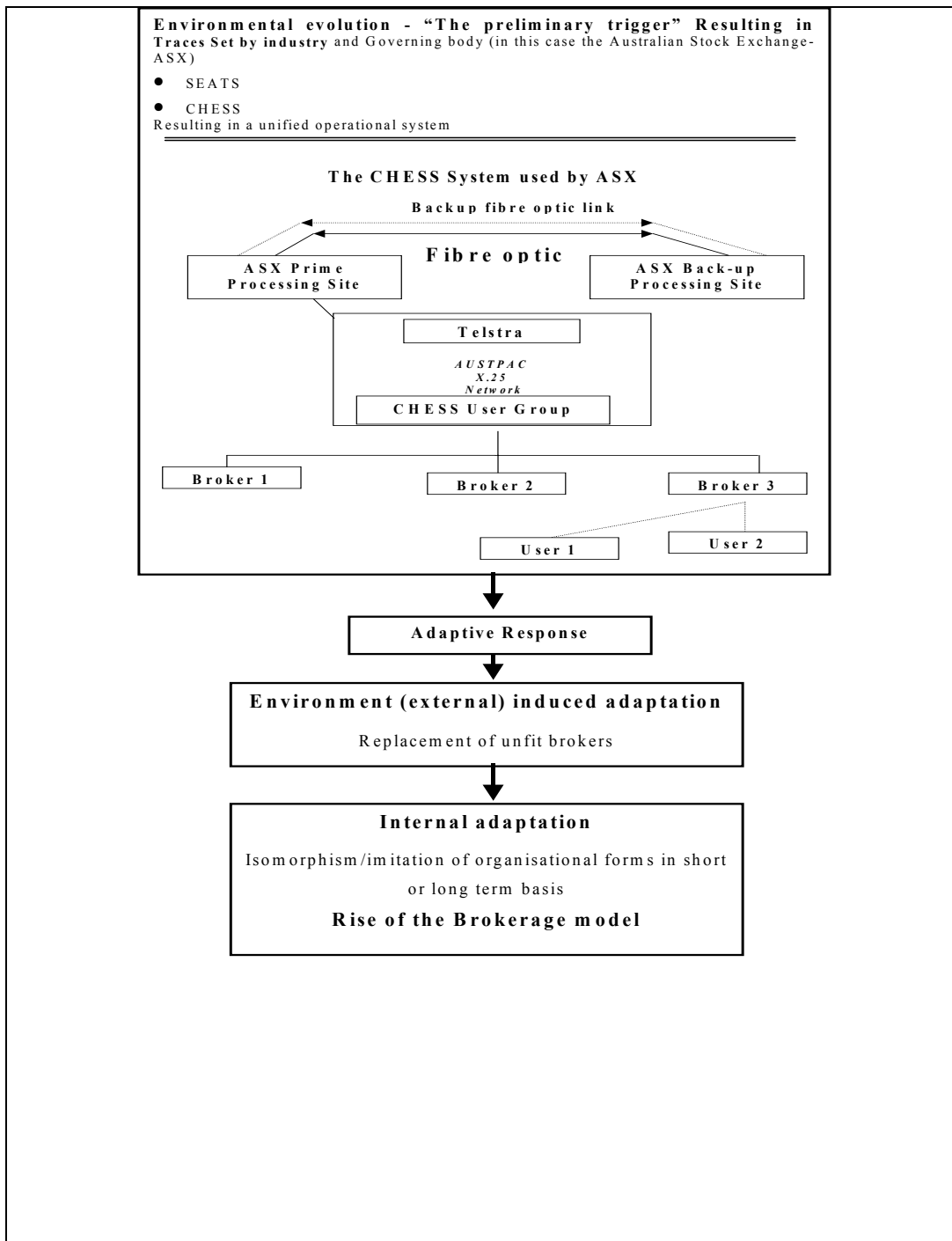


Figure 2: The proposed ICT diffusion framework showing the industry & cluster dynamics

Consider a hypothetical case where a stock broking firm decides that a strategic move would be to transform its business into an entity offering services to a very distinct group of customers. To achieve this, the first move is to offer the big suppliers such as the brokerage and discount wholesalers, banks, and investment firms services as a middleman. The stock broking firm can also negotiate with all the new suppliers of products and the other services offering them access to new clients. Secondly the stockbroker also takes advantage of ICT as the mode of communication in geographically dispersed locations by allying itself with brokers that serve small regional communities and in return provide the technological platform for the regional brokers, offering them access to information and resources they need to continue their previous operations. Therefore it is safe to assume that ICT provides a number of options as far as partners and the potential customer base is concerned.

Whilst ICT provides a wide range opportunities for cooperation between brokers, it also acts as a unifier of practice with ASX implementing SEAT and CHES and the majority of the brokers using one or two specific ICT platform for compatibility. This constant move between determinism and strategic choice (autonomy in the form of selection based on partners and potential customer base options) will shape the firms in such a way that although they look similar as far as the basic business model is concerned, their operations become vastly different. From the diagram below (Figure 3), it can be seen that once technology is diffused at the industry level, coupled with further development of the communication technologies, stock brokers retain a broker business model where they act as intermediaries between various firms in the value system; however within the predefined constraint (i.e. the broker business model) they differentiate themselves by having a more focused business strategy or a generalist approach catering to a wide variety of customers. In the Australian stockbroking industry, although brokerage is the base model of the industry, brokers can be categorized in terms of the kind of service they provide. In essence;

- Full service (advisory) stockbrokers
- Non-advisory stockbrokers

Full service brokers offer advice on buying and selling shares, make recommendations and provide research. They also offer other investments such as options, debentures and bonds and compile tailored investment plans. As full service brokers offer advice and other services investors generally pay a higher brokerage fee to buy and sell shares. In case of non advisory brokerage, they offer no recommendations or advice regarding the appropriateness of an investor's decision; consequently their brokerage fees tend to be lower than that of a full service stockbroker. Non-advisory stockbrokers can either operate only on phone or with Internet. Therefore in essence the basic operation of the stockbroker is to provide an intermediary function between customers and other members of the value system involved in stock transactions. However after having this basic characteristic each stockbroker tends to differentiate itself based on the type of technology it uses and also the level of service it provides (Haveman, 1993a; Haveman, 1992).

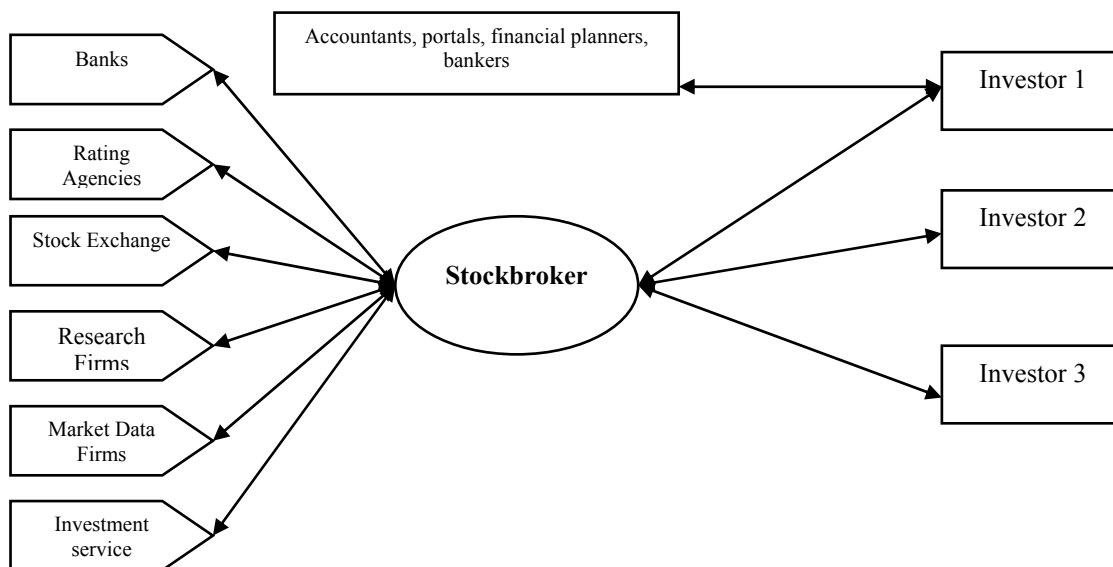


Figure 3: Diffusion of technology at industry and cluster level

The framework in this paper proposes that although isomorphism is argued to be the outcome of institutional change, nevertheless, it is believed that ICT will allow diversity among organizational forms. Diversity is essential for changing institutional norms. This is in contrast to DiMaggio and Powell (1983) who discussed isomorphism based on the assumption that organizations become increasingly similar through institutional forces. Their primary focus is on the maintenance of institutional norms through coercive, mimetic, and normative processes. In doing so, they have ignored organizational diversity and its role on future organization change (Haveman 1992).

DISCUSSION

In the proposed framework, the aim was to develop an institutional aspect of diffusion of innovation. The approach would proceed from a different set of ideas from Rogers' diffusion of innovation theory and the schools of thought within this theoretical realm. In this paper the emphasis was on the experimentation and cooperation rather than coercive action by bigger actors to dictate rules and regulations" (McMaster, Vidgen&Wastell, 1997:65). In this regard, diffusion of innovation is not always a push mechanism in a sense that the way industry is run is always pushed down the chain of command and adhered to by all the members. Rather in some cases and especially with the usage of IT smaller firms can shift the balance of power to themselves and thus the players in the network need to change their role and strategy from a push to pull (McMater et al., 1997).

As the framework indicates in (figure 2), from a macro perspective, the initial trigger for change (being the adoption and integration of Internet in most of the stock transaction processes) results in setting a uniform working platform that sets the boundary within which change can take place. In the case of the stockbrokers, the ASX implemented SEATS followed by CHES to eliminate traditional floor trading and speed up the transactions by using ICT. However once the macro limits, such as uniform technology is in place, firms actively seek to differentiate themselves. One way is to develop a cluster-like cooperation where the broker acts as a go-between for the players in the industry, and provides services at a lower cost. This is in sharp contrast to the time when the strategy had to be developed in-house at a higher price by the brokerage houses.

In terms of cluster level change, diffusion occurs in a predetermined set of norms. In a sense the industry has already chosen the right path for the firms, and the "right way" of operating is predetermined for its entire members. However, within these predetermined norms, firms have the strategic choice of being selective to ensure their differentiation from other participants in the industry. This constant move between determinism and strategic choice (autonomy in form selection), coupled with further development of the communication technologies will result in the inter-organizational ties between firms in the industry being strengthened. Over time, these "technology-induced embedded" relationships (Granovetter, 1985) accumulate into a network or a cluster of firms connected together to deliver the final product/service to end consumers (Granovetter, et.al., 2000). This is how value networks or ICT enabled alliances are formed. These dictate the way that new technologies are diffused in the industry. Therefore, diffusion of ICT can be regarded as a phenomenon exceeding the rationalistic assumption of markets and encompasses relationships that influence the choice(s) of diffusion.

In the Australian stockbroking industry, although brokerage is the base model of the industry, they are divided based on the kind of service they provide. In essence the basic dichotomy is based on the extent of service that brokers provide. This means there are two basic brokerage options one being a full service (advisory) stockbrokerage and a non-advisory brokerage. Full service brokers offer advice on buying and selling shares make recommendations and provide research. They also offer other investments such as options, debentures and bonds and compile tailored investment plans. As full service brokers offer advice and other services you generally pay a higher brokerage fee to buy and sell shares. In case of non advisory brokerage, they offer no recommendations or advice regarding the appropriateness of your decision; consequently their brokerage fees tend to be lower than that of a full service stockbroker. Non-advisory stockbrokers can either operate only on phone or with Internet. Therefore in essence the basic operation of the stockbroker is to provide an intermediary function between customers and other members of the value system involved in stock transactions. Based on the above one can regard the diffusion of the ICT into stockbroking firms, as the result of conscious decisions made on behalf of the brokers based on the resources and linkages they have had in doing business.

CONCLUSION

This paper looks at the consequences and opportunities created as a result of ICT diffusion in the stockbroking industry, from an institutionalist perspective. As mentioned earlier, ICT creates an environment where the old ways of operating no longer applies and new rules have to be developed. These new rules set the conditions within which organizations can operate, within which management can make strategic choices. The proposed framework examined the structure and governance

mechanism of the industry by examining the role of ASX and the influence of SEATS and CHES on the marketplace. It also acknowledges the social context (i.e. role of technology and change in the niches) and economic outcome of change (i.e., role of inter-organizational relationships and power relations between the dominant and small brokers). It is suggested that the ICT diffusion framework for the stockbroking industry presented can be used by the industry leaders to actively shape the adaptive trajectory of their firms. These industry leaders can in turn define the way the industry is and should be. They provide blueprints for organizations by specifying the forms and procedures an organization of a particular type should adopt if it is to be seen as a member-in-good-standing of its class.

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