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Abstract

A review of the Diffusion of Innovation (DOI) literature is carried out. This review is later applied to the uptake of the Internet amongst stock brokers in Australia. A framework is proposed where organizational uptake of the Internet and Internet-based trading is embedded in an institutional context encompassing an industry as well as brokerage level of analysis. It is anticipated that the industry's governing body establishes the overall legal and professional boundaries. Within these boundaries individual stock brokers differentiate themselves through selective adoption of components of the new technology. This is to incorporate the initial setting of industry level protocols and regulations in addition to the semi-autonomous differentiation at the brokerage level. Following the proposed framework, a comparative analysis of traditional and institutional approaches to DOI is carried out.

KEYWORDS**:** *Internet, Internet-based trading, Inter-organizational cooperation, Stock broking, Industry-level analysis, Clusters, Australia*

INTRODUCTION

The adoption of Internet and Internet-based trading by stock brokers has resulted in a number of structural and firm-level changes. Dominant firms within this sector who readily adopt the Internet are able to stimulate the firms with whom they interact and cooperate, to also embrace the cited technological innovations. One motive for this is to safeguard any competitive advantage they gain.

In general, as Kauffman *et.al.* (1999, 2000) found, firms in the finance industry including the brokers tend to implement the technology that addresses their immediate survival needs and/or will improve their competitiveness. Fichman (1999) and Lyyntinen & Klein (2002) pointed out that when diffusion is not uniform, at the industry level, taking cumulative or sequential effects in diffusion process as a valid indication of a successful diffusion is wrong. To understand this process and the factors that influence the rate of diffusion one needs to put aside Rogers' (1983) Diffusion of Innovation (DOI) theory which looks at diffusion as a flow of ideas and innovative practices from dominant organizations and instead look at the role of environment and inter-organizational relationships influencing the scope of uptake of the Internet on the daily operations of the firms. At the macro level diffusion proceeds sequentially by setting the boundaries imposed through legal and professional requirements. By allowing an institutional perspective, diffusion at firm level develops into selective adoption of innovative technology or practice within the industry endorsed limitations. In order to develop a theoretic framework of diffusion, the following questions are asked:

- When the stock brokers responded to the Internet, why did they choose the particular options/ strategies they did?
- What prompted strategic success and/or failure?

In order to answer the above questions, a review of the literature on the Internet and Internet-based trading is carried out. This is further complimented with a theoretical framework to describe the relationship between firms and industry level innovation uptake. This approach is then applied to the Australian stock broking industry, where, the governing body has set the overall legal and professional boundaries. Individual stock

brokers later differentiate themselves within these boundaries through a selective adoption of components of the new technology.

THEORETICAL DEVELOPMENT

Rogers and diffusion of innovation

According to Rogers (1983) diffusion is a process by which an innovation spreads across a population of organizations beginning with the initial awareness of the innovation, and progressing to its formal adoption and full scale development. Rogers (1983) believes that adoption of diffusion is only successful if the innovation is superior be it in technology or managerial practices and also if the entity supports and advocates the adoption of the innovation. In reality Rogers has not talked directly about technology as the sole source of competitive advantage and relative superiority in the industry. Nonetheless in Information Systems research the technological innovation and superiority in the industry tend to go hand in hand (McMaster, & Kautz, 2002). Rogers's analysis has further given rise to four general approaches to diffusion, each dealing with the concept of 'diffusion' at an industry level and 'adoption' at a firm level (Fichman1999):

- *Innovation decision process theory:* Potential adopters of a technology progress over time through five stages (knowledge, persuasion, decision, implementation and confirmation).
- *Individual innovativeness theory:* Individuals who are risk takers or otherwise innovative will adopt an innovation earlier in the continuum of adoption/diffusion.
- *Rate of adoption theory:* Diffusion takes place over time. Innovations usually go through a slow, gradual growth period, followed by dramatic and rapid growth, and then a gradual stabilization and finally a decline.
- *Perceived attributes theory*. There are five attributes upon which an innovation is judged. These are complexity, trialability, observability, relative advantage and compatibility (Fichman, 1999).

Rogers' interpretation of diffusion theory has emphasized that communication links are required to drive technology adoption. In addition to communication, obtaining the knowledge required to assimilate and deploy technologies is likely to play an important role in patterning the diffusion of complex technologies (Attewell, 1992). Fichman (1992; 1999) found from his extensive review of the diffusion literature that what was adopted and how it was adopted was dependent on the context in which the adoption took place.

Fichman (1992) developed a conceptual framework to guide future research in diffusion. He identified two adoption contexts: *classes of technology* (those that conform closely to classical diffusion assumptions versus those that do not) and *locus of adoption* (individual versus organizational). Rogers' interpretation according to Fichman (1999) is viable in situations where technology is developed and assimilated mainly by organizations which have the ability to acquire the appropriate knowledge as well as develop barriers against other potentially competitive innovations. Diffusion starts out slowly among pioneering adopters, reaches "take-off" as a growing community of adopters is established and levels-off as the population of potential adopters becomes exhausted. This leads to an "S-shaped" cumulative adoption curve. Innovations possess certain characteristics (relative advantage, compatibility, complexity, trialability, observability) which, as perceived by adopters, determine the ultimate rate and pattern of adoption (Fichman, 1992).

An institutional approach to DOI:

The traditional approach to DOI pointed to diffusion being a decision to use a certain innovation, technological or managerial in a given organizational as well as industrial context (Mustonen-Ollila and Lyytinen, 2004). This decision implies that there is a recorded intention to use the innovation based on what other firms have done and have in turn succeeded in doing. The bulk of innovation from this perspective is based on external knowledge that is diffused sequentially amongst firms based on size and power relations in the industry. However one thing the researchers (Lewis and Seibold, 1993; Harvey, Palmer and Speier, 1998) neglected in evaluating the 'success' or failure of formally adopted innovations was the fact that adoption is not an all or nothing process. As Lewis et. al, (1993) point out; "Innovation research findings have increasingly noted the lack of fidelity (match between design/intended use and actual use) and uniformity (similarity across users) in innovation process outcomes" (Lewis et. al, 1993: 323). In line with his argument, the institutional approach reconsiders the sequential adoption and implementation stages. This proposed approach accepts the initial stage of diffusion being deterministic in nature. However, this determinism is later replaced with autonomy where within a specified constraint firms tend to differentiate themselves. This is similar to the findings of Mustonen-Ollila et.al. (2004) where the findings showed in IS-based adoption, companies prefer to adopt an externally-furnished innovation "only if it fits well with an identified problem and there were no internal resources to address the

need of the firm" (Mustonen-Ollila et.al., 2004: 43). Therefore the process of adoption is a function of individual firm's strategic choice in conjunction with externally-induced professional and legal boundaries.

According to Hannan and Freeman (1989), at any given point in time, the structure of any given organization is the cumulative result of a series of decisions made based on the structural and industry options available. In other words, the environment is very specific in its selection and retention. Regulations and protocols are reflections of entry barriers that each industry develops to control the inflow of newcomers. Once industry and governance structures as well as "legitimate" organizational form have evolved, in order to survive and innovate, each firm can occupy a position in a web of strongly complementary technical relationships. Once the innovation is taken up, it creates cumulative paths or industry level protocols. These protocols coupled with clusters of firms serving a specific niche are the first levels of regulatory boundaries that centre around the original innovation. From this perspective, diffusion results in a change where at a macro level change becomes a dynamic initiation process that all members of the industry should go through in order to be allowed to stay in the industry. At the firm level however, infusion of innovation becomes selective i.e. through experimentation; mimicry and past experiences firms tend to differentiate themselves by selecting from a range of opportunities provided by the new innovative tools such as technology.

In this proposed approach similar to an institutional approach to change (Baum, 1996a, 1996b; Boone *et al*., 1995; Haunschild and Miner, 1997; Zucker, 1984) it is posited that the diffusion of ICT is affected by several factors acting both singularly and in concert, including the extant technology, the introduction of the innovative technology and the structure and coordination mechanisms within the industry (Boon *et al*., 1995:p.267-272).

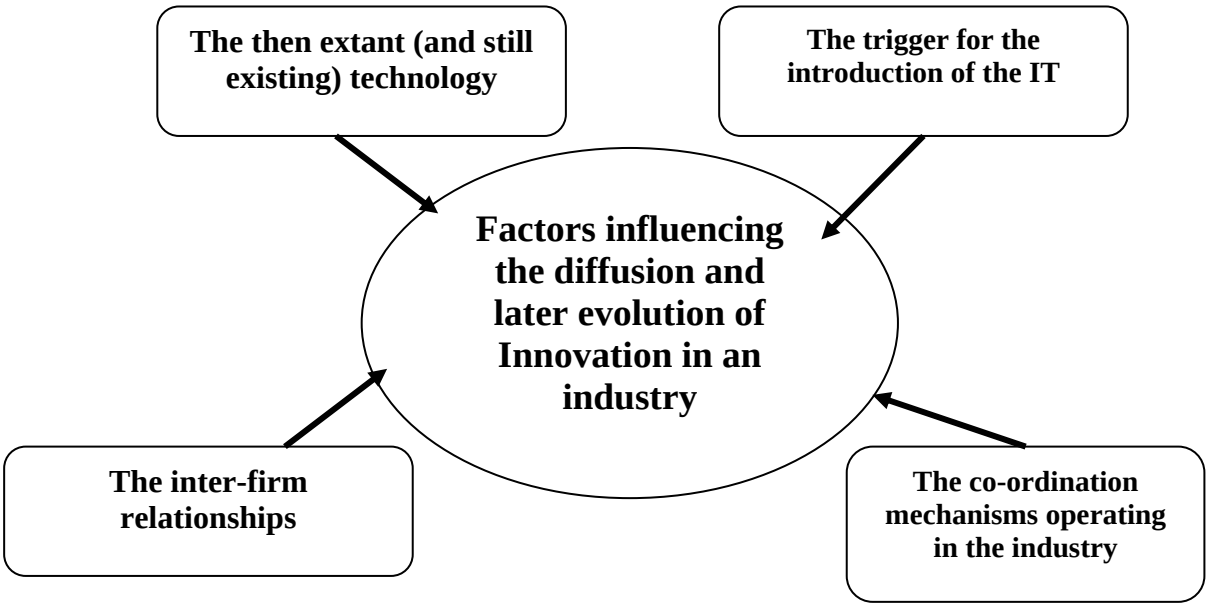

Figure 1: The Institutional approach: Factors influencing the diffusion of innovation adapted from Boon *et al*., (1995:p.267-272).

Institutional theory ranks the coordination mechanism and inter-firm networks more important than technology as a source and trigger for change. This is because the interfirm relationships and coordination mechanisms play a far more decisive role than the type of technology and the possible options or variations of technology. Inter-firm relationships are so important to an extent where it can also influence the cross industry uptake of innovation as industries tend to get interconnected by firms' value chain and industries' value systems (Porter, 2001). Based on the articles reviewed (Abrahamson (1991); Abrahamson, and Rosenkopf (1997); Antonelli, (1989); Baptista. (2000); Dosi, Malerba, and Teece (2003); Galaskiewicz and Wasserman (1989); Powell (1987, 1990); Singh, (1986)) the sequential approach to diffusion is only limited to setting the macro boundaries, which includes professional or legal restrictions. Therefore, firms are encouraged to operate autonomously outside their immediate value chain. This is an institutional approach whereby a mix of determinism and autonomy replaces total industry dominance as advocated by classical DOI theory (Leonard-Barton, 1988).
This approach was also used by Mustonen-Ollila et.al. (2004) in studying diffusionary practices when it was observed that, the majority of the innovation uptakes included a general uptake of diffusion with the legal and

professional specifications that the industry had outlined. However the innovation was later customised. Mustonen-Ollila et. al. (2004) further point to the notion of strategic decision making of firms in absorbing innovative technologies and/or practices; "more over, there was no change in this aspect over time. The companies studied, routinely formalised, made explicit and transferred internal IS innovation knowledge into broader categories identified by the industry to suite them" (Mustonen-Ollila, et.al, 2004: 44). The discussion of the proposed framework can be illustrated by the following example from the Australian stock broking industry.

AUSTRALIAN STOCK BROKERS AND DOI: A WORKING EXAMPLE

By the late 1980s, most Australian stock brokers' transactions were computerised and had begun to use computers to replace floor traders. Traditionally, floor traders took phone and computer orders from the brokers and worked with stock specialists at trading stations on the trading floor. In 1987, the Australian Stock Exchange (ASX) initiated a system called Stock Exchange Automated Trading Systems (SEATS), which was basically a computer-based trading system that first allowed a limited range of computer based trading in the ASX in 1987. This major change was followed by Clearing House Electronic Subregister System (CHESS).This was implemented in two phases; the first in 1994 and the second in 1997.

The computerisation meant that there was a reduction in the number of floor traders and the staff required to transact and register daily trades. At the same time imposition of CHESS memberships provided the possibility for each broker to do trade without relying on wholesale stock traders. This reduction in staff and a relative autonomy of brokers in dealing with customers without total reliance on bigger traders meant brokers had either the choice to trade by themselves or become an affiliate. Being independent meant focusing on a small niche and evolving into an entity fully equipped to serve that specific niche. On the other hand becoming an affiliate meant joining bigger entities and in doing so, gaining access to far more information and potential customers, with lesser autonomy (Aitken, Muthusamy and Wong, 2000).

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 the Internet as the mode of communication in geographically dispersed locations by allying itself with brokers that serve small regional communities and in return provides the technological platform for the regional brokers, offering them access to information and resources they need to continue their previous operations.

Therefore, whilst IT provides a wide range of opportunities for cooperation between brokers, it also acts as a unifier of practice with ASX implementing SEAT and CHESS and all the brokers using both the platforms for compatibility not only with ASX but also with Australian Securities and Investment Commission's legal requirements (ASIC, 2003). 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. The constant move between these options is in fact due to the dynamic nature of the environment and a proactive approach of the firms in experimenting with alternatives provided as a result of IT diffusion. In the Australian stock broking 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 the two main groups of brokers are: full service (advisory) stock brokers and non-advisory stock brokers. 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 high brokerage fee to buy and sell shares. Non-advisory brokerage, on the other hand 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 stock brokers can either operate only on the phone or via the 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 each stock broking firm tends to differentiate itself based on the type and the scope of service they provide. It is fair to say at their base all brokers act as intermediaries between customers and other entities in the value system, that tend to operate in the back office (in that customers do not necessarily need to meet them to buy or sell stocks and this is essentially the basic service a broker provides). However the main point of differentiation is whether information about the market trends and possible good options are provided in addition to the information available in newspapers and other mass media. In the case of the Australian stock broking industry, this is the

main differentiating characteristic where as mentioned, the function and scope of the information provided would separate information-providers from non-advisories.

PROPOSED FRAMEWORK

Based on the example of the Australian stock broking industry, from a macro perspective, the initial trigger for change results in setting a uniform working platform that acts as a boundary that outlines sanctioned technologies and managerial practices in the industry. However, once the macro protocol or the uniform technology is in place, firms actively seek to differentiate themselves. Therefore the proposed framework seeks a balance between the selective as well as adoptive mechanisms of DOI. In exploring the industry and broker level of analysis, the following assumptions underline the proposed framework: Firstly, the emergence of forms is best explained in terms of the relationships that develop between the organizational suppliers, consumers, regulators, and intermediaries operating in an institutional arena (DiMaggio and Powell 1983: 148). Secondly, the constitutive rules have a strong bearing on how new form will be developed (see also Kwon 1990). Novel organizational forms are most likely to become legitimated when they fit into the pre-existing cultural beliefs, meanings, and typification of an organizational community (DiMaggio and Powell 1983). Thirdly, the distribution of population densities for existing forms within a community will have a strong bearing on the development of new forms.

As the proposed framework in figure 2 represents, from an institutional point of view as far as the macro level is concerned, the innovative change results in the choice of technology and or/governance mechanism which include managerial practices. This is important to note since not all innovations need to be technology oriented. The change in the industry will result in two possible out comes. First, the unfit brokers are removed and second the brokers that can adapt are given a chance to do so. The process of adaptation is as follows; the industry and governance structures as well as "legitimate" organizational form have evolved, in order to survive and innovate. At this stage compatibility and standardisation is essential. After the brokers' compliance with the "legitimate" structures and protocols, each firm can later strategically differentiate itself as long as the differentiation falls within the predefined "legitimate" boundaries.

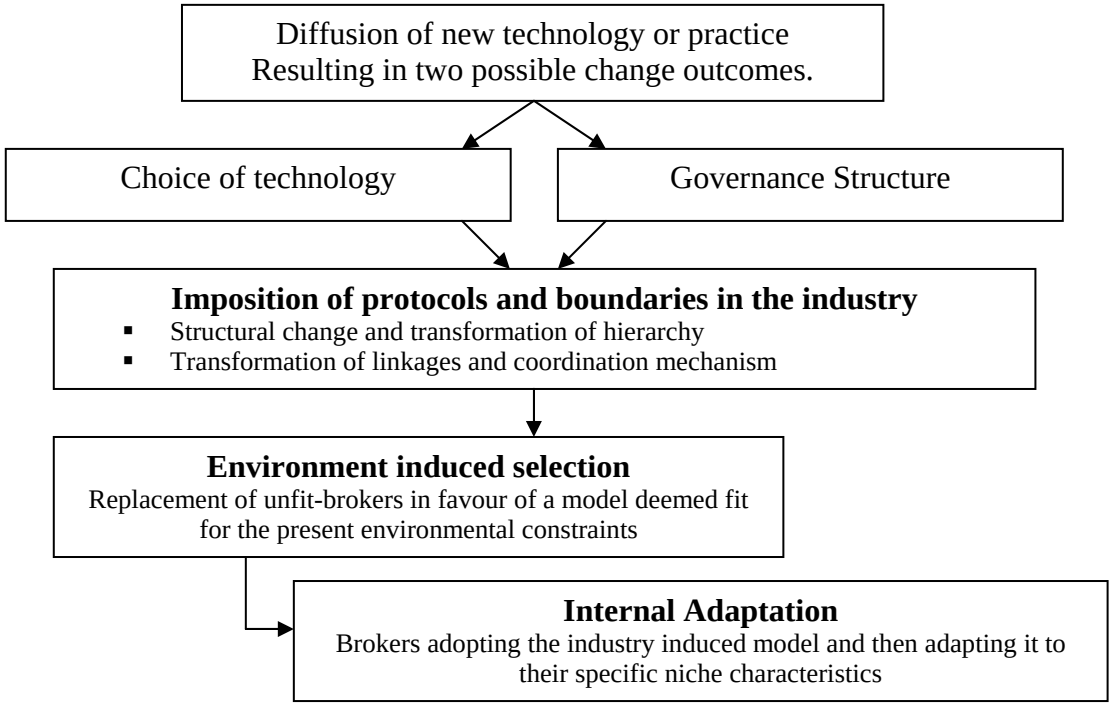

Figure 2: Proposed framework

This theoretical framework contributes to the institutional research agenda in several ways. Firstly, to develop the micro-foundations of institutional theory the paper focuses on the behaviour of individual firms, and tries to explain the variety of responses to regulatory and competitive pressures. Secondly, the uniformity assumption is relaxed. This means first technology or any other innovative change results in unification practice across an industry. After the initial unification of practices, members of the industry will differentiate themselves as long as their practices are in line with the regulatory framework developed, maintained and monitored by the industry's regulatory authority, in this case ASX and ASIC. This is an approach which highlights a possible alternative to Rogers' theory of DOI, in that diffusion is not a cumulative, sequential process and change as a result of innovation, and tends to include social as well as technological perspectives (Leonard-Barton, 1987).

Finally, following the analysis of the traditional DOI, the institutional approach in this paper is examined based on the initial variables outlined by Fichman (1992).

Component	**Definition/ Generalization Rogers (1983) Diffusion of Innovation Theory. Source: Fichman, (1992)**	**Definition/ Generalization An institutional perspective on the diffusion of Innovation**
Definition of diffusion	Diffusion is the process by which a technology spreads across a population of organizations stretching from initial awareness of the innovation, to potentially, formal adoption and full scale development (Rogers, 1983).	In addition to the general definition of diffusion there is a need to explore normative relationships between firms ad the governing body of industry when confronted with a new system.
Typical diffusion pattern	Process starts out slowly among pioneering adopters, reaches "take-off" as a growing community of adopters is established and the effects of peer influence arise, and levels-off as the population of potential adopters becomes exhausted, thus leading to an "S-shaped" cumulative adoption curve.	Diffusion at a macro level acts as unifier of practice by imposing protocols and regulations that all members should abide by in order to be deemed legitimate. However within these protocols and boundaries firms tend to exert autonomy and differentiate themselves.
Characteristics of innovation	Innovations possess certain characteristics (relative advantage, compatibility, complexity, trialability, observability) which, as perceived by adopters, determine the ultimate rate and pattern of adoption.	Innovations possess certain characteristics (relative advantage, compatibility, complexity, trialability, observability) which, as perceived by adopters, determine the ultimate rate and pattern of adoption.
Characteristics of the adopter	Some potential adopters are more prone to innovate than others, and can be identified as such by their personal characteristics.	As far as the industry level diffusion is concerned, firms tend to have uniform characteristics. It is the macro characteristics that later distinguishes adopters from each other.
Opinion leaders and change agents	The actions of certain individuals (opinion leaders and change agents) can accelerate diffusion, especially when potential adopters view such individuals as being similar to them.	The actions of certain firms (opinion leaders and change agents or dominant firms in case of industrial cliques) can speed up diffusion by imposing an environment that favours fast adoption of the new initiative. The opposite is also true when the influencers do not see the change as necessary or view it even as dangerous to their existence.

Table 1: A comparative analysis of DOI components

Coming back to the sections in the literature review with the propositions mentioned earlier in the paper; two questions were posed in the introduction to this paper. By using an institutional approach to DOI, one can answer the following questions;

- When the Stock brokers responded to the Internet, why did they choose the particular options/ strategies they did?

The interviews indicated that when the Internet was diffused in the industry, at first it resulted in price wars since the Internet by reducing the cost of transactions had increased price-based competition. This resulted in entry of new online brokers competing for a piece of the market based on low prices and it prompted the traditional brokers to rely on their relationship with customers. Over time the Internet resulted in convergence of organizational archetypes as a result of unification of practice where traditional agents also dealt with online transactions in parallel to their brick and mortar presence.

- What prompted strategic success and/or failure?

Institutionalism suggest that success or failure will depend, in part, on how well the changes made as a result of management exercising strategic choice, fit the organization to the new environmental conditions. Finally there will be the incremental changes that accrue following every major environmental change, but just as no one could predict the conjunction of the Asian financial crisis and the serendipitous level of development of Internet technology, the next major stimulus for change, and hence the responses or solutions, cannot be predicted.

Conclusions

This paper looks at the institutional and structural consequences and opportunities created as a result of ICT diffusion in the Australian stock broking industry, from an institutionalist perspective. Internet and Internet-based trading creates an environment where the old ways of operating no longer apply 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 the ASX and the influence of SEATS and CHESS on the marketplace. It also acknowledges the social context (i.e. the role of technology and changes in the niches). It is suggested that the ICT diffusion framework for the stock broking 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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