Organizational Adoption of XBRL

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INTRODUCTION

Electronic business and markets continue to gain influence in many sectors of the economy. These relatively recent phenomena involve information technology (IT) related innovations that are increasingly important sources of business innovation, organizational competitiveness and survival (Fichman 2004, Swanson 1994). Research on the uptake of these innovations is necessary if we are to understand their significance and their implications for management and organizations.

Many e-business innovations are what King et al. (1994) term ‘network innovations’, embedded in complex technological and social networks of institutions, knowledge, infrastructure and support. The diffusion of network innovations is highly complex and has been relatively neglected in the literature (Damsgaard and Henriksen 2004, Kurnia and Johnston 2000). This paper aims to address this shortcoming using XBRL diffusion in Australia as an example.

XBRL (eXtensible Business Reporting Language), is a relatively new technology for web-based financial reporting (Pyman 2004). XBRL’s proponents have suggested that it will revolutionize the entire financial information supply chain (Brown and Willis 2003). With an increasing number of leading organisations, including accounting, software, regulatory organisations, supporting integrated and consistent electronic reporting around the world, XBRL is touted to become the standard language for financial reporting (Bergeron 2003, Fielding 2003).

As a new technological innovation, the success of XBRL will be determined by the scale of its adoption by businesses. Yet, the results of the survey conducted by Pinsker (2003) suggest that relatively little knowledge of and experience with XBRL exists in the auditing, accounting and financial reporting sectors. We are interested in why, given the espoused benefits of this innovation in electronic financial reporting and markets (Doolin and Troshani 2004), XBRL adoption has been limited. We use Australia as a case study of XBRL adoption and diffusion in order to explore this research question empirically.

In this study we focus on the organizational adoption of IT innovations, rather the secondary adoption of an innovation by individuals within an organization (Russell and Hoag 2004, Zaltman et al. 1973). Network innovations in IT require institutional support and commitment and are frequently too significant and complex to be adopted on the authority of an individual (Dedrick and West 2004). In the following section we introduce the XBRL innovation and explain why...
we believe it is a useful network innovation to study. We then ground our study in prior work on IT innovation adoption. Since the organizational adoption of XBRL is not well understood, we use an exploratory approach grounded in qualitative data to provide an analysis of the reasons for its relatively limited uptake in the Australian context (Benbasat et al. 1987, Dedrick and West 2004). The analysis leads to the development of a conceptual model of contextual factors influencing organizational adoption of e-business innovations.

**XBRL**

XBRL is an XML-based non-proprietary open standard that is used for the preparation, exchange and publishing of financial information across disparate computer platforms, software applications and accounting standards. XBRL is intended to eliminate time-consuming, labor-intensive and error-prone practices which are currently used for generating and exchanging financial reports. In addition, it facilitates analysis and continuous auditing, thereby maximizing the transparency with which financial information is reported and consumed (Doolin and Troshani 2004).

XBRL is a derivative of XML (eXtensible Markup Language) and as such it takes advantage of the ‘tag’ notion which associates contextual information with data points in financial statements. When formatted with tags, financial statements are called XBRL instance documents. The tags themselves are based on accounting standards and regulatory reporting regimes and are defined in XBRL taxonomies. These are developed for specific countries, accounting jurisdictions, and even specific organizations (Debreceny and Gray 2001, Deshmukh 2004). Sometimes, multiple instance documents produced using different taxonomies need to be processed by the same software tool. Capabilities of this nature are enabled by the XBRL specification, which constitutes the rules and technology platform determining how XBRL works. This specification is central to the operation of XBRL (Willis et al. 2003).

XBRL was developed under the auspices of the XBRL International, a consortium which oversees the evolution of the XBRL specification and coordinates the efforts of local consortia. The latter cover local jurisdictions based on countries, regions or internationally recognized business reporting regimes (Doolin and Troshani 2004). The aim of a local consortium, such as XBRL Australia, includes promoting XBRL and developing local taxonomies. XBRL is complex, and software tools are used to produce and read instance documents. Collectively, XBRL International, the local consortia, and software developers and vendors are suppliers of the XBRL innovation.

Potential adopters of XBRL include individual organizations, accounting firms, investors and analysts, stock exchanges, banks and regulatory authorities. These adopters are different in the way they deal with financial reports, and therefore, in the way they benefit from XBRL. Some produce financial reports, while others consume them (Bergeron 2003). Producers and consumers of financial reports are connected through information flow requirements. For instance, in Australia, individual organizations are required by law to submit financial reports regularly to regulatory government authorities, such as the Australian Stock Exchange, a consumer. This suggests that, generally, adopters require two types of automated software tools: tools which produce instance documents, and tools which consume them with the aim of carrying out further processing and analysis. Combined together, the suppliers and adopters of XBRL constitute its community (Markus 1990).

Issues such as coordinating the efforts of the local consortia, motivating first movers, and managing XBRL complexity are expected to be challenges when implementing XBRL. These factors are associated with the innovation environment, the nature of the adopting organization, and the technology upon which the XBRL innovation is based. In particular, XBRL shares a number of distinctive features with other network innovations, such as EDI (Damsgaard and Lytyinen 1998). XBRL is inter-organizational, connecting organizations electronically, and opening up an organization’s interior to partners. It is a relatively complex innovation that requires specific expertise to implement, if not operate. It relies on a reliable telecommunications infrastructure, and standards are essential in its diffusion. Network externalities are important in its adoption decisions, and there is considerable third party involvement in the development and provision of XBRL services.

**ORGANIZATIONAL INNOVATION ADOPTION**

Examination of the literature on why organizations adopt IT related innovations reveals multiple approaches to studying this phenomenon. One of the most established approaches involves the identification of a range of contingency factors that influence the adoption of the innovation (Allen 2000, Fichman 2004, Jeyaraj et al. 2006, Kwon and Zmud 1987, Prescott and Conger 1995). Each factor is assumed to be a necessary and sufficient condition for the adoption outcome to occur (Markus and Robey 1988). Fichman (2004) calls the specific combination of factors that are collectively sufficient to explain an innovation outcome the ‘innovation configuration’ (p. 320).

Innovation adoption is a complex, context-sensitive process (Wolfe 1994). Factors influencing the organizational adoption of an innovation can be classified as characteristics of the organization, its environment, and
the innovation or technology itself (Flanagin 2000, Jeyaraj et al. 2006, Kwon and Zmud 1987). Many contingency or factor models of IT innovation adoption tend to follow this ‘technology-organization-environment’ approach (DePietro et al. 1990), suggesting that it is useful for understanding IT innovation adoption. Following calls to extend the framework to other innovation domains (Chau and Tam 1997, Thong 1999, Zhu et al. 2003), we have used it to organize our exploratory study of the factors that facilitate or inhibit adoption of XBRL by Australian organizations. We acknowledge its limitations as a theoretical framework but, following Dedrick and West (2004), find it to be “a useful analytical tool for distinguishing between inherent qualities of an innovation itself and the motivations, capabilities, and broader environmental context of adopting organizations”.

DePietro et al. (1990) technology-organization-environment model defines an innovation adoption context that arises from the interaction, and influence on innovation decision-making, of three elements of context (Figure 1).

The technological context comprises characteristics of current practices and technologies internal to the organization and of available relevant external technologies. Innovation adoption decisions depend on both what is available and how well the available technology fits the organization’s existing technological base (DePietro et al. 1990). Technological factors are often operationalized in innovation adoption studies using innovation characteristics drawn from the work of Rogers (2003) on the diffusion of innovations. While Rogers (2003) is interested in the influence of these factors on individuals’ adoption of innovations, they have been used by extension in the study of organizational innovation adoption by other authors (Fichman and Kemerer 1993).

In particular, Tornatzky and Klein (1982) found that the relative advantage of an innovation over its predecessor, its compatibility with the organization’s needs and existing systems, and its complexity, were consistently associated with innovation adoption behaviours. Potential adopters typically evaluate an innovation in terms of whether the likely benefits outweigh the costs of adoption (Premkumar et al. 1994). A radical innovation is likely to represent increased relative advantage, but reduced compatibility with an organization’s existing infrastructure and legacy systems (Dedrick and West 2004, Premkumar et al. 1994). The number and difficulty of processes and activities involved in its adoption may also negatively influence adoption (Niederman 1998).

Aspects of the organizational context that may facilitate or inhibit adoption of an innovation include an organization’s structures and processes (DePietro et al. 1990) and the internal resources that constitute an organization’s readiness to introduce an innovation (Chau and Hui 2001, Chwelos et al. 2001, Kuan and Chau 2001, Wymer and Regan 2005). Large organizations are more likely to have financial and human resources available for IT investment and adoption, have a greater need for internal and external coordination through IT, and be able to achieve benefits such as economies of scale (Zhu et al. 2003). However, Premkumar et al. (1997) note that smaller organizations may be less conservative than their larger peers, and more open to innovative ideas and technologies. Employees’ expertise and confidence to implement and operate a technology-related innovation affect both the human capital available for adoption and its acceptance within the organization (Chau and Hui 2001, Fillis et al. 2004). Support within an organization for an innovation, either from top management (Grover 1993, Premkumar and Ramamurthy 1995) or an internal innovation champion (Premkumar and Potter 1995, Russell and Hoag 2004) can also be an important enabler in the adoption of new IT.

The environmental context constitutes the arena in which adopting organizations conduct their business. Within this context, relationships with business partners, competitors, industry associations and government, may influence adoption decisions (DePietro et al. 1990). The more intense the competition in an industry, the stronger is the pressure on an organization to adopt alternative innovations in order to gain or maintain competitive advantage (Chwelos et al. 2001, Damsgaard and Lyttinen 2000, Ramamurthy et al. 1999). Influence or pressure from trading partners can also be an important factor in the adoption of inter-organizational innovations such as EDI (Bouchard 1993, Iacovou et al. 1995).

For an innovation to be adopted, information about it must be available to potential adopters (Premkumar et al. 1994, Rogers 2003). The extent of information

![Figure 1. The context of technological innovation adoption (after DePietro et al. 1990).](image-url)
available will depend on the level and nature of communication within the industry (Frambach 1993). An environment with success stories and pioneering adopters can also raise awareness and encourage innovation adoption (Elliot 2002, Gharavi et al. 2004). Critical mass theory suggests that the potential benefits of certain innovations require a critical mass of adopters in order to be realized. In particular, the benefits of network innovations are derived from the positive network externalities associated with mass adoption (Katz and Shapiro 1986, Markus 1990, Shy 2001). Without a critical mass of adopters of inter-organizational innovations such as EDI the network externalities are low (Bouchard 1993, Damsgaard and Lyytinen 2000).

Technical and infrastructural support for a technological innovation may be an important requirement for its diffusion (Chau and Hui 2001). For example, a lack of standards may act as a barrier to the diffusion of a relatively complex IT innovation, such as EDI (Bouchard 1993, Damsgaard and Lyytinen 2000). Government may influence innovation adoption through supportive policies and pronouncements (Elliot 2002), the provision of incentives and support, or through regulatory requirements (Kuan and Chau 2001).

METHOD

The research reported in this paper is exploratory in nature and utilizes qualitative evidence. We are concerned with the extent to which contextual factors related to technology, organization and environment explain the limited adoption of XBRL in the Australian context. Given the uncertain and complex nature of network innovations like XBRL, we believe that their adoption can be better understood by examining the interpretations of the relevant community members (Van de Ven and Rogers 1988, Wolfe 1994).

Data were collected via semi-structured interviews with ten individual representatives of institutional members of XBRL Australia, the local XBRL consortium. The operations manager of XBRL Australia was also interviewed. Interviews were conducted face-to-face during April and May 2004, and lasted for an average of one hour. A summary of the interviews is shown in Table 1.

The interviews were based on a common interview protocol, and focused on topics such as the extent of use of XBRL in Australian organisations; motivations for adopting or supporting XBRL; the relative costs and benefits of XBRL; factors facilitating or hindering XBRL adoption; stakeholders and relationships in XBRL diffusion; and the role of XBRL consortia. All interviews were audio-taped and transcribed. Transcripts were analyzed thematically using qualitative data analysis software. Codes were developed based on the conceptual model of technological innovation adoption discussed above as well as themes that emerged from the data. Comparative analysis allowed patterns of shared properties and dimensions to be generated. Selected quotes from the interviews are used in the discussion below to illustrate the analysis.

We believe that construct validity has been adequately addressed (Patton 1990, Yin 1989). The interviews provided a range of perspectives, and both authors participated in the interviews and data analysis. We also reviewed supporting documentation such as industry white papers, professional publications and Web-based resources, experimented with XBRL software, and attended the 2004 International XBRL Conference. Clearly, the study reported in this paper is based on the Australian context in 2004, and therefore, we accept its external validity cannot be ensured.

ANALYSIS

For analytical purposes we use the technology-organization-environment framework of DePietro et al. (1990) to structure our findings on the contextual influences on XBRL adoption in Australia. Figure 2 summarizes the factors we found to be relevant to organizational innovation adoption in this case. The sign displayed next to each factor indicates the direction of influence on the adoption decision: most commonly negative or inhibiting (−), although occasionally positive or enabling (+).

Technology

Several features of the XBRL innovation itself emerged as significant influences in organizational adoption decisions.

Relative advantage. In studies of IT innovation adoption, relative advantage is commonly expressed in terms of a perceived cost/benefit analysis. From the perspective of software vendors and professional accounting firms, XBRL offered potential sources of additional revenue, such as the provision of advisory and consulting
services to corporate clients. XBRL requires the development of specialized taxonomies and software applications to generate and read instance documents, all of which provide opportunities for adding value for suppliers of XBRL at different stages in the financial reporting value chain.

However, from the perspective of potential adopters such as large companies, banks, government agencies and regulatory authorities, the benefits of XBRL remained largely unproven. Evidence that XBRL had produced cost savings in external reporting compliance was limited to a small number of cases. With respect to internal reporting, legacy systems were often perceived as achieving the same functionality. As Chau and Tam (1997, 2000) note, whether an organization perceives an innovation as advantageous may depend on how satisfied it is with its existing technological solution.

Overall, while there was a general acknowledgement that XBRL was ‘the way forward … it’s something that has to happen’ (Large Company), in the short term any potential benefits of XBRL were outweighed by the perceived costs and effort of establishing the required systems. A number of our interviewees attributed this to the absence of a clear ‘business driver’ or ‘killer application’:

My sense is that the clients, the people, the companies that would implement this just don’t see a burning need at the moment. I’ve heard it described as a solution in search of a problem (Accounting Firm #3).

**Complexity.** The complexity of XBRL was commonly mentioned in our interviews: ‘Just even to understand how you map that data and what all these tags mean and why, is still … going to be a hurdle to overcome’ (Software Vendor #3). This complexity made it difficult for decision makers in organizations to ‘get their heads round’ XBRL. Developing specific taxonomies and ‘tagging’ financial data is a specialized task, requiring specialized knowledge. The relative newness of XBRL makes that knowledge scarce and there are costs involved in acquiring it. Software Vendor #1 commented, ‘XBRL is complex. One needs to have people trained to do it. You can’t do that by trying to sell it by itself. It doesn’t work as a business model’. The obvious solution to the complexity of XBRL for many of our interviewees was for XBRL functionality to be built into software tools and applications, effectively ‘hidden behind the scenes’ and transparent to the user (Accounting Firm #1).

**Trialability and observability.** Trialability and observability are innovation characteristics drawn from the work of Rogers (2003). Both are related to risk (Fichman and Kemerer 1993). Trialing an innovation helps reduce the uncertainty surrounding its adoption, while visibility stimulates discussion and allows potential adopters to evaluate the benefits of adoption. The ability to observe and experience the benefits of XBRL was an important factor in adoption decisions. Many of the XBRL implementations that had been trialed at the time of the interviews were considered ‘pilots’ in order to demonstrate ‘proof of concept’:

People tend to pilot at this stage on the basis that if and when they succeed they will move the entire operation onto XBRL, as opposed to just the new bit, and if it fails they’ll go back to the tried and trusted methodology (Software Vendor #1).

Being able to observe demonstrations of working XBRL applications and determine the suitability of XBRL’s capabilities for an organization’s needs was also important. The absence of readily available software tools to facilitate this was frequently mentioned:

So the tools are still not there and that is really a problem because … you can talk until the cows come home but you’re not convincing people. So we can’t go any further than saying, ‘It’s good, this is what we can do with it, this is the capabilities, but we can’t show you’ (University Academic #1).

**Stability.** The relative stability of the XBRL innovation was a frequently mentioned barrier to the development of commercial applications. The iterative development of the XBRL specification, central to the deployment and use of XBRL, was highlighted. There was an apparent tension between the desire of the ‘very smart, very bright’ people at XBRL International to improve the specification and the realities faced by XBRL users. The latter would often develop software tools and applications based on a particular version of the specification, only to find that a new version had been released by the time their software was ready: ‘As the specification changes … you have to change the functionality, and software doesn’t get changed overnight. It takes a long time to change’ (Accounting Firm #1). There was general agreement that a degree of stability in the...
specification was necessary, and that future changes to it should be incremental ‘add-ons’ rather than a complete new version:

If they keep changing their mind on what the spec is, it’s like it’s a moving target … so we need something that’s going to be stable, won’t change for a while, gives people the chance to actually evaluate it, get used to it, get things up and running properly and then they can go and maybe make small incremental changes (Software Vendor #2).

Organization

Two aspects of organizational context appeared to influence the limited adoption of XBRL in Australia.

Innovation champion. An organization’s involvement with XBRL invariability resulted from the efforts of a small number of ‘champions’ – ‘visionary type[s] … pushing the XBRL track because [they] feel there can be a benefit for it’ (Software Vendor #2). However, continued commitment to XBRL in the face of unproven benefits and the need to generate revenue or ‘payback’ was difficult for many champions:

I think everybody just has to convince their own decision makers higher up, you know, whatever the organization, that there’s some benefit in doing this … I think it’s going to come down to sort of someone pushing it in each company and having the time and wanting to adopt (Accounting firm #2).

Organizational readiness. Limited resources inhibited many innovation adopters’ readiness to consider XBRL applications. This was sometimes the result of limited financial resources or company takeovers, but more often it related to limited time and human resources in the face of perceived high regulatory burdens. The most common example provided in respect of this was the need for financial reporting staff in companies, accounting firms and regulatory agencies to focus on the adoption of International Accounting Standards (IAS) within Australia:

The biggest thing, is 2005, the adoption of IAS. Now this has distracted people, they’re too busy doing this plus their usual financial reporting stuff … They’re all preoccupied with all the other things, so there’s a kind of timing thing (Regulatory Authority).

Environment

The environmental context for XBRL in Australia produced a range of factors that influenced the extent of its adoption. We discuss the most influential below.

Market conditions. Market size was highlighted as a barrier to XBRL adoption in Australia. The relatively small number of listed companies of interest to analysts, or with the range of subsidiaries from which to see an obvious benefit in internal data coordination, or even with the necessary IT expertise to utilize XBRL, were cited as examples of obstacles to encouraging XBRL adoption. The small Australian market was not perceived as attractive by this international software vendor:

[Australian XBRL clients] are not particularly large targets right now. In the grand scheme of things Australia is a small economy, and the budget is much bigger [elsewhere] and the amount of effort is the same, so why would we go there [Australia] first (Software Vendor #1).

Trading partner influence. The influence of business partners was perceived to be a major potential influence on XBRL adoption. For example, the adoption of XBRL internally by companies would require the accounting firms that audited their accounts to also adopt XBRL.

More commonly, the potential requirement for organizations to comply with XBRL formats prescribed by consumers of external financial reports such as banks and regulatory authorities was raised by our interviewees. In particular, the Australian Tax Office (ATO), Securities and Investment Commission (ASIC) and Stock Exchange (ASX) were considered important candidates for driving XBRL adoption because of their high profile and/or large reporting base:

I mean, we do support the standard but … we wouldn’t be using XBRL in the absence of a directive from ASIC or ASX or ATO saying that this is going to be the standard that you have to use (Large Company).

While not everyone thought this could or should be mandated by these institutions, there was general agreement that even allowing reports to be submitted using XBRL would be a powerful driver of XBRL diffusion:

The way I see it coming in will be through these guys, these regulators saying, ‘Look we need our stuff in XBRL’ ... It would give people a reason to re-look and say, ‘We’re submitting this in XBRL and we’re submitting this in XBRL, well maybe we should think about how we can work that back’ (Accounting Firm #2).

The Australian Prudential Regulatory Authority (APRA), responsible for regulating banks and superannuation funds, did require the regular financial reports it received to be filed in XBRL format. While some APRA clients were producing this information in XBRL from their own systems, most only entered it into Excel templates provided by APRA for subsequent conversion into XBRL-formatted data, lessening its influence in encouraging adoption.
Available information. The early stage of adoption in Australia suggests that the availability of information about XBRL and its benefits is important. The local consortium, XBRL Australia, successfully secured a government grant to promulgate XBRL, and was active in running seminars, workshops and electronic news groups, writing articles in professional publications, meeting with interested organizations, and providing a conduit for international information on XBRL. Its role was to build awareness of XBRL, and it specifically targeted groups of potential adopters such as banks and regulators. Its activities were often conducted in conjunction with the two professional accounting bodies in Australia, who had an interest in keeping their members informed about XBRL developments. In addition, three of the ‘big four’ accounting firms were active in ‘getting the XBRL message across’ (Accounting Firm #3).

According to one software vendor, as information sources about XBRL increased, corporate awareness of XBRL also started increasing. However, this vendor and other interviewees perceived a crucial absence of local XBRL success stories. It was also suggested that over-selling of the concept in earlier years had contributed to unrealistic expectations among the community of potential XBRL adopters.

Critical mass. A major explanation given to us for the limited adoption of XBRL in Australia was the absence of a critical mass of XBRL applications, software tools and users. This was variously framed as a ‘Catch 22’, ‘chicken and egg’ or ‘wait and see’ situation, in which ‘nobody really wants to go first’ (Local Consortium). It seems that potential consumers of XBRL-based data such as banks and regulators are reluctant to adopt without sufficient numbers of organizations wanting to send them XBRL-tagged data. That is unlikely to happen until XBRL functionality is standard in the financial software packages that reporting organizations use. However, software vendors are reluctant to invest time and resources into developing XBRL exporting facilities until there is a demand for it:

Yeah, it’s a chicken and the egg problem that XBRL suffers ... The problem is that a [bank] isn’t going to invest money into it. They’re going to come and say to you, ‘That’s all very sexy and I’d love to see that work, but who’s going to send me XBRL marked up data?’ And then we go, ‘Well, nobody, but one day they will’. And of course they just go, ‘Well, see you later’. Then if you go of course to the people who can express the stuff like [accounting package vendors], they turn around and say to you, you know, ‘Okay if I publish XBRL, who can consume it?’ And you go, ‘Well nobody, but if you guys actually did it ... ’ (Software Vendor #3).

A number of interviewees suggested that if producing and consuming XBRL data was a commonly available and relatively simple computer desktop task, such as through the inclusion of XBRL in Microsoft Office, then people would begin to use the functionality, eventually generating a compounding adoption effect. It could also create a competitive stimulus among other software producers:

When you’re looking at trying to create a demand, when you get someone like Microsoft starting to build something into their software, that sort of makes people sit up and think, ‘Well, if they’re starting to do it then maybe there’s something actually going on with this thing’. It’s something they see as beneficial, so that’s a big advantage ... It may [also] sort of jog people a bit to actually be pushed into doing things because of the competitive nature of the industry. If Microsoft do it, then it’s like, ‘We’ve got to do something so we can have a comparable product to that’ (Software Vendor #2).

Available support. XBRL adoption depends on the production and availability of appropriate taxonomies, which are in turn based on accounting standards and reporting requirements. The more financial reporting standards and formats used, the greater the number of taxonomies needed (and translations between them). XBRL also became caught up in the international harmonization of accounting standards, as taxonomy development tried to keep pace with changing standards:

So versioning is going to be a big thing in the future. At the moment we’re still trying to get the base taxonomies, but you still have to think in advance, that there’s going to be new standards, new elements (University Academic #2).

Increasing use of XBRL-based financial information raises the need to audit financial statements presented in electronic format, in turn likely to require the modification of auditing standards (see Pinsker 2003).

A crucial area of technical support was the availability of software tools to facilitate experimentation with XBRL and to both produce and read XBRL instance documents. The production of taxonomies also relies on specialized software tools. These tools are effectively complementary technologies (Smith 2004) to XBRL, which need to be developed and deployed alongside its adoption.

DISCUSSION

Wolfe (1994) argues that the determinants of innovation adoption vary with the characteristics of the innovation. In general, our analysis of XBRL adoption in Australia (see Figure 2) reflects the particular context of Australia, the relatively early stage in XBRL adoption, and XBRL’s nature as a network innovation. The traditional innovation-related factors of relative advantage, complexity, trialability and observability were observed to play a largely negative role in XBRL adoption in this context. Although there were some reported cases of XBRL pilot
applications, the absence of readily available software tools to facilitate this mitigated against this effect. Interestingly, a new factor related to the stability of the innovation emerged from our analysis. We suggest that a high degree of change creates uncertainty with regard to an innovation, reducing the willingness of organizations to experiment with or invest in the new technology and effectively hindering its adoption. In this case, the XBRL specification underwent significant changes before arriving at its current version. While some considered this as a normal iterative evolution, it was also viewed as a major inhibitor to XBRL adoption, necessitating costly redevelopments and compatibility problems for software vendors and influencing potential adopters to wait until the technology stabilized.

Organizational factors did not appear especially relevant, perhaps reflecting the early stage of XBRL development and diffusion. The exceptions were the difficulties faced by innovation champions in justifying adoption and the way that stretched resources adversely affected organizations’ readiness to adopt XBRL. As Niederman (1998) observes with the development of EDI, early adopters often incur significant costs to generate the infrastructure required for later adopters to perceive the innovation as beneficial.

Environmental factors were more prominent in explanations of the limited adoption of XBRL. While the local XBRL Australia consortium, professional accounting bodies, large accounting firms and software vendors were active in disseminating available information about XBRL, the lack of local XBRL success stories was perceived to inhibit adoption. The lack of available support for XBRL in the form of taxonomies, standards and software tools, and the limitations of Australia’s small market size, were considered important factors negatively influencing XBRL adoption.

The influence of trading partners, in the form of institutions requiring financial reports such as banks and regulatory authorities, was suggested as a major driver of XBRL adoption through allowing or mandating the submission of financial information in XBRL form, placing certain government authorities, in particular, in a critical enabling role in the adoption of this innovation. However, some likely implications of such a strategy warrant attention. First, if regulatory bodies and other adopters were to move their entire operation to XBRL, many of their employees could rapidly become redundant. Second, while regulators could mandate adoption for their specific needs, this would likely narrow the focus of XBRL, possibly limiting its more widespread adoption. Third, making XBRL mandatory would be an intensive and complex undertaking that required specific procedures to be followed, including the amendment of relevant legislation. All these, combined with a democratic-styled society and an Australian culture described as ‘very suspicious of authority’ (Regulatory Authority), would make mandating XBRL reporting difficult and time consuming.

As a network innovation, XBRL adoption was heavily dependent on a critical mass of both innovation suppliers and adopters, which was lacking in Australia. Until the stalemate between XBRL consumers, producers and software vendors is broken the situation is likely to continue. XBRL becomes beneficial as it becomes more ubiquitous. However, once a critical mass is reached the benefits accruing to early adopters provide a strong incentive for others to adopt XBRL, increasing the momentum of its diffusion.

The collective set of factors we derived from our analysis of XBRL adoption in Australia are shown in Figure 2 as individually influencing the innovation adoption decision. However, the original model proposed by DePietro et al. (1990) shows the possibility of interactions between technological, organizational and environmental factors (Figure 1). Indeed, a limitation of many factor-based studies of innovation adoption is that they do not allow for complex interactions between the various factors comprising the ‘innovation configuration’ (Fichman 2004). In contrast, we found that the factors relevant to XBRL adoption formed a web of interrelated interactions and influences.

For example, XBRL awareness generates local demand for XBRL and XBRL-enabled software applications. However, secrecy to avoid ‘tipping off’ the competition concerning emerging XBRL solutions limits the number of known successful Australian XBRL implementations. Local success stories form an important source of available information. If these are limited, they restrict the extent to which XBRL benefits can be observed. In turn, unproven benefits are likely to discourage further trials of and investment in the technology. Unproven benefits, small or nonexistent financial returns, and the lack of success stories, all increase the difficulties faced by XBRL champions in justifying their organization’s adoption of the innovation. Both success stories and trialability require appropriate software tools and applications. XBRL built into desktop applications and accounting packages allows potential adopters the opportunity to experiment with it and experience its benefits. This is likely to help create a critical mass of users, encouraging adoption. However, a continuously changing XBRL specification produces redevelopment and compatibility problems for software vendors, in turn inhibiting adoption.

In order to depict the interactions between the main adoption factors identified in this study we used a concept map (Novak and Cañas 2006). The result is shown in Figure 3. Technological (innovation-related) factors are shown in rectangular shapes, while organizational factors and environmental factors are shown in rounded rectangles and ovals, respectively. Relationships between the factors are shown using labeled arrows and linking propositions. The figure is not intended to be
CONCLUSION

Published work on XBRL has focused mainly on the expected benefits of using it and the technical mechanisms by which it works. Little research has been conducted on the factors that facilitate and inhibit XBRL adoption, and our findings provide a preliminary analysis of these. The findings have implications for policy and adoption strategies of governments and adoption decision makers in Australia and similar national contexts.

The role that XBRL can potentially play in enhancing intra- and inter-organizational information supply chains suggests that the findings of this paper are a useful contribution to research on e-business more generally. Our study confirms the applicability and utility of the technology-organization-environment model approach for understanding the adoption of e-business and network innovations, and adds to it the notion of innovation stability and critical mass. In particular, we move beyond the simple linear effects of contextual factors on innovation adoption to emphasize the interactions that occur between factors (Fichman 2004). Given the complex nature of network innovation adoption, tracing these interactions is an essential part of understanding their effects.

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