BIFOCAL TECHNOLOGY ADOPTION: 
A CASE STUDY OF A TECHNOLOGY TRANSFER TOOL

Giselle Rampersad, School of Computer Science, Engineering and Mathematics, Flinders University, Adelaide, Australia, giselle.rampersad@flinders.edu.au
Indrit Troshani, University of Adelaide Business School, University of Adelaide, Adelaide, Australia, indrit.troshani@adelaide.edu.au

Abstract

The purpose of this study is to provide a bifocal view of technology adoption from both organizational and network perspectives. It is based on a case study of a technology transfer tool which allows the exploration of the adoption process as users first engage with the tool internally within a technology transfer office and then externally with agencies using the same tool. It contributes a bifocal framework to the technology adoption literature by integrating the technology-organizational-environment theory at the organizational level with the network theory at the network level. It offers both practitioners and academics a richer and more comprehensive view of adoption than existing alternatives. This is critical as the success of inter-organizational tools, like the organizations which they serve, is influenced not only by the organization but also by the inter-organizational networks in which they are entrenched.

Keywords: technology adoption, organizational adoption, networks, bifocal adoption, dual level analysis, technology transfer.
1 INTRODUCTION

This study contributes a bifocal technology adoption perspective that incorporates organizational and network levels beyond the predominant focus on the individual level. While extant technology adoption research is dominated by models focusing on technology adoption by individuals, such as the Technology Acceptance Model (TAM) (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), this study moves beyond, toward a bifocal perspective incorporating the organization and the wider network in which it is entrenched. Consequently, the research question for this study is “what are the factors influencing the bifocal adoption of technologies within organizations and their networks”? Networks have become a rich metaphor for the complex collection of relationships that characterize the managing of modern businesses (Axelsson and Easton, 1992). In particular, networks have become instrumental in impacting on a firm’s ability to innovate. Through networks, firms gain access to scarce knowledge resources and skills, partake in service innovation through partnerships with other firms, and engage in technology transfer to obtain R&D competencies, funding, tacit and explicit knowledge (Rampersad et al., 2010b).

This exploratory study contributes to an important emerging stream of adoption research focusing on multilevel perspectives for understanding adoption of tools mirroring processes within, between, and amongst organizations (Crossan et al., 1999, Damsgaard & Lytinen, 1998, Lapointe & Rivard, 2005, Pan et al., 2006). Specifically, it provides a bifocal perspective based on the adoption of a technology transfer tool as users first engage with it at the organizational level, and subsequently at the network level with technology transfer partners. It contributes to the adoption literature by integrating network theory with organizational technology adoption theory. The study examines the adoption of a technology transfer tool (TTT) at a medium-sized Australian university. Using the TTT, researchers and managers liaise with the technology transfer office (TTO) which is part of the university. Through technology transfer, the TTO subsequently uses the TTT to interact with external organizations within the network. Therefore, the study explores TTT adoption as it progresses from organizational to network levels mirroring technology transfer processes.

Given the growing strategic importance of inter-organizational systems (IOS) in technology transfer, this study is significant to practicing managers and academics alike. IOS have grown in strategic importance as they are being increasingly recognized as facilitating the achievement of clear strategic outcomes and the strengthening of linkages and relationships among parties that collaborate in fostering innovation (Cavaye 1995; Cavaye & Cragg 1995). Generally, extant studies approach IOS research as a technology adoption and assimilation question (Grover & Saeed 2007) and have focused on four streams of research. These include an emphasis on technology (Grover & Saeed 2007; Premkumar et al. 1994; Rogers 1995), organization (Chwelos et al. 2001; Geri & Ahituv 2008; Grover & Saeed 2007; Mackay 1993; Spinardi et al. 1997), environment (Bensaou & Venkatraman 1995; Chwelos et al. 2001; Damsgaard & Lytinen 1998; Grover & Saeed 2007; Henriksen 2006; Kaushik 2009; Li et al. 2006; Kurnia & Dare 2005; Kurnia & Johnston 2000; Premkumar et al. 2005; Teo et al. 2003), and relationships (Hart & Saunders 1998; Grover & Saeed 2007; Meier 1995; Son et al. 2005; Williams 1997). Findings across all streams seem to be consistent in suggesting that the adoption of IOS has proven to be difficult (Ali et al. 2008; Kurnia & Dare 2005; Kurnia & Johnston 2000). At least in part, this can be attributed to the fact that IOS are becoming increasingly complex automated webs of interactions amongst numerous heterogeneous organizations (Garud et al. 2002; Garud & Rappa 1994; Robey et al. 2006; Robey et al. 2008; Van de Ven et al. 1999). Consequently, IOS researchers have called for more research on multiple levels of analysis to understand IOS dynamics which suggests that existing models are less than adequate in explaining IOS adoption phenomena. Specifically, Damsgaard and Lytinen (1998) and Damsgaard and Henriksen (2004) argue that the complexity of inter-organizational innovation necessitates a multi-level account with multiple points of observation and theoretical frames. In addition to providing useful insights into organizational, industry, and institutional factors, they argue and call for the need for multi-level research on the adoption of complex, networked technologies that are intricate and complex.
Therefore, this study is important both to practitioners and academics in understanding the adoption of technology transfer tools from a richer perspective that moves beyond the individual to the organization and its network.

2 THEORETICAL FRAMEWORK

This study follows the dualistic approach suggested in Pan et al. (2006) and Crossan et al. (1999) which examine a unit of analysis at two intertwined levels, namely, at the organizational and project levels of analysis. For example, by way of a case study, Pan et al. (2006) identify an organizational level theory of capability development as a lens for examining their unit of analysis before descending to the project level to capture specificities that the organizational lens overlooks, thereby resulting in a richer and more comprehensive outcome than using each level of analysis alone. This paper explores the adoption of a TTT as the process of technology transfer moves from interaction within the organization beyond it to include external organizational players that are connected in a network with the focal organization.

Adoption at the organizational level can be understood through application of the technology-organization-environment (TOE) model. The TOE model is an appropriate model to apply in an innovation context as it has been applied to understand organizational adoption in many other information systems contexts (e.g. EDI (Iacovou et al., 1995; Kuan and Chow, 2001), financial reporting systems (Doolin and Troshani, 2007; Troshani & Doolin, 2007; Troshani & Doolin, 2005), open systems (Chau 2001), electronic business (Zhu et al., 2005; Zhu & Kraemer, 2004), inter-organizational systems (IOS) (Henrikson, 2006), enterprise resource planning systems (ERP) (Pan & Jang, 2007), and global information systems (GIS) (Lai, 2008)). DePietro et al. (1990) have proposed a useful analytical TOE model that can be used for the structured analysis of technology adoption in organizations, in that, it helps distinguish between the intrinsic characteristics of technologies, organizational capabilities and motivations, and broader environmental dimensions that impact on organizational adopters (DePietro et al., 1990). These studies show that the TOE model has been applied across different domains suggesting that it may also be useful in currently under-researched contexts, including that which concerns the adoption of TTTs. Given that technology, organization and environment contexts can vary across the different domains, further research is warranted to better understand the organizational adoption of TTTs amongst organizations that participate in innovation development.

Specifically, the DePietro et al. (1990) model suggests that decisions to adopt new technologies in organizations are shaped by the influence and interaction of three categories of generic TOE factors (Trostani, Rampersad, & Plewa, in press). The technology context is concerned with both internal and external technologies available to an organization (Tornatzky & Fleischer, 1990). It focuses on the manner in which technology characteristics themselves can influence adoption and includes factors such as a perceived benefits-obstacles trade-off and organizational fit. The perceived benefits-obstacles trade-off of particular technologies relate to the “possible gains and barriers” associated with their adoption (Chau & Hui, 2001, p. 6). Organizational fit has been defined as the congruence between the innovation and an organization’s goals, values, structure and processes (Rogers, 1995, Sia et al., 2004).

The organizational context captures the characteristics of an organization, including technology competency of its human resources, management commitment, availability of financial resources, and size, and the manner in which these might affect adoption of technologies in organizations. Technology competency refers to the extent to which technical skills and technological know-how are available in an organization (Lin, 2006, Zhu & Kraemer, 2005). Management commitment reflects top management support for technology adoption (Molla & Licker, 2005). Organizational resources include financial resources that are required to cover perceived financial investment and administrative costs in technology adoption processes (Chau & Hui, 2001, Kuan & Chau, 2001, Swatman & Swatman, 1992).
The environmental context represents the arena where adopting organizations conduct their business (Mehrtens et al., 2001, Pan & Jang, 2008, Tidd et al., 2001, Tornatzky & Fleischer, 1990). The influence of partners, competitive pressure, and regulatory compliance are outlined as relevant environmental factors. The influence of partners in technology adoption decisions has been widely accepted in the literature (Kuan & Chau, 2001), particularly when technologies are meant to facilitate the establishment of strategic inter-organizational alliances (Chwelos et al., 2001, Lin, 2006). Organizations often embark on technology adoption initiatives in response to competitive pressure and threats of losing competitive advantage (Abrahamson, 1991, Kuan & Chau, 2001, Patterson et al., 2003, Porter & Millar, 1985, Zhu et al., 2004). Regulatory compliance has also been recognized as a critical factor that can impact technology adoption (Lai, 2008, Lytyinen & King, 2006, Williamson, 1983).

As the technology transfer process moves beyond the organizational level, network theory can be applied to understand technology adoption in networks. The application of network theory has allowed researchers to incorporate both network levels and organizational levels of analysis to provide a more thorough understanding of intricate dual-level processes that intertwine between the firm and the network where the firm is embedded (Ford & McDowell, 1999, Rampersad et al., 2010a). Furthermore, researchers have used the network to explore dynamic processes as networks can be viewed as ‘live’ transitions of interaction between organizations (Etzkowitz & Leydesdorff, 2000, Medlin, 2006, Rampersad et al., 2010b). Network constructs including trust, commitment and communication efficiency have been recognized as key factors for technology adoption in networks (Rampersad and Troshani, 2010; Rampersad et al., 2010b).

Trust is a core element of network theory. It is critical for achieving the adoption and usage of systems aimed at fostering inter-organizational improvements. Trust “may well be the missing link in forging an understanding of the organizational and competitive impact of inter-organizational systems” (Meier, 1995, p. 145). When surveying industrial buyers using eBay’s marketplace, Pavlou (2002) found the two dimensions of trust, credibility and benevolence, to positively impact relationship continuity and reduce perceived risk. Furthermore, the results showed a positive effect of credibility on satisfaction (Pavlou, 2002). Further research is needed to investigate how trust operates in technology adoption.

Besides trust, commitment emerges as one of the most researched factors in network theory (Morgan & Hunt, 1994, Perry et al., 2002, Siguaw et al., 2003). Commitment has often been examined as a global measure, defining it as “a desire to develop a stable relationship, a willingness to make short-term sacrifices to maintain the relationship, and a confidence in the stability of the relationship” (Anderson & Weitz, 1992, p. 19). However, it is important to note that it has several dimensions, reflected in a broad range of conceptualizations that can be found in the literature. Three major themes around which definitions center relate to an economic dimension, such as financial loss occurring when leaving the partnership, an affective dimension including emotional and psychological ties with the partner or relevant staff, and moral obligation (Meyer & Allen, 1991). More recently, research has brought these streams together by simultaneously testing affective, calculative and normative commitment, all of which reflect different motivations for committing to the relationship (Cater & Zakbar, 2009). Lai et al. (2009) studied affective commitment alongside trust in an electronic commerce context, showing a positive impact of commitment on the fulfillment of strategic benefits. More research is required to substantiate commitment as a relevant concept in this context.

In addition to trust and commitment, communication, that is, the “formal as well as informal sharing of meaningful and timely information between firms” (Anderson & Narus, 1990, p. 44), is a critical activity within networks (Duncan & Moriarty, 1998, Johnston et al., 2005). In particular, communication efficiency has emerged as a relevant concept as the innovation context provides unique challenges surrounding intellectual property, different jargons used by collaborating organizations which may include researchers or business executives and the costs of communication as frequency may not always equate to effectiveness (Rampersad et al., 2009a). Communication efficiency is defined as communication effectiveness given communication costs. Communication effectiveness includes transparency, credibility and knowledge codification and communications costs.
includes on economic costs and secrecy issues (Moen aert et al., 2000). Further research is necessary to substantiate the relevance of communication efficiency in the context technology adoption. Figure 1 illustrates the two levels of analysis and the associated processes and issues.

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Figure 1. Bifocal adoption of a technology transfer tool

3 METHOD

Consistent with the research question of investigating factors concerning the bifocal adoption of technologies within organizations and their networks, we deemed exploratory qualitative research to be the most suitable method for this study. Such an approach allows researchers to identify subtle nuances of information, and, thus, grasp complex issues in rich detail (Galliers, 1990). Qualitative research is particularly valuable for the in-depth understanding of situations and behaviors. The case study method, in particular, is widely employed in innovation research (Yin, 2003). Contexts in which organizational behaviors are central to the investigation are especially applicable (Yin, 2003). The benefits of a case study lay primarily in its ability to help comprehend inherent technology adoption complexity “reality” in considerably greater detail (and the analysis of a considerably greater number of variables)” (Galliers, 1990, p. 162). The case study method is conducted in a “natural setting” examining research questions by multiple means (Benbasat et al., 1987).

We used a case study for data collection. It comprised of an inductive focus group and interviews. Data collection was also supported by relevant documentation concerning the adoption of the TTT under investigation. To stimulate the creative process and generate relevant content areas, the focus group was conducted before the interviews. The key advantage of focus groups lies in their potential to generate ideas and new topics in the discussion amongst group members which may not be encountered in one-to-one interviews (Kinnear et al., 1996). This advantage was realized in our
research because the discussion amongst group members was facilitated rather than led. The focus group discussion was free-flowing and flexible which increased the likelihood of new topics emerging (Kinnear et al., 1996). Sixteen face-to-face in-depth interviews followed the focus group. In-depth interviews can be valuable when the research aims to generate a comprehensive list of ideas about complex concepts (Yin, 2003). Furthermore, they are useful where expected information is likely to vary considerably (Benbasat et al., 1987, Marshall & Rossman, 1989).

3.1 The case organizations

We identified the case site in line with existing literature, i.e., based on access to the case organization(s) as well as sampling and data collection conditions being suitable for the research context (Yin, 2003). The two organizations where this study took place are situated in Australia. They include a mid-sized university and a technology transfer office (TTO). With a diversity of research areas and innovation projects, we deemed the university context to be particularly advantageous, given that it allowed for a multitude of perspectives. This university context was significant as the university under investigation was one of the first organizations in Australia to use information systems to manage innovation first within the organizational context and then within the network context. Nevertheless, the TTT can be used in other organizations that manage innovation such as government grant bodies, public research institutions or in private sector organizations with an innovation focus. These contexts are currently under negotiation for future roll-out so at this stage, and as a consequence, they cannot be tested.

We chose Australia as a research context for the following reasons. Australia is a developed economy that is characterized by a solid innovation capacity. There are many organizations in Australia that are focusing on innovation as a means of gaining competitive advantage (Cutler, 2008). Additionally, federal and state governments and industry associations are continuously attempting to incentivize innovation initiatives in organizations by supporting industry-wide programs focusing on knowledge acquisition and deployment and subsidies fostering innovation (Cutler, 2008).

Investigating the adoption of a newly developed TTT was well suited for this research. The aim of this TTT was to create a supportive environment and collaborative interface for all parties involved in innovation development and commercialization, a process that includes researchers, university management, TTO staff, and other stakeholders. Using web-based functionality, the TTT provides an issue-based approach towards innovation. Researchers who have ideas that might be commercially viable start using the TTT by completing a questionnaire. In response, the TTT transforms the responses into issues that require attention, resulting in customized work plans that can provide guidance to innovation teams and individuals. Other functionalities include intellectual property (IP) management, document sharing, project management, and a customizable reporting system.

3.2 Sampling

Given the early stage of adoption, we used judgment sampling to identify staff that had used the TTT at the time of data collection. We selected a diverse group of informants all of whom were knowledgeable about the topics of interest. Informants belong to two broad groups, namely, researchers and research administrators employed by the university and TTO staff. The focus group included six research administrators and researchers, whereas the sixteen interviewees included four researchers (Researchers#1-4), and three research administrators (Administrators#5-7) from the university, and nine TTO staff (TTO#8-16).

Research administrators support researchers in innovation processes by assisting them with various tasks including funding applications. Researchers source research funding, engage in research collaboration, and carry out research in addition to teaching and administrative duties. The informants were based in diverse research contexts, including business, chemistry, computing, environmental, health and social sciences. While all TTO informants had used the TTT prior to their participation in this study, four of them had additional knowledge, due to their involvement in its development and
user training. The sample is inclusive of various organizational ranks and functional areas including marketing, licensing, and consulting.

3.3 Data collection, analysis and validity

The focus group and in-depth interviews followed a discussion guide consisting of themes relating to perceptions of adoption drivers and inhibitors concerning relevant technology, organizational, and environmental factors. The interview method enabled us to undertake semi-structured in-depth interviews covering all themes systematically while also, when necessary, allowing us to customize our approach in order to suit the interviewees’ functional idiosyncrasies. Interviews were concluded when consensus and stability on relevant themes were reached. That is, until agreement among interviewees was achieved and disagreements explained on all topics (Miles & Huberman, 1994). While noting emerging issues, we maintained the same interview guide for all interviewees in order to allow for the identification of similarities or differences in views. With interviewee consent, we recorded all interviews. While recording may have limited communication openness in some cases, its benefits relating to flexibility, data processing, and comprehensiveness outweigh its limitations (Miles & Huberman, 1994).

We analyzed the data systematically. Two of the three researchers involved in this study conducted all interviews. Three researchers analyzed the collected data with the third providing a valuable external perspective minimizing bias. Driven by the TOE and network models, data were analyzed thematically. Codes were developed as patterns in the data emerged which provided the basis for analysis (Miles & Huberman, 1994). Data belonging to each theme were incrementally assembled before themes were triangulated against literature. That is, moving back and forth hermeneutically between the data and the relevant literature, we amended the structure and analysis of findings until we developed a thorough understanding of the phenomena represented in the data.

To address construct validity, we employed multiple information sources. Primary data came from the focus group and interviews. Interviewees made available additional relevant documentation. Researchers also found archival documentation on the TTO and university websites. This approach allowed for extensive triangulation. We achieved additional triangulation by deliberately selecting informants from multiple different disciplines and functions within both target organizations (Miles & Huberman, 1994). The chain of evidence was maintained by tracing conclusions to focus group and interview summaries, and to collected data (Yin, 2003). Together, these measures enhance construct validity and reliability of this research resulting in an overall improvement in quality (Yin, 2003).

4 RESULTS

In this section we discuss organizational and network factors that were validated qualitatively. The organizational level encompasses technology, organizational, and environmental factors whereas the network level includes trust, commitment, and communication efficiency.

4.1 Organizational Level

4.1.1 Technology context

Benefits-obstacles trade-off To assess benefits and potential obstacles, potential users were able to trial the TTT prior to organization-wide adoption. Interviewees consistently pointed out the benefits that the TTT offered in fulfilling innovation requirements. For example, improved efficiency and productivity in innovation development were perceived as primary benefits. Interviewees consistently stated that it made everything easier. Additionally, it streamlined innovation processes, reduced
workload, and provided easy disclosure mechanisms for researchers. The TTT also offered location-independent accessibility to relevant innovation documentation, allowing innovation collaborators to add value to projects at various stages. This enhanced both operational efficiency and communication consistency:

It cuts the amount [of time] we have to spend to get their [researcher’s] idea out. (TTO#15)

It improves accessibility and consistency of communication as everyone is using the same words and language. (TTO#9)

In relation to communication benefits, interviewees TTO#13-16 believed that the reporting capabilities of the TTT were also beneficial for all stakeholders, and for university management, in particular, as it helped with strategic planning and monitoring. It increased emphasis on organizational structure (TTO#11) while also enhancing accountability and transparency (TTO#9, 12, 16):

Drawing from it [TTT] and identifying what is actually going on in their schools and departments, I would suspect Heads of School have a role to keep track of different workloads and what they [staff] are actually doing, … So, maybe that [TTT] will just make it a bit easier to draw on very quickly. (TTO#12)

The TTT is web-based. The organizations participating in innovation development adopted the Internet which was the prerequisite platform for running the TTT. Therefore, setup and use did not present any obstacles. The only obstacles that raised concerns include the frequent upgrades that occurred during initial adoption stages. The TTT underwent many modifications before arriving at its current version with some earlier versions exhibiting some deficiencies which were rectified in subsequent upgrades. These upgrades concerned navigability, layout, and version control features concerning innovation documentation. Generally, interviewees believed that no major obstacles existed concerning functionality that could adversely affect adoption.

While TTT developers considered the progression through the various versions as a normal iterative evolution of the TTT, users perceived it as application instability. Particularly, this issue emerged with researchers who expected a stable application before adopting it. Perceptions of instability may affect adoption adversely (TTO#9). Nevertheless, interviewees overwhelmingly considered awareness of both benefits and obstacles as crucial in helping them gain a thorough understanding of the TTT and its potential for supporting innovation. Overall, evidence collected suggests that the benefits-obstacles trade-off is largely skewed towards benefits because the TTT generally helps in fulfilling innovation objectives effectively and efficiently.

**Organizational fit** reflects the level of congruence between the TTT and organizational processes and structures which interviewees deemed extremely important. The TTO developed the TTT. Consequently, TTO interviewees perceived organizational fit to be strong at the TTO:

Ultimately, the software [TTT] at the moment supports the current structure and process. And in that regard, the software can be deemed a success. (Researcher#3)

However, university interviewees perceived a lack of fit between the TTT and the university as an adopting innovation partner in three ways, namely, i) innovation outcomes, ii) innovation processes, and iii) organizational policies. With innovation outcomes, a lack of complete fit is evident as the commercialization objective of the TTT runs counter to the general culture of the university in question:

There is a real cultural inertia at this point that is a barrier to commercializing so [the TTT] at this point in not a solution to that... A cultural shift is necessary. Academics ask, what is in it for me? Not a great deal. What’s the dollar figure? What is it worth? A fundamental shift needs to occur from the University asking ‘how much would it cost’ to ‘how much would it pay’ (Researcher#4)

With innovation processes, university interviewees found lack of fit between the manner in which the university manages IP and the manner in which the TTT prescribes it. For example, the TTT provides
a standard “one-size fits all” (Researcher#3) approach towards IP management, while the university typically takes a fluid process-based approach:

There were a number of questions in [the TTT] which really did not apply to me but I could see it applying to some people. (Researcher#3).

Additionally, organizational policies in the participating university which are not uncommon in many others in Australia can be rigid due to union agreements. University interviewees perceive these policies as barriers that “make it particularly difficult” (Researcher#3) to motivate researchers to adopt TTTs as “full time academics are on a full load and can’t work extra [innovation-related work] due to union agreements” (Researcher#4).

4.1.2 Organizational context

Technology competency Employees in adopting organizations are generally well-trained with technical skills and have experience in using various types of ICT as part of their routine jobs. Universities, in particular, provide an excellent pool of skills and capabilities. Although all interviewees deemed it as an important contributor to TTT adoption, they took technology competency as a given in adopting organizations. Nevertheless, interviewees emphasized the need for ongoing training for the preservation and renewal of technology competency, particularly in universities. For example, research students play a significant role in innovation, while generally maintaining only a transient commitment with universities. Due to high turnover, a significant need exists for ongoing training for innovation functions, including R&D, commercialization, and IP management, and the manner in which these can be achieved using the TTT (TTO#8-11). Consequently, training emerged as a key factor influencing technology competency, and in turn, the uptake of the TTT in the university.

Management commitment A general consensus emerged concerning the need for management commitment if the adoption of the TTT was to succeed. In particular, interviewees considered commitment from top management to have cascading effects and encourage organization-wide commitment which positively affects adoption:

Within the university, I think it is going to be important to have the buy-in of Heads of Faculty and Heads of Schools. The fact that the Vice-Chancellor sent out an email is probably a good thing. Because you want people to know that the powers-that-be think this [TTT] is a good thing. (TTO#9)

Having that positive predisposition from the hierarchy above is necessary. There must be institutional commitment... (Researcher#4)

Organizational resources Interviewees confirmed the need for resources to be available on an ongoing basis for successful organization-wide adoption (TTO#16). In particular, the TTO underscored that lack of financial resources constitutes a major constraint concerning TTT upgrades and marketing across partner organizations:

One of the barriers at the moment for us promoting it [TTT] and encouraging other organizations’ uptake of it is just our lack of funding to progress it. (TTO#14)

Interviewees also highlighted the challenges that researchers face at the university in relation to their availability to engage in innovation development. At least partially, funding models used in universities are based on teaching income. Consequently, time constraints for innovation are common in academia because the researchers’ time is typically shared amongst a variety of tasks, including innovation research, teaching, and administration. These constraints constitute an adoption barrier as “they [researchers and academics] don’t have the time.” (TTO#10).

All interviewees perceived organization size to be an important adoption driver. Specifically, they considered the relatively small size to impact adoption positively due to relatively higher organizational agility:
We have the advantage that we are half or quarter of the size of [other Universities] so we ought to have a couple less layers of administration. A risk exists in that but the organizational agility and speed of adoption, again looking at the example of not having to do signoffs of particular kinds of research where someone is willing to pay us. (Researcher#3)

4.1.3 Environmental context

Innovation partners’ influence Innovation in universities commonly requires partnerships between researchers and businesses or government departments (Möller & Rajala, 2007, Rampersad et al., 2009b). Interviewees underscored the strong relevance of partners in innovation. Particularly, the nature of partner involvement in terms of providing input into innovation processes and the manner in which these activities are carried out can have a deep impact on adoption intentions.

Ideal adoption outcomes constitute identical TTTs being adopted by all innovation partners (TTO#10). Because TTO staff work closely with both university researchers and administrators, the positive drive of university management to adopt the TTT also had a positive impact on TTO staff in increasing their willingness to integrate it into their work processes:

At the start, I was very skeptical about [the TTT] … but then you see that the Heads of School really like it, which is a benefit. Once they [the university] signed on behind us, it has been wonderful. Not having them behind us was not wonderful but it is growing and that has been an outcome of their confidence in us and our confidence in them which is growing because it was not always there. (TTO#10)

Moreover, interviewees perceived partners’ influence to be strong not only as a driver of adoption intentions but also as a driver for designing “partner-friendly” (TTO#9) TTTs.

Competitive pressures With increasing competition for research funding and public and private research customers, pressures surrounding the development of university research into innovations of value to industry are mounting (Möller & Rajala, 2007, Srivastava & Franza, 2009). Interviewees confirmed that TTT adoption supports the adopters’ drive for both enhancing their competitiveness and innovation capabilities over non-adopters while also being perceived to elevate their reputation for attracting prospective innovation partners:

There is a publicity spin [this University] has put on this [TTT]; that is, ‘we are the only university here that is taking this task seriously. We have software that does it.’ (TTO#9).

Interviewees identified regulatory compliance as a driver for the TTT adoption in two ways. First, given its benefits, the TTT could facilitate accountability, transparency, and communication concerning the manner in which public funds are used for achieving innovation outcomes (TTO#9, 12, 16). Some interviewees believed that to monitor usage of public funding, government agencies might adopt the TTT themselves, which might create “bandwagon” adoption pressures:

If some of the R&D corporations or some of the granting bodies, all the capital companies that actually fund some of this research, adopted themselves, then you will in fact find that it will be a pull through. In other words, if you want to start reporting to us, you have to report in this format; if you are using it already, then that makes a lot of sense to come flying through. So, that would actually increase its uptake. (TTO#9)

Second, ongoing government commitment to innovation has created a positive climate for TTT adoption. For example, an Australian Federal Government initiative, ERA (Excellence in Research for Australia), is a new research evaluation framework that entails the systematic collection of extensive research and innovation information. Interviewees considered the TTT as a means to, at least partially, assist universities in fulfilling ERA requirements:

Under the current ERA data collection for government funding… I do know that there is a requirement to collect information on commercial activity. And so I think this [using the TTT] would be an easy way of doing it. (TTO#14)
4.2 Network Level

4.2.1 Trust

The qualitative data confirmed earlier research in network literature about the importance of trust. Trust is fundamental in the exchange of information and knowledge in networks (Jarvenpaa & Todd, 1997, Jarvenpaa et al., 1998, Jarvenpaa & Staples, 2000, Li et al., 2008) as also reiterated below:

If [the innovation application] can do anything, it needs to bring people towards those relationships because fundamentally any commerce is about trust. (Researcher#4)

While interviewees generally agreed that the TTT can facilitate the development and maintenance of trust given the transparency it allows in the interaction process, the importance of both personal interaction and relationships to build trust was also stressed as “researchers still need that relationship. You’ve got to build the relationships and the trust before, so I don’t see [the TTT] as a way of doing that. I see it as a value added thing” (TTO#16). Hence, the importance of trust, and the ability of the TTT to facilitate it, either directly or indirectly, as a value-add emerged clearly from the data.

4.2.2 Commitment

Commitment is critical in innovation-oriented partnerships, as it creates a climate that allows for coordination and success (Irwin et al., 1998). Only if parties commit to the partnership, and thus only if parties devote themselves to it and manage it as a long-term and stable venture, will the partnership succeed. The interviews confirmed the relevance of commitment in innovation contexts. In particular, the need for different organizational levels and individuals to commit to innovation and commit to the adoption of the TTT emerged. All parties, including senior university and partner management as well as individuals engaged in innovation-oriented partnerships need to invest in these partnerships and demonstrate their commitment with their actions:

With reduced commitment and unclear status, how are we going to identify opportunities? On a part-time basis, possibilities take a long-time to unfold because there is no commitment (Administrator#7).

4.2.3 Communication efficiency

The qualitative evidence confirmed the findings in the literature that communication efficiency was important. As previously defined, communication efficiency includes dimensions of transparency, credibility, knowledge codification, costs and secrecy issues (Moenaert et al., 2000). Interviewees confirmed the importance of transparency:

I am not sure who is managing the relationships between partners. Different people are talking to the same client. There needs to be more information sharing. The system [TTT] helps with transparency. (Administrator#7)

Qualitative evidence also confirmed the importance of credibility (Watts & Henderson, 2006):

This is important for quality assurance and improving the expediency of outcomes. In the past, there were cases where clients paid for work done and it was never delivered and no one knew. The system could help with monitoring and ensuring the quality outcomes are delivered. (Administrator#7)

Knowledge codification also emerged as a core factor:

It is very important to interpret what the industry partner said. And the researcher, I am sure, will understand something different from what you understood. So if you have it written down somewhere that we can both see, that is brilliant. (TTO#11)
It makes it more straightforward for staff, so if they are just coming in from a different role, it really breaks it down into step-by-step chunks that are quite easy to manage, so it is not over-loading for them (Interviewee-TTO#14). Communication cost was also deemed important, particularly the cost of time (Researcher#1, TTO#10, 11, 14, 15)

It cuts the amount we have to spend to get their idea out. And we can probably focus more on where the gaps are in their thoughts and we can probably give more clear steps for them after the first meeting if they have put the project into [innovation application] already. It is more productive, isn’t it? At the moment we have to go and see them, and get all the info, and come back, if this is missing, heaps of emails back and forward. (TTO#15)

Interviewees also confirmed the importance of secrecy and intellectual property as significant considerations in commercialization.

I guess there is risk that inventions could be disclosed when they are not meant to be to external people that is compromising their intellectual property. (TTO#8)

5 DISCUSSION

This study contributes to the existing body of knowledge by proposing and qualitatively validating a bifocal technology adoption perspective. It offers a dual level analysis concerning the adoption of a TTT from both organizational and network perspectives by integrating the technology adoption literature with network theory. It contributes to an important emerging stream of adoption research that moves beyond a focus on the individual to multi-level perspectives for understanding adoption of tools mirroring processes within and between organizations (Crossan et al., 1999, Damsgaard & Lyytinen, 1998, Lapointe & Rivard, 2005, Pan et al., 2006). Stemming from qualitative data, it extends prior multi-level adoption and IOS research by integrating organizational and network levels.

The study built on and extended the dualistic approach suggested in Pan et al. (2006) and Crossan et al. (1999) who examined the organizational and project levels of analysis. This study explored the adoption of a TTT as the TT process moved from interaction at the organizational to the network levels. At the organizational level, the technology-organizational-environmental model was applied, and the qualitative results confirmed the importance of technology factors such as perceived benefits/obstacles trade-off and organizational fit; organizational factors such as technology competency, management commitment, organizational resources and organization size; and environmental factors such as innovation partner’s influence, competitive pressure, and regulatory compliance. At the network level, network theory was applied and the collected evidence confirmed the importance of trust, commitment, and communication efficiency.

6 CONCLUSION

The study offers important insights to both academics and practitioners as it provides a bird’s eye view that considers critical organizational and network adoption factors. At the organizational level, managers should consider technology context factors such as perceived benefits/obstacles trade-off and organizational fit; organizational context factors such as technology competency, management commitment, organizational resources, and organization size; and environment context factors such as innovation partner’s influence, competitive pressure and regulatory compliance. At the network level, trust and commitment between partners is important and communication efficiency reflecting dimensions of transparency, codification, credibility, and intellectual property and costs are also critical. For ICT professionals involved in inter-organizational systems used for innovation, this case study sheds light on how the adoption process mirrors underlying business processes that move from within the organization to networks of organizations. For ICT firms offering tools to support the
innovation and technology transfer process, this study is significant and provides a rich two-layered perspective for adoption that is characteristic of the innovation process.

The findings of this study should be interpreted in light of its limitations. The study was based on a single case study which may not be widely generalizable. However, the single case was appropriate as the TTT was novel and used in the university context at this time. Nevertheless, as the tool is rolled out to other organizations such as government grant agencies, public research institutes, commercialization agencies and private firms focused on innovation, the study should be replicated in the future to provide cross-case comparisons. A larger roll-out would also lend itself to further quantitative modeling and investigations. Overall, the study paves the way for a rich research agenda. While it integrates two theories and levels of analysis, these are not mutually exclusive, and consequently, future research should delve further and deeper into the interplay of factors among various levels of analysis. Indeed, the bifocal framework proposed paves the way for interesting and insightful research that investigates the intricacies of adoption in technology transfer settings.

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