HERDING CATS: PRACTICAL AND THEORETICAL PERSPECTIVES ON INTER-ORGANISATIONAL KNOWLEDGE TRANSFER ACROSS RESEARCH-INDUSTRY BOUNDARIES

Kathryn J. Hayes* and J. Anneke Fitzgerald

Centre for Industry and Innovation Studies, University of Western Sydney, NSW
Email: kate.hayes@uws.edu.au
Postal Address: Building EC, Parramatta Campus
Locked Bag 1797, Penrith South DC, NSW 1797

Preferred Streams: Stream 6, Knowledge Management and Intellectual Capital

Stream 9, Networks, Clusters, Collaboration and Social Capital

Profiles:

Kate Hayes is a Doctoral Candidate at the University of Western Sydney who submitted her thesis in April 2007. She spent eighteen years working for IBM Corporation in Australia and New York. Her research interests include occupational subcultures, organisational culture, communities of practice, knowledge management, innovation and hybrid organisations. Her current research programs deal with interactions between occupational subcultures in commercialization processes and potential applications of ambient technology in small and medium sized manufacturers.

Anneke Fitzgerald is the Research Studies Program Coordinator in the College of Business, University of Western Sydney, Australia. Since completing her PhD in 2002, Anneke's research interests include employing mixed methodology in Organizational Behavior in Health Care Organizations. Anneke has published her work in peer-reviewed journals, at academic and professional conferences and in edited books. Her current research focuses on graphic simulation techniques for optimization of work processes in hospital emergency departments.

HERDING CATS: PRACTICAL AND THEORETICAL PERSPECTIVES ON INTER-ORGANISATIONAL COMMUNITIES OF PRACTICE AND KNOWLEDGE TRANSFER ACROSS RESEARCH-INDUSTRY BOUNDARIES

ABSTRACT Commercialisation activities combining the discoveries of one occupational group, such as scientists, with the commercial skills of managers involve interactions across occupational and organisational cultures. This paper explores the challenges posed by working across occupational and organisational boundaries, and describes management techniques developed informally in four Australian organisations to address barriers to knowledge transfer. It also presents recommendations for management practice from diversity management and innovation theories. The context of the study is Australian hybrid industry-research organisations composed of academic, government and industry personnel. Semi-structured interviews with a total of twenty scientists, engineers and managers focused on their experiences of knowledge sharing across organisational and occupational cultures, and methods used to manage these boundaries. The existence and efficacy of boundary-crossing individuals and boundary object strategies are explored. A generic process management model of innovation is extended to acknowledge and accommodate occupational and organisational cultural proclivities towards exploration or exploitation, and to stimulate future research.

Keywords: *Inter-firm knowledge sharing, Barriers to knowledge sharing, Cross-boundary knowledge sharing, Cross-sector collaborations, Innovation, University-Industry Partnerships*

When asked to nominate a metaphor to describe the experience of working to commercialise a promising innovation as part of a hybrid organisation composed of industry, research and government organisations, two of twenty interviewees volunteered the same striking phrase: herding cats. Several spoke of chaos and the challenge of managing organisational webs of "many to many relationships" that spanned occupations, organisations, public and private sectors. Others described using political tactics in attempts to satisfy diverse constituents with incompatible motivations and goals. One researcher described working in a publicly funded institution as travelling in an armoured tank, compared to which commercialisation work in a hybrid industry-research organisation was riding a moped through busy traffic, without a helmet. Collectively the informants viewed working across organisational and occupational boundaries as difficult, demanding and from a career perspective, potentially dangerous.

This paper explores the challenges posed by working across occupational and organisational boundaries, and describes management techniques developed informally in four Australian organisations to address

barriers to knowledge transfer. It also presents recommendations for management practice from diversity management and innovation theories. The context of the study is hybrid industry-research organisations, also known as "Triple Helix" organisations in the Australian Cooperative Research Centres (CRC) program. The research question which is explored using a qualitative approach, concerns the management of occupational boundaries to improve organisational processes and outcomes in Australian Cooperative Research Centres.

Triple Helix Organisations, the Inter-Organisational Organisation

Since the 1980s, governments of industrialised economies have looked to innovations involving the generation of, and reconfiguration of knowledge as a means of maintaining their competitive advantage (Gibbons et al., 1994). The evolution of triple helix organisations in which private firms and publicly funded research groups collaborate has been traced across Europe, the USA, Latin America and Asia (Etkowitz & Leydesdorff, 2000). In these hybrid industry-research organisations, knowledge management, including the identification, capture and evaluation of innovations, occur across organisational and occupational boundaries.

The Australian CRC program provides an example of government intervention intended to stimulate innovation, and produce economic returns through fostering collaborative arrangements. CRCs are composed of academic, government and industry members working together to bring an invention to market and operate as trans-disciplinary, temporary organisations intended to link discovery, application and use (Department of Education Science and Training & Howard Partners, 2003).

The study of hybrid industry-research organisations is important due to their anticipated contribution to national economies, their rapid spread and increase and the concomitant investment of public and private funds. For example, by 1999 hybrid research-industry organisations had already become the organisational form receiving 69% of industrial funding support for academic research and development in the USA (Tornatzky, Lovelace, Gray, Walters, & Geisler, 1999).

Working Across Organisational and Occupational Boundaries

Previous research suggests members of research and commercial occupations, working together in hybrid industry-research centres will almost inevitably experience tension between their occupation specific norms and beliefs (Gibbons et al., 1994; Hackett, 2005; Kuhn, 2002; Sitkin & Stickel, 1996; Steiner, 2000; Trice, 1993). Tension between researchers' exploratory work behaviours and business managers' emphases on rapid exploitation of commercial opportunities (Cyert & Goodman, 1997; Hayes & Fitzgerald, 2007; March, 1991) can be exacerbated in triple-helix organisations with unclear authority structures, particularly if individuals participate on a voluntary basis, as is the case with Australian CRCs.

One imperative for hybrid organisations appears to be ensuring that constructive and not destructive conflict results from the expression of occupational and organisational difference. Research points to the value of "multicultural adaptation rather than assimilation" in research collaborations across research and industry occupational and organisational boundaries (Turpin, 1999, p. 244) and the desirability of cultural difference between industry and research groups (Yee, 1996). If commercial and research cultures and organisations merge, and become less distinct, it is possible that the complementary skills, abilities and knowledge that provide the rationale for industry-research collaboration will be lost.

Steiner (2000) asserts that more than conventional science skills are required to be an innovator, or to produce science of interest to industry. In fact, she proposes that the norms and beliefs inculcated in a good scientific education may inhibit the ability to work with industry. Thus, a boundary-crossing researcher-manager, able to shift their cultural frames and decide when to be a "good" researcher and work by the book, and when to be "incompetent" and digress from accepted scientific practice can be invaluable to innovation efforts (Steiner, 2000).

Similarly, diversity and multicultural literatures recommend secondment as a way of providing the tacit knowledge needed to work within an unfamiliar culture by immersing individuals into that culture (Ely &

Thomas, 2001; Fernandez, Mutabazi, & Pierre, 2006; Pires, Stanton, & Ostenfeld, 2006). The intent of secondment is to develop some of the characteristics of boundary-crossers, individuals equally at home in more than one organisational or national culture. In addition to the desirability boundary-crossing, Kuhn (2002) adds the use of boundary objects, in the forms of artefacts, activity routines or reified concepts as a potential means of managing boundary conflict in a constructive and positive manner. Furthermore, a boundary is not inevitably a barrier. Boundaries can be interfaces which facilitate the production of knowledge, and "boundary objects" whether material objects, organisational forms, spaces or procedures, can enable communication between communities (Star & Griesemer, 1989).

In the context of US Industry-University research centres Tornatzky et al. declare that of the 'range of skills and competencies needed to build and sustain these boundary-spanning organisations, none plays a more important role in centre success than leadership'(1999, p. 101) and continue to recommend a participatory leadership style.

Communities of Practice and Triple Helix Organisations

Recent research (Hayes, 2007) has observed that research members of CRCs can act as inter-organisational, Knowledge-stewarding communities of practice (CoP). CoP are characterised as voluntary groups who work and learn together, distinguished by their passion for a particular knowledge domain, sharing similar roles and skills and possessing a common bond (Wenger, McDermott, & Snyder, 2002). Wenger et al (2002) expand upon the four different strategies to encourage development of CoP first identified by the American Productivity and Quality Centre. These are Helping, Knowledge-stewarding, Best-Practice and Innovation CoP. Knowledge-stewarding communities are primarily devoted to organising, upgrading and distributing knowledge frequently used by members. Innovation CoP are intentionally cross-functional in composition, and 'intentionally cross boundaries to mix members who have different perspectives' (Wenger et al., 2002, p. 77). While the deliberate combining of the knowledge and skill sets of research and business personnel may suggest that whole triple helix

organisations are Innovation CoP, the presence of managers and overt expectations of commercially valuable results argue against this possibility in Australian CRCs.

CoP do not necessarily work to produce defined outcomes or operate with a definite agenda or timetable (Wenger & Snyder, 2006). CoP last as long as members want them to and, because they are populated by volunteers, do not respond well to management supervision (Wenger & Snyder, 2006). While managers may regard research groups working within CRCs as specialised technical teams, the researchers describe attitudes, beliefs and assumptions that suggest they comprise a separate CoP within each CRC (Hayes, 2007; Hayes & Fitzgerald, 2007). The CRC programme may well have provided research CoP with opportunities to obtain organisational legitimacy and on-going funding they previously lacked.

Although there is evidence of the existence of boundaries between occupations and institutions in hybrid organisations, little is known about how boundary management occurs. This poses the following question: How can occupational boundaries be managed to improve organisational processes and outcomes in Australian Cooperative Research Centres?

METHODOLOGY

A qualitative, semi-structured approach was employed. A CRC typically consists of individuals from a variety of occupations aligned with a particular industry, located within a broad context of Australian society and public research policy decisions. The ability to effectively identify, isolate and accurately measure both dependent and independent variables within a natural setting is limited. In addition, the scant literature on managing across the boundaries of industry-research partnerships does not support attempts to define dependent and independent variables. As social activities occurring within organisational and national cultures, commercialisation processes in a complex social system suit holistic investigation using qualitative methods.

A total of twenty scientists, engineers and business managers were recruited from four CRCs. Two of these CRCs were from the Information and Communications Technology sector and two were from the Biomedical sector. Two CRCs had graduated from the program, and two were currently receiving CRC program funds. The organisations' maturity ranged from newly formed with only a few years of operation to twenty years of operation for a publicly listed company that developed out of the CRC program. The four CRCs (IT Graduate, IT Current, Biomedical Graduate and Biomedical Current) were composed of individuals representing over 60 private companies, 11 academic institutions and 13 government bodies. The participants' experiences and perceptions of working across occupational and organisational boundaries were recorded and transcribed verbatim. QSR N-Vivo® software was used to aid detailed coding and analysis of the collected research material, facilitating the interpretation process. Member checks, in which the data and interpretations were provided to participants for correction, verification and challenge, were used to increase the credibility of the research. Through the analytic phase of the project, the research material was found to cluster around a number of core themes. Through a reflective, iterative process, we interrogated theme content to explore relationships between and within the themes.

Despite the suitability of the selected methodology, the research findings depend upon the memory, insightfulness, and honesty of the interviewees. The findings are also constrained by time, place, and the changeable nature of individual perspectives. Consequently, the findings cannot be readily extrapolated to other contexts. However, as the following sections illustrate, the insights provided by the interviewees extends existing theory to consider the potential impact of organisational and occupational barriers on the functioning of triple helix organisations. Further, the researchers themselves bring with them a range of experiences that may influence the data findings. However, careful consideration of findings, discussions, checking and rechecking material and meaning helped to reduce the potential for researcher bias.

RESULTS

During semi-structured interviews lasting between 30 and 90 minutes, participants were asked questions about strategies currently used in their hybrid organisations to manage occupational and organisational boundaries.

Secondment

Informants explained that although the first CRCs were unequivocally encouraged to temporarily transfer individuals between the participating organisations, this did not commonly occur. The Biomedical Graduate CRC had used physical secondment to immerse an individual into the other occupational culture, possibly with a view to developing boundary-crossing individuals:

"…by putting a scientist within a company, … that created a day-to-day experience of the drivers of the company and commercial concerns so that the work was done in the context of the need for specifications, for reproducibility, for product integrity." (Researcher, Biomedical Graduate)

This approach was under active consideration in the IT Current CRC. However, a researcher from the Biomedical Current organisation raised practical objections to the use of immersion via secondment:

"Once you start off with parties that are not already in the same location that was never going to happen because what you would require is for the parties to effectively give up their best people to somewhere else. And it just wasn't going to happen and it hasn't happened in our place."(Researcher, Biomedical Current)

The low incidence of secondment in the four CRCs suggests that it has proved unpopular, possibly due to thick organisational boundaries, especially between business and research organisations. Of the twenty individuals interviewed, only four had experienced physical secondment. Of these four, three came from the Biomedical Graduate CRC. No informants from the two currently funded CRCs had experienced secondment. Given that secondment appears to becoming increasingly unpopular with CRC organisations, it is unlikely to provide a solution to inter-occupational and inter-organisational tensions in the future.

Boundary Crosser and Boundary Object Strategies

Use of the boundary crosser and boundary object strategies advocated by Kuhn (2002) to lessen the impact of occupational and organisational boundaries were described by respondents from all four CRCs. Four interviewees displayed characteristics of boundary-crossers: key individuals who are skilled and often certified (holding educational and professional qualifications) in two distinct bodies of knowledge, and who translate the behaviour, knowledge-systems and social values of one group for the other. For example, a researcher from the Biomedical Current CRC, when asked why he had not returned to academia as planned explained:

"When I moved into the organisation there were two subcultures which between them defined the whole culture [with] almost no point of overlap. The two groups lived on different floors and talked about each other. They had to communicate a lot, but there was very little understanding of, and very little sympathy towards one another's points of view. There was often tension, sometimes useful, but sometimes not between the two subcultures. I think the reason that I slotted into this organisation so well is that I was the only person in the organisation that had training in both subcultures. And so I loved it from the start, it was a foot in both camps and it just made life much more interesting." (Researcher, Biomedical Current)

In addition to boundary crossers, the Biomedical Current CRC used a formal innovation management process as a boundary object to link disparate occupational and organisational groups. This process, a variant of the Stage-Gate® new product process, tracks the development of initial research ideas, manages what is included and what is left out of prototypes and moves control of the product from research to design engineering then to production engineering, and finally to business unit management. Within the Biomedical Current CRC this process, in addition to performing technical functions such as testing and validation, clearly performed bridging functions between organisational and occupational cultures. For example, it functioned as a transition mechanism through the "grey area" when research exploration activities decline and commercial exploitation activities became dominant.

It is interesting to note that as a boundary object, the process supports structured contact between the two groups. Communication and time spent in formal meetings, negotiating and documenting agreements at the beginning of the commercialisation cycle may act as a structural intervention to decrease the likelihood of inter-occupational and inter-organisational miscommunication, due to undocumented, but

deeply held, norms and assumptions. The impact of exposing groups to each other and getting small, documented agreements early in the cycle is consistent with the development of shared norms and reports of improvements in resolving intra-group differences (Bettenhausen & Murnighan, 1985). Additionally, the process was reported to function as a ritual encompassing several rites, allowing controlled contact between organisational and occupational cultures, and assisting transfer of jurisdiction from inventors to manufacturing and sales management in a planned and consensual manner. The Discussion section considers the possibility of developing boundary objects as substitutes for boundary crossers to aid commercialisation in triple helix organisations.

Management Techniques

In addition to boundary crosser and boundary object techniques, the informants described a range of other management practices used to manage inter-occupational interactions. Management techniques that accommodated the motivations and norms of both research and commercial occupational cultures were described. These include: feedback loops to provide credit, appreciation and recognition to the research team at the conclusion of commercialisation projects, promotion of the CRC name and identity as a way of defusing inter-university rivalries about which institution is seen as pre-eminent, offering recognition and prestige as inducements to researchers to work in commercial collaborations and using different versions of the same business plan for different audiences.

A commercial manager from the Biomedical Graduate CRC advocated the use a mix of monetary incentives, coercion, persuasion and contact:

"A scientist says 'You're in that [commercial] group and therefore I don't have to think much harder about it' and you can bludgeon them down with money, you can persuade them and I think in different cases you need to use both of those approaches. In terms of building structures to dissolve that barrier I think the only thing you can do is try to make as many interactions as possible … I don't think there's any obvious solution to it." (Manager, Biomedical Graduate CRC)

In addition to attempting to accommodate the differences between commercial and research occupational subcultures, at least two tactics pre-empted inter-occupational tension by arranging for research and

commercial groups to work independently. Separate industry and research committees worked autonomously and gave direct advice to the CRC board in the IT Current CRC, and a researcher from the IT Graduate CRC explained that colleagues had avoided inter-occupational conflict by developing fledgling organisations completely within the boundaries of research groups, and then making a clean break when selling them off to commercial groups. The researcher volunteered that the companies may grow at a slower rate using this approach, but saw compensatory benefits:

"They have sold the companies and started new companies and now they are self-funded they don't need venture capitalists. And maybe the size of the company is smaller and the growth is slower, but they can manage that and derive more pleasure from working in those companies." (Researcher, IT Graduate)

The three individuals interviewed from the Biomedical Current CRC each identified different processes used within their CRC to manage inter-occupational tension. Consistent with commercial desires for cohesion and conformity (Pech, 2001), the CEO was identified as using political processes to pre-empt conflict occurring:

"… the CEO will canvass and potentially polarise opinion prior to meetings in order to secure smooth passage through the political minefield of the different stakeholders' opinions. …… it generally doesn't become contentious at the board level as a result of the ferreting around behind the scenes and trying to talk the issues through to a common outcome." (Manager, Biomedical Current)

However, dissatisfaction with this political approach was evident:

"You almost get the view that says the corporate entity, or core parties in this case, will ultimately get what they want and then the CEO's job is to manage the scientific component underneath it to suit." (Manager, Biomedical Current)

A researcher from the Biomedical Current CRC advocated selecting only low risk, highly certain projects for research and industry collaborations. However, in his view, the cost of this compromise was a reduction in the chance of performing breakthrough research.

The variety of other management techniques, including separation, acknowledging and accommodating dissimilar occupational and organisational cultural norms and political methods of pre-empting discord indicates recognition of the challenges of managing inter-organisational and inter-occupational collaborations and a variety of formal and informal approaches in use. Consistent with theory, the existence of boundary crossing individuals and boundary objects aided collaboration across occupational

and organisational borders. However, boundary crossers need to be present in the organisation and motivated to perform a linking role to be effective. The following section advocates the use of process models of innovation as substitutes for boundary crossers and presents an extended process theory model of innovation incorporating research and commercial motivations and goals.

DISCUSSION AND DIRECTIONS FOR FUTURE RESEARCH

Complexities and contradictions abound in the organisational context of hybrid research centres, making them a fertile setting for future research. The existence of boundary-crossers is identified both as an accelerant of commercialisation (Cyert & Goodman, 1997; Steiner, 2000) and productive relations between practitioners and academics (Kuhn, 2002). The benefits of organisations having the right combination of skills in a person motivated to use them to act as a "translator" between communities and organisations, rather than to use their expertise to build a personal power base are self-evident. However, boundary-crosser strategies to overcome occupational and organisational cultural difference rely upon the ability to identify, recruit and retain these scarce individuals. The existence of boundary-crossers or spanners is undoubtedly an advantage for hybrid organisations, but is not sufficiently robust to be relied upon as a primary mechanism for overcoming the potential for cross-occupational cultural misunderstandings. Similarly, there is a clear need for CRC-specific management techniques that while encouraging and supporting CoP, also guide their activities towards commercial ends.

Sitkin and Stickel (1996) assert that process management techniques stabilise organisational routines and tighten the linkages between them, and yet make cross boundary, cross community linkages more difficult. This contradicts the bridging function performed by the development process used in the Biomedical Current CRC. The development process appears to coordinate the activities and manage the expectations of multiple stakeholders from a variety of disciplines and organisations. Figure 1 below shows a schematic representation of a generic stage gate process, extended to acknowledge and accommodate occupational and organisational cultural proclivities towards exploration or exploitation.

(insert Figure 1 here)

An in depth analysis of the linking role performed by processes working as boundary objects in organisations could help to resolve the apparent conflict of evidence. It may be the case that while process management tools may not be applicable to basic or pure fundamental research activities, they might aid in managing the transition between research and commercial communities. Researching methods to develop boundary objects as readily accessible and low cost methods of linking research and commercial occupational subcultures has high priority as an avenue for future research.

Acknowledgement

The researchers would like to thank the participants for their generosity in allowing us to benefit from their time and experience, and the ANZAM reviewers for their helpful suggestions.

REFERENCES

Bettenhausen, K., & Murnighan, J. K. (1985). The Emergence of Norms in Competitive Decision-Making Groups. *Administrative Science Quarterly,* 30(3), pp. 350 - 372.

Cyert, R. M., & Goodman, P. S. (1997). Creating Effective Industry-University Alliances: An Organizational Learning Perspective. *Organizational Dynamics,* 25(4), pp. 45 - 57.

Department of Education Science and Training, & Howard Partners. (2003). *Evaluation of the Cooperative Research Centres Programme*. Canberra, Australia: Howard Partners Pty Ltd.

Ely, R. J., & Thomas, D. A. (2001). Cultural Diversity at Work: The Effects of Diversity Perspectives on Work Group Processes and Outcomes. *Administrative Science Quarterly,* 46, pp. 229 - 273.

Etkowitz, H., & Leydesdorff, L. (2000). The Dynamics of Innovation: from National Systems and "Mode 2" to a Triple Helix of University-Industry-Government Relations. *Research Policy,* 29, pp. 109 - 123.

Fernandez, B., Mutabazi, E., & Pierre, P. (2006). International Executives, Identity Strategies and Mobility in France and China. *Asia Pacific Business Review,* 12(1), pp. 53 - 76.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The Dynamics of Science in Contemporary Societies*. London: Sage Publications.

Hackett, E. J. (2005). Essential Tensions: Identity, Control and Risk in Research. *Social Studies of Science,* 35(5), pp. 787 - 826.

Hayes, K. (2007, 6 - 7 September). *Triple Helix Organisations, Knowledge-Stewarding Communities of Practice and Perceptions of Time: The Hunters and Gatherers of Commercialisation.* Paper presented at the 8th European Conference on Knowledge Management, Consorci Escola Industrial de Barcelona, Barcelona, Spain.

Hayes, K., & Fitzgerald, A. (2007). Business and Research Forms of Debate: Argumentation and Dissent as Barriers to the Commercialisation of Innovations in Hybrid Industry-Research Organisations. *International Journal of Technology, Policy and Management,* 7(3), (In Press).

Kuhn, T. (2002). Negotiating Boundaries Between Scholars and Practitioners: Knowledge, Networks and Communities of Practice. *Management Communication Quarterly,* 16(1), pp. 106-112.
March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science,* 2(1), pp. 71 - 87.
Pech, R. J. (2001). Termites, Group Behaviour, and the Loss of Innovation: Conformity Rules! *Journal of Managerial Psychology,* 16(7), pp. 559 - 574.
Pires, G., Stanton, J., & Ostenfeld, S. (2006). Improving Expatriate Adjustment and Effectiveness in Ethnically Diverse Countries: Marketing Insights. *Cross-Cultural Management: An International Journal,* 13(2), PP. 156 - 170.
Sitkin, S. b., & Stickel, D. (1996). The Road to Hell: The Dynamics of Distrust in an Era of Quality. In R. M. Kramer & T. R. Tyler (Eds.), *Trust in Organizations: Frontiers of Theory and Research* (pp. 196 - 215). Thousand Oaks, CA: USA: Sage Publications Inc.
Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907 - 39. *Social Studies of Science,* 19(3), pp. 387 - 420.
Steiner, C. (2000). Teaching Scientists to Be Incompetent: Educating for Industry Work. *Bulletin of Science, Technology and Society,* 20(2), pp. 123 -132.
Tornatzky, L. G., Lovelace, K., Gray, D. O., Walters, S. G., & Geisler, E. (1999). Promoting the Success of US Industry/University Research Centres. *Industry and Higher Education,* 13, pp. 101 - 111.
Trice, H. M. (1993). *Occupational Subcultures in the Workplace*. Ithaca, NY: ILR Press, Cornell University.
Turpin, T. (1999). Managing the Boundaries of Collaborative Research: A Contribution from Cultural Theory. *International Journal of Technology Management,* 18(3/4), pp. 232 - 245.
Wenger, E. C., McDermott, R., & Snyder, W. M. (2002). *Cultivating Communities of Practice: A Guide to Managing Knowledge*. Boston, MA: Harvard Business Press.
Wenger, E. C., & Snyder, W. M. (2006). Communities of Practice: The Organizational Frontier. In L. Prusak & E. Matson (Eds.), *Knowledge Management and Organizational Learning* (pp. pp. 259 - 269). Oxford, UK: Oxford University Press.
Yee, Y. S. (1996). Technology Transfer and the Research University: a Search for the Boundaries of University-Industry Collaboration. *Research Policy,* 25, pp. 843 - 863.

Figure 1: Extended Process Theory Model of Innovation Incorporating Transition Ceremony and Recognition Feedback Loop.