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Strategic knowledge networks for global education

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The inherent opportunities for communication, collaboration and experiential learning in an online and global network create the impetus for the new network paradigm in higher education. A strategic knowledge network in education was designed and developed to build 'Mode 2' knowledge capabilities; create new knowledge for innovative application; and help to shape, influence or create professional practice. This paper presents a case study of a masters program at a large university of technology in Australia, in which students undertook industry-based coursework as part of a strategic knowledge network. Complexity of projects increased throughout the program; and the real-world projects included working with local and international mentors, thus positioning coursework within the industry. In this flexible learning environment, graduates developed 'Mode 2' knowledge capabilities for the networked world of work.

Keywords: Mode 2 knowledge; strategic knowledge network; online learning community; online collaborative projects; industry-based coursework

Focus of paper

In a global knowledge-based society, communities play a pivotal role and reshape the processes of learning and sharing knowledge, in and among organisations (Huysman et al. 2003). At the same time, Barab et al. (2004) suggest that we 'know little about the educational value of employing a community model for supporting learning' (3). Thus, while the inherent opportunities for communication, collaboration and experiential learning in an online and global network create the impetus for the new network paradigm in higher education, the challenges in realising these opportunities may seem considerable.

In this paper, I present a case study of a coursework masters program. A community model was designed and applied in this program to support learning and to prepare graduates for the 'knowledge-based' world of work, through the development of 'Mode 2' knowledge production and leadership capabilities – in, and for, the global networked environment. First, I present the learning and knowledge-sharing community model designed: the Strategic Knowledge Network. Second, I discuss application of the model in an example from my practice. Third, I highlight interconnections between the case study and ideas developed in other examples of Mode 2 research.

I begin by introducing the concept of Mode 2 knowledge as context and present an overview of the strategic knowledge network model, including the 'learning' and 'leadership' zones, key criteria for success, and the pivotal roles of network manager and relationship manager. Then I focus on five projects that I facilitated in the graduate program capstone subject, global relationship management, to illustrate application of the model. Discussion includes some of the challenges I faced as an educator, and outcomes of the projects for the students and my teaching practice.

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Community model for learning

Mode 2 knowledge

A socially distributed knowledge production system exists as a global web, connected by communication technologies (Gibbons et al. 1994). The global networked environment now includes activities such as virtual team projects, virtual conferences, virtual 'worlds' (for example, 'Second Life'), blogs, and other emergent forms of communication and collaboration using a range of tools, including mobile technology. The development of Mode 2 capability draws upon the flexibility of socially distributed knowledge, versus the traditional disciplinary approaches to teaching evident in Mode 1 knowledge (Gibbons et al. 1994; Solomon and Usher 1998). Mode 2 emphasises problem-solving in the context of application and is not confined to particular disciplinary thinking; in the development of solutions, different theoretical perspectives and practical methodologies are mobilised and may not even be based on disciplines as we know them (Nowotny et al. 2003). Significantly, Mode 2 capability can be transferred to new problems and situations.

Gibbons, et al., the first proponents of Mode 2, explain this flexibility as follows, with particular focus on the leadership and knowledge production capability developed in transient teams. Such teams are often described as 'virtual'.

> … people come together in temporary work teams and networks which dissolve when a problem is solved or redefined. Members may then reassemble in different groups involving different people, often in different loci, around different problems. The experience gathered in this process creates a competence which becomes highly valued and which is transferred to new contexts. (Gibbons et al. 1994, 6)

This is relevant to the development of curriculum and graduate attributes in higher education. Graduates can be prepared to take up leadership positions in industry, in which this competence is needed, if the curriculum designed incorporates the development of Mode 2 knowledge production capability. In the professional teaching practice outlined later in this paper, coursework was linked to industry-based virtual team projects. Such practice contributes to the 'breakdown of the university's monopoly of knowledge legitimation and to a developing consciousness that the university is no longer the only or principal site in which "valid" learning occurs' (Garrick and Usher 2000).

Strategic knowledge network model

A strategic knowledge network model (Peterson 2004) may be applied in education, business, professional associations and research. In education, this model creates the framework and flexible learning environment for the development of Mode 2 knowledge capabilities. Real-world projects include working with local and international industry mentors, and coursework is positioned in the industry within a strategic and creative learning community. Communication and activities occur face-to-face and online in virtual conferences and virtual team projects, with the complexity of projects increasing throughout the program. Through positioning graduate coursework in multiple organisational settings, with industry mentors to support the students, this model extends Garrick and Usher's (2000) ideas on flexible work-based learning for employees in their own organisations.

There is a strong sense of impetus in the strategic knowledge network in education, beyond achievement of academic requirements for individual students. At the same time, fulfilment of the academic requirements must be integral to the model when it is applied in education. Successful completion of coursework and gaining the qualification is the raison d'etre for the students, that is, the coursework is the 'core business' of the graduate program; and the

program and its students are the 'core business' of the strategic knowledge network, though other communities can emerge and exist independently of the program.

A strategic knowledge network in education is a two-tiered collaborative model. Members of the network are interested in sharing knowledge and exploring new knowledge potential – for the benefit of individual members, the network, the specialist area practice, education, and consequently the industry generally.

The first tier of the model is strategic and focused on research and communicating new knowledge. Achievement and communication of outcomes is facilitated by an annual virtual conference for the network and invited specialists; other ongoing projects and activities such as presentations and publications; and influencing professional practice in the workplaces of each constituent group (students, graduates, teachers and the industry).

The second tier is a community of practice, which is focused on learning, improving, shaping and reifying practice (Wenger 1998; Wenger et al. 2002). The community of practice includes virtual team projects, which are focused on the achievement of specific tasks and timelines (Lipnack and Stamps 2000). Innovative practical application is encouraged, particularly around significant and emergent themes in the specialist area. In the program under discussion, the specialisation itself was emergent, integrating communication management (such as marketing, corporate communication), interactive multimedia design, and Internet management (such as virtual team meetings, e-business, databases for knowledge management). In this context, 'innovative' practical application frequently included the design and development of new e-communication strategies not yet embedded in mainstream organisational practice, but sought after by the students' industry advisers and mentors worldwide. Thus, in this model international industry relevance is pivotal to the coursework. Real-world problems and issues are integral to virtual team projects and activities, which are undertaken systematically throughout the graduate program.

Learning and leadership practice zones

Within the strategic knowledge network model there are two practice zones: learning and leadership. The learning zone is the community of practice tier of the model, and the leadership zone is the strategic tier. The two tiers do not function in isolation. Mode 2 knowledge production is central to both zones, because it is integral to learning and leading the practice. In the *learning practice zone*, students, teachers and industry mentors work together in the graduate program. In the *leadership practice zone*, students, graduates, teachers and industry advisers communicate and collaborate to position the program participants as leaders in the field. Both practice zones are supported by technology. Appropriate tools are selected based on accessibility and availability, as well as best fit with the communication and collaboration activities required.

The learning and leadership practice zones are illustrated in Figure 1.

Principles of a strategic knowledge network and criteria for success

There are 10 principles underpinning the strategic knowledge network model for the development of Mode 2 knowledge capability, introduced as follows:

(1) Graduate program is the nexus – students, graduates, teachers and industry advisers are the actors in a global network.
(2) Creativity focus – interdisciplinary theoretical frameworks; innovative practical application; transdisciplinary problem-solving.
(3) Learning focus – individual research; peer learning and multidisciplinary teams; constructivist learning environment.

(4) Community of practice – to learn, improve and shape the practice in industry-based coursework with teachers, and local and international industry mentors.
(5) Communication and collaboration focus – face-to-face and online conversations, meetings, projects, presentations, publications, conferences.
(6) Strategic academic roles – an educator is the network manager and relationship manager, or these roles may be shared with colleagues.
(7) Structure and governance – academic requirements; project management.
(8) Shared strategic intention and outcome focus – to create new knowledge and new practice; innovate; and position graduates as leaders in the field, with and within industry.
(9) Measurable objectives – for the network and for each project.
(10) Achievement of strategic intention and influence – creation and dissemination of new knowledge and practice; innovation; and graduates positioned as leaders in the field.

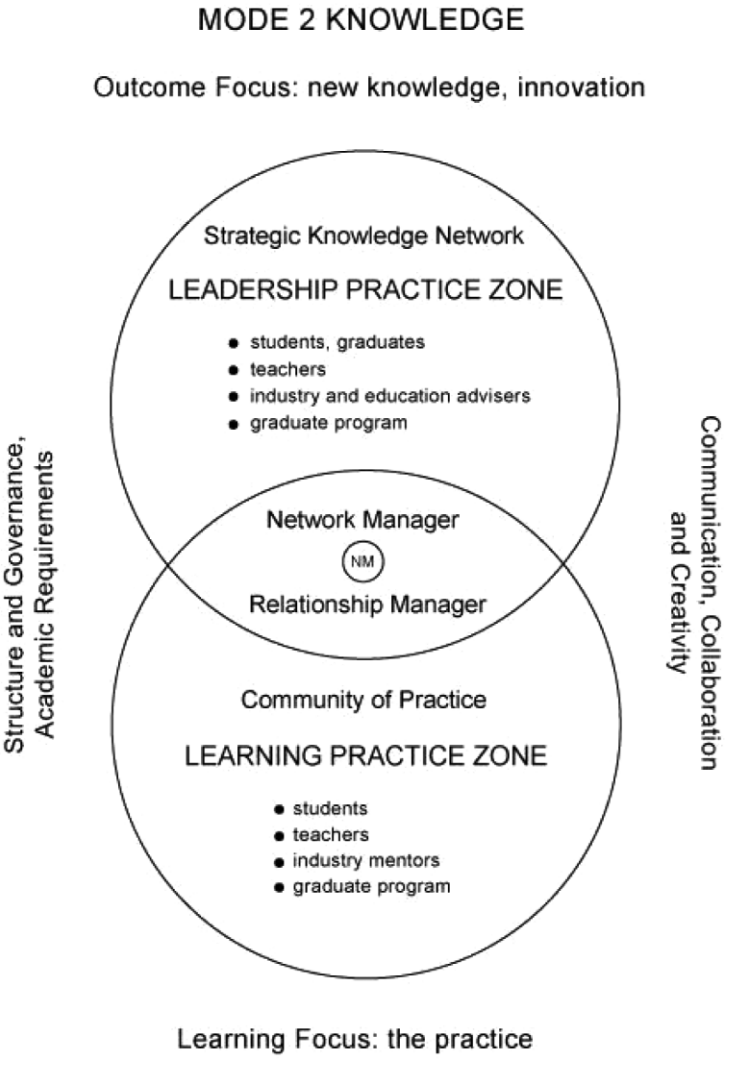

Figure 1. Two-tiered model – a strategic knowledge network supported by technology.

Drawing on Creech and Willard's (2001) 'formal knowledge network' model developed for the sustainable development arena, we can identify criteria for success in a strategic knowledge network in education. They include ensuring that trust-based relationships are developed; and that there is a shared strategic intention with measurable objectives, a common view of what 'success' might look like, and an outcome focus. While each project undertaken in the network should have its own measurable objectives, these projects and activities should also support achievement of the network's overall objectives. There is defined structure and governance to ensure that the network is managed effectively. In a strategic knowledge network for education, all the objectives are relevant to the shared strategic intention of the network, the 'practice' of the community within it and, crucially, the academic requirements. It is not simply about collective strength or sharing good ideas, although these are assets within any collaborative model.

Unlike a formal knowledge network (Creech and Willard 2001) or a formal community of practice (Odom and Starns 2003), a strategic knowledge network is constructed specifically to facilitate a strategic and social way of learning, knowing and doing, with and within industry worldwide.

A strategic knowledge network also needs to ensure that:

- A shared strategic intention and measurable objectives are identified for the network, with activities and projects also identified (each with its own measurable objectives) to help fulfil the overall network's objectives.
- An evaluation is undertaken on completion of each project to determine if it met its objectives, and then to determine whether or not the success of the project actually met and even advanced the network's objectives.
- An annual evaluation of the whole network's activities is undertaken to reflect on the level of interest and commitment of network participants.

However, the real success of the strategic knowledge network depends on building social and intellectual capital; it does not depend on a planning, monitoring and evaluation framework. The educator with pivotal roles of network manager and relationship manager inspires *people* to participate in the network.

Network and relationship manager

At the heart of the strategic knowledge network is the essential network manager: an experienced educator, who is able to conceptualise the possibilities and guide or bring ideas to fruition. While the global network is supported by technology, the network will break down if it is not nurtured (McDermott 2001) or if there is no opportunity for the learning community to mature.

The network manager identifies and responds to opportunities for change and growth, and manages the evolving nature of the learning community. As new ideas emerge, the network manager must be flexible in responding, while monitoring the overall strategic intention of the network as well as the learning objectives and outcomes of the graduate program. The manager must be able to implement appropriate structure and governance and ensure that activities relate to the students' fulfilment of academic requirements. The manager oversees broad communication of the network's new knowledge with focus on research projects, presentations, virtual conferences, a website, and other publications. Communication of the network's new knowledge is also achieved by conversation and practice in industry and education. Suitable technology tools and applications must be sourced for online communication and collaboration in the network, and this aspect is overseen by the network manager with the teaching team, students and university technology support.

The network manager also must be the essential relationship manager, or there may be a team to perform this role. Without careful establishment and nurturing of relationships, a network cannot exist. Ideally with the help of an industry advisory group champion, the network manager facilitates action to position the program and its participants as recognised leaders in the field.

There are seven aspects to be considered as a pathway for action in creating a strategic knowledge network. These aspects apply to both the learning practice zone (the community of practice) and the leadership practice zone (the strategic tier) of the model. The aspects are listed in Table 1, followed by an overview summary for each zone.

The *learning practice zone* is a social constructivist environment, in which learners co-construct their knowledge through interaction with others (see Light and Cox 2006; Woolfolk 1995, 2008). The network manager establishes and facilitates a community of practice in which students, teachers and industry mentors share and build knowledge. With the strong emphasis on peer learning in this environment, teachers and industry mentors act as coaches learning from and with the students. They work together to learn and improve the specialist practice, both individually and collectively. This learning, improving or shaping of practice occurs in the context of the coursework learning objectives and outcomes. While there is certainly the essential structure required for any coursework program with an academic calendar, formal assessment and so on, there is a strong emphasis on creativity and experimentation. In particular, multi-, inter- and transdisciplinary approaches to problem solving are fostered in virtual team real-world projects, which provide concurrent academic and industry mentoring for the students. Risk taking is encouraged in a safe learning environment, as they 'push the boundaries' and attempt to invent the possibilities in a rapidly changing or emergent specialisation. The learning objectives of the coursework are assessed and on successful completion of the academic requirements the student is awarded the qualification.

Table 1. Seven key aspects to guide the network manager in creating a strategic knowledge network.

Seven key aspects	Learning practice zone	Leadership practice zone
Environment	Community of practice Flexible learning environment, with and within industry	Structure and governance; university and industry
Communication	Peer learning	Shared strategic intention
Rationale	Learn, improve and shape practice	Outcome focus
Practice	Learning objectives Coursework Creativity Experimentation Transdisciplinary approaches to problem solving Innovation	Create practice New Mode 2 knowledge; Innovation
Conversation and collaboration	Individual and collaborative projects with industry mentors and teachers	Virtual conferences for the network Strategic conversations and collaborations for smaller groups, or between individuals
Definable and measurable outcomes	Learning outcomes Assessments	Research publications Presentations Performance in industry
Realisation of potential	Academic requirements Qualification	Leaders in the field

In the *leadership practice zone*, the network manager contextualises the program and network within the university environment and in strategic liaison with the industry. In this zone there is formal structure and governance, in terms of managing the network and stakeholder relations both inside and outside the university. Furthermore, there is a shared strategic intention and an outcome focus: to create practice (not merely to learn and improve practice); to develop Mode 2 knowledge and leadership capability; and to position graduates as leaders in the field in the networked world of work. Strategic conversations and collaborations in the leadership zone occur through an annual virtual conference, linking network members around the world – students, alumni, teachers, industry advisers and mentors, and education advisers. Outcomes are measured through research publications, presentations, and performance of graduates in industry as leaders in the field.

By matching actions to the seven key aspects in both the learning and leadership practice zones, the network manager has a 'roadmap' to follow in creating the strategic knowledge network. Activities and strategic direction often intertwine and should not be seen as being mutually exclusive within the two zones of learning and leadership. The congruence of the two zones is illustrated in Figures 2 and 3.

Each of the seven aspects or steps represents different challenges and opportunities for the network manager, who facilitates the development of both intellectual and social capital. The concept of 'social capital' relates to trust-based relationships, and resides in people's ability to negotiate shared meaning (Cohen and Prusak 2001; Wenger 1998). The network manager ensures that academic requirements are fulfilled while managing students, teachers, and self; and managing liaison with advisers. In turn, the network manager is part of a wider network within the university management structure and must be responsive to other requirements and relationships.

Next, I present an example from my practice of teaching within a strategic knowledge network model. This illustrates the learning environment in which I was both the network manager and relationship manager. Discussion focuses on some of the challenges faced, as well as outcomes for the students and my teaching practice.

Practice example

Curriculum

In the 'capstone' subject, global relationship management, students undertook collaborative virtual projects with an international mentor from the industry. This approach put into practice the knowledge network theory students studied, and each semester projects focused on developing an e-communication strategy for knowledge sharing in a complex global network. Usually I negotiated the projects with industry mentors, but occasionally students arranged their own projects.

The project approach was holistic, in terms of learning, research and assessment. Learning in the concurrent subject strategic communication informed the international project; while some research was adapted for different contexts and applications in the concurrent subjects: internet business, and streaming technologies. In the first phase of the project, students individually researched the mentor's organisation to identify the communication technologies used by that network, as well as the collaborative model (or hybrid), if any, to which the network conformed. The second phase of the project was for the students as a team to engage with the international mentor and scope out the collaborative project. Later they presented their interim findings to the mentor in an interactive presentation, via the Internet with voice and text chat. The final phase was for the student team to complete their research and write the collaborative formal report. Each student also wrote a reflective paper at the end of the project evaluating

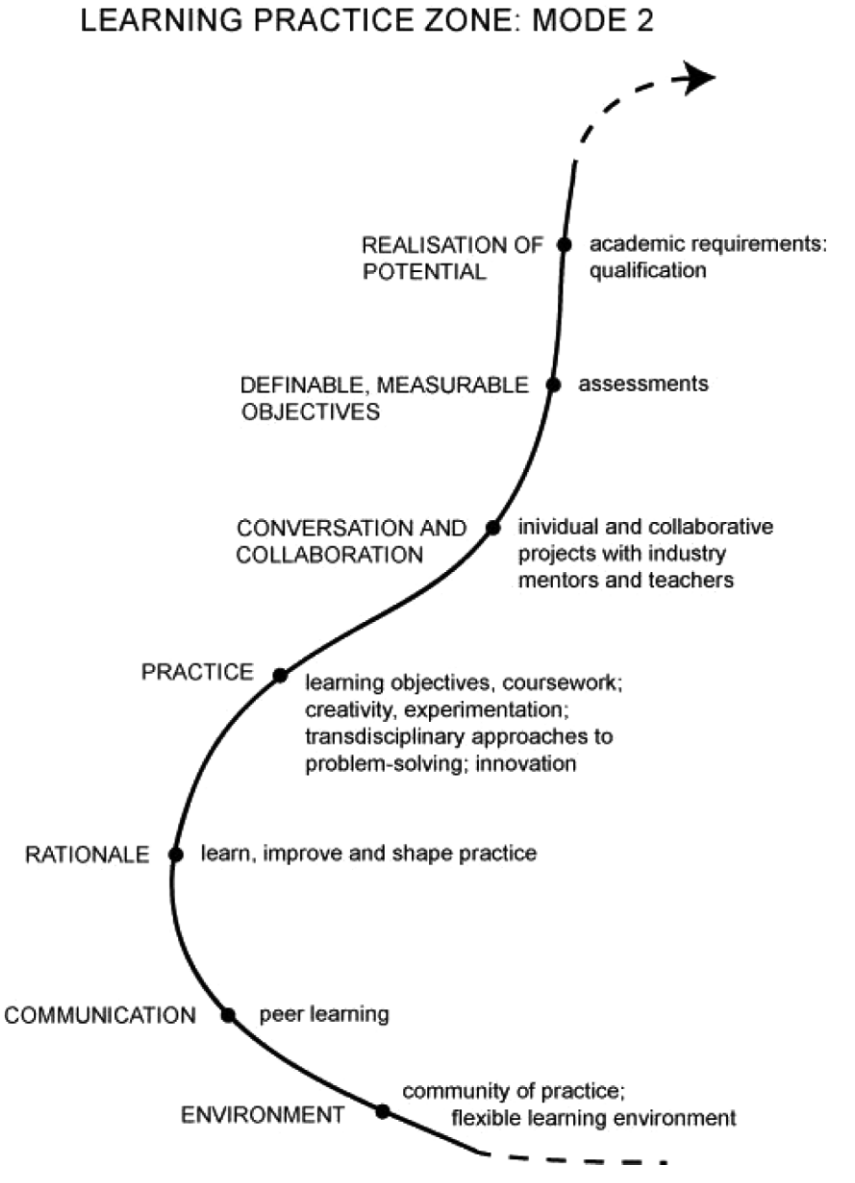

Figure 2. Action pathway of seven steps in the learning zone to develop Mode 2 knowledge.

the experience, in relation to their previous coursework on virtual project management and the new theory studied on knowledge networks.

Project management and communication within the student team and with the international mentor were assessed. Written assessment was individual research papers and the team report. As a final masters subject, assessment included critical thinking, complex problem solving, negotiation and leadership. In particular, the transdisciplinary approach in tackling the project challenge was integral to assessment. I monitored the project frequently, prompting where necessary. Responses to those prompts and students' own initiatives were noted, as well as development of ideas and strategy. For example, in one project, the prompt to consider

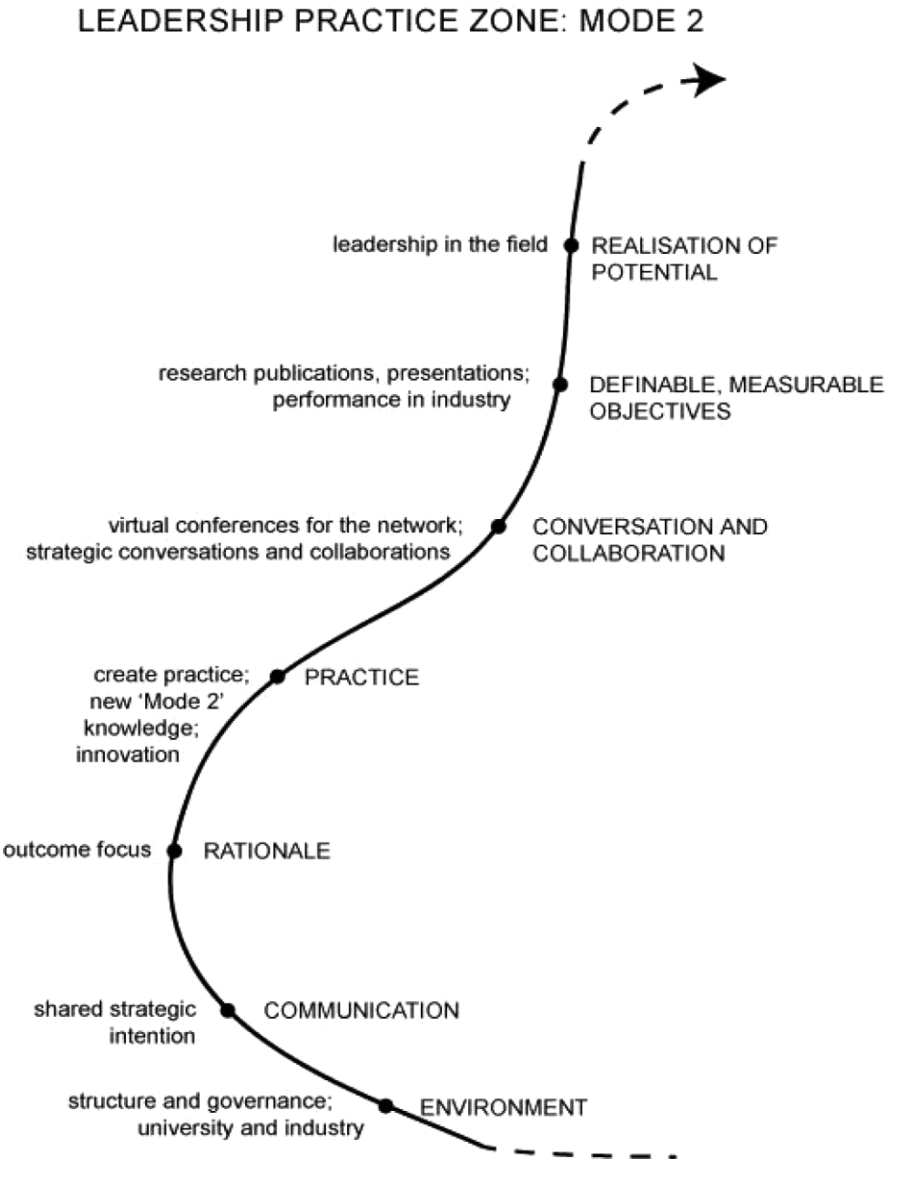

Figure 3. Action pathway of seven steps in the leadership zone to develop Mode 2 knowledge.

measurement of communication strategy resulted in one student's in-depth research on e-metrics: measurement of website performance against strategic communication objectives, within overall business objectives of the organisation. This facilitated important content in the report; in addition, the student was inspired to pursue this new consulting area after graduation.

Facilitation required detailed planning to create the learning environment, with provision of appropriate performance modelling, coaching and scaffolding. Facilitating in a highly complex international online project in the final semester of a masters degree is not for the inexperienced teacher. It takes considerable skill and tacit knowledge to 'know' when to prompt or intervene, and when to observe and wait. The level of facilitation approaches that of a research degree

supervisor, but emphasises the importance of peer learning and collaboration as well as a more structured program of coursework.

Challenges in these major projects included reconciling academic requirements; the industry mentor's needs and expectations; and students' competing academic and work priorities. The student teams had not necessarily worked together before and all had different knowledge, skills, learning styles, interests, and expectations of personal performance. The challenge of undertaking many aspects simultaneously in the projects is one that the students and I both faced. For example, while they undertook background reading on a range of collaborative models and developed an online 'knowledge bank' of reading resources, they examined the international network and prepared to scope out the written project proposal with the industry mentor. Availability of the mentors also varied, and students needed to be prepared for the mentor not responding in the way envisaged because of other competing demands.

The projects students undertook with industry mentors were core to the community of practice, in which participants learned and improved their individual and collective practice. Annual virtual conferences provided further opportunities for all network members to share and build their knowledge through conversation over three to four days, particularly in relation to new and emerging developments in the field.

Five of the projects are now described, highlighting further some of the challenges and achievements.

Global Network Project 1 – Canada, Malaysia, Australia

The distributed learning system 'Blackboard' was used, as well as two web-based collaborative software tools (eRoom and Centra) for clarifying the mentor's needs, for students' planning and discourse, and for the virtual presentations of findings to the international mentor. eRoom is a tool to support virtual project teamwork and this software was used for a range of communication activities such as threaded discussion of concepts, as well as project planning, decision making and document management. Centra combines interactive PowerPoint with voice and text chat, which was particularly useful for presentation of interim findings for clarification by the mentor and for presentation of the final report. The students also published an asynchronous website presentation, incorporating 'streamed' video explanations of the strategy recommended embedded in a 'mock-up' of the home page proposed. There was great diversity within and between the student and mentor teams. Students were based in Australia, though two had come from India and one from Singapore; the mentor team was based in Canada and Malaysia. Language proved to be a significant point of difference, although all spoke English. Significantly, the term 'template' had different meanings *between* teams – students produced a 'mock-up' while the mentor expected a 'prototype'. This was important and memorable learning, illustrating that even when people think they speak the same 'language' this may not be the case (see Sapir 1956).

Global Network Project 2 – Asia-Pacific

The four students in this team were enrolled in different subjects, which added fresh challenges. Two were enrolled in global relationship management and strategic communication; the others were enrolled in communicating technical solutions. One student from the latter sub-team was the project manager and they had all worked together before. The relevant learning objectives and assessments were mapped to the project, which was conducted flexibly out of semester over the summer to suit the mentor and the students. I accommodated this in the interests of the students working with a prominent global organisation and network, and the valuable

learning I was confident the students would gain from the experience. The added complexity of the project being 'out of semester' is something I chose not to repeat, because the students rarely met as a whole team. I believe the parameters of normal coursework are reinforced during normal semester time, being a familiar psychological pattern to the student and the teacher.

Global Network Project 3 – United States of America, Australia, Japan

In this project, one student completed a project alone while her classmates undertook a different one. Through mutual peer support, it was expected that increased learning would result for all participants, as they would be able to observe the outcomes for consultation with two global networks instead of only one. It was also an opportunity to test some of the theory on collaboration in our local team. The outcome for this student was outstanding – she completed a major research report to international acclaim within the mentor's corporation network. This student had contributed strongly in the early stages of the other team project and continued to provide input. However, her colleagues did not reciprocate to nearly the same extent. This was further learning for me – I could have built in firmer parameters to ensure that she received more peer support. While assessment included their ability to perform collaboratively, it was natural for the other students to focus on their own complex project. It was important to be realistic in my expectations of the students, who either had full-time employment or full-time study programs. I had clearly stated expectations for peer support, but I needed to build a stronger bridge.

Global Network Project 4 – United States of America

I negotiated this project through my membership of an international professional association. The objective of the project was to provide a high-level e-communication strategy with a supporting toolkit of recommendations for the development of a knowledge hub for the mentor's network. Students embraced the challenge and their learning was significant. One subsequently completed related doctoral studies supported by scholarships. Two others, who work in information technology strategy and mobile technology marketing roles (and were somewhat sceptical about the subject at the outset), identified and pursued a new consulting opportunity synthesising e-metrics and knowledge networks. They attributed this directly to their international project learning experience in global relationship management.

Global Network Project 5 – Australia, United States of America

Students engaged with the mentor, establishing lines of communication, aims and their consultative role. An online workspace was constructed for student discourse, while the network was examined in relation to the theory being studied. However, most discourse occurred (or did not) in small teams, or occasionally together face to face in a class meeting. The online space could have been used much more extensively for project planning and continuing discourse on research findings. This might also have ensured more obligatory participation, as it would have been obvious who was participating. The issue of accountability is important and was a 'sticking' point in the student team dynamics in this project. Some students attempted to understand and resolve the different personal performance expectations, interests and abilities within the team, raised in a class meeting. In the minds of some students, the issue and differences were clearly resolved at the meeting. For others, this was not the case, evidenced in discussion with me and in remarkably divergent reflective papers. This was valuable learning on some of the challenges and pitfalls of collaboration.

Outcomes of projects

The five projects discussed highlight the following outcomes for the students and for me as the educator:

- Students extended their earlier practice in the program in multidisciplinary virtual project teams to a higher-level, more complex and international context. There was a much greater co-dependence required within the local team than in earlier projects, and students took leadership roles related to their strengths such as project manager or creative director. By taking a second support role to another leader, each student was also able to expand their learning about the different roles within the team. This meant they developed a strong appreciation of the cross-cultural dynamics related to disciplines and nationalities. Deeper understandings about the implications of 'language' were acquired experientially, with strong emphasis on the development of trust-based relationships as an essential ingredient of international project management.
- Projects were the nexus for peer learning, with research and practice interlinked. Students created an online workspace for discourse, development of concepts, and management of the virtual project as a multidisciplinary team. They developed collaborative research capability informed by interdisciplinary thinking as the culmination of this interdisciplinary program (communication management, interactive multimedia design, and Internet management).
- Students adapted existing knowledge and experience to the new theoretical concepts and situation, for complex transdisciplinary problem solving related to knowledge networks: this was one of the real challenges and outcomes. The learning experience cultivated the ability to adapt the strategic thinking and practical application in context for other distributed organisations and networks, post-graduation.
- A real benefit of participating in these collaborative projects was that students engaged with an international industry mentor's organisation and devised an e-communication strategy, in response to a real organisational project challenge set by the mentor in line with the curriculum. This was a supportive learning environment, in which students could develop 'Mode 2' capabilities related to problem solving, technological communication and collaboration in an international setting.
- Students learned to be creative and improvise, because communication and action are not always forthcoming in the desired timeframe, or at all, in international projects. The educator needs to manage students' expectations of the availability of international mentors, and provide guidance on 'work around' approaches if the mentor does not respond in the manner or timeframe hoped for.
- In partnership with industry mentors, students created new practice in the emergent field of virtual communication related to knowledge networks and e-communication strategy. The strategic thinking, creativity and innovation achieved within these virtual projects prepared graduates for new leadership positions in the networked world of organisations – positions requiring Mode 2 capability.
- The final reflective papers that students wrote consolidated their learning about virtual team dynamics and knowledge networks. Reflective professional practice also equipped students for further application of the concepts after graduation, because they synthesised the theory and practice, learned from their successes and mistakes, and made new connections.
- Other transformative outcomes resulted from these projects, such as graduates moving on to related doctoral studies or developing a new consultancy niche in their professional practice.

- International professional networking of the educator underpinned most of the projects negotiated, and students could propose projects with their own industry contacts. The educator leading such projects needs to be flexible in accommodating project opportunities and interests, and establishes the flexible learning environment with appropriate performance modelling, coaching and scaffolding.
- Students needed to be guided on how to reconcile their competing academic requirements and take advantage of multiple project opportunities. It is important to keep the projects 'in semester' rather than conducted over summer, to avoid unnecessary extra challenges for communication and to maintain impetus for discourse. The educator also needs to be realistic about expectations of students in a group being able to undertake two concurrent projects, facilitating peer support for each participant.

Through practical experience in iterative virtual projects (and virtual conferences), together with examining theoretical concepts in virtual communication and collaboration, Mode 2 capabilities were developed, as the following stories illustrate.

Prior to undertaking the masters program, one student, 'Nigel', was a very experienced international project manager in a multinational organisation. In managing those projects, he had travelled extensively. After graduating, he was recruited back into the organisation to transform its work practices for the online environment, *because* of his new Mode 2 capabilities developed in the program – specifically related to inter- and transdisciplinary problem solving, teamwork, and communication in the online networked environment.

Another graduate from Global Network Project 4 commented:

> This project was pivotal in teaching me some of the communications management skills necessary to work virtually in a large and diverse team and achieve consistent client communications and work outputs. It was a real challenge... undertaking the project in a 'mentored' environment also meant that, while the pressure to excel was real, we were able to take risks and make mistakes. The project was also grounded in theoretical concepts which gave the team a frame of reference to work towards. ('Caroline', graduate, 2003)

Mode 2 research

While there has not been extensive discussion in the literature, in terms of creating Mode 2 learning environments such as the graduate coursework case study above, there are some interesting parallels in terms of Mode 2 research and experience of collaboration in higher education across disciplines and countries.

Van Aken (2001) argues that there should be a balance between Mode 1 and Mode 2 in terms of knowledge production in the field of management, for example, because business schools have an educational mission to train professionals and because it is important to increase the relevance of research beyond academia. Winberg (2006) also emphasises a balance between Mode 1 and Mode 2. She sums up attempts to transform higher education in South Africa through Mode 2 knowledge production, to prepare graduates to contribute to the social and economic reconstruction of the country. She says:

> Effective educational practice requires carefully designed curricula, in terms of scope and sequence, which include both disciplinary and transdisciplinary learning experiences. Such curricula would need to develop generic and context-specific competencies that would enable the graduate to travel between two – or more – contexts, such as the academic context and the context of a society in transition. (Winberg 2006, 164)

Vale and Ryan (2008) suggest that academics, who consider that disciplinary/Mode 1 knowledge is all that is required to teach, are becoming less common. Reporting on a collaborative project by eight Australian universities to offer a Graduate Certificate in Tertiary Education

(GCTE), they highlight the fact that development of the program needs to be shared, with each of the universities to offer the Core or Foundation Unit for their local staff to ensure that a community of learners could develop in the context of their own institution. Resonating with my own experience with students and the whole strategic knowledge network in the case study discussed, Vale and Ryan highlight mutual accountability as a very important aspect of working collaboratively in the cross-university GCTE project. They add that membership of the project is dynamic and there needed to be a stronger structure in place, in terms of activating their reference group as well as an appropriate conflict resolution procedure. Again, this learning resonates with the strategic knowledge network project experiences outlined earlier in this paper, as well as the structure and governance integral to the strategic tier of the model.

In terms of research practice, social capital facilitates knowledge production and learning. Based on a study in Finland, Aurenen (2005) suggests that Mode 1 and Mode 2 knowledge production networks can co-exist, and while the influence of social capital on intellectual capital was evident in the Mode 1 and Mode 2 networks examined in that study, the 'intense' networkers were members of the Mode 2 unit. In relation to another case study based on 65 interviews conducted with academics and academic managers in Sweden, Marton (2005) challenges some of the assumptions of Mode 2. She found that there was not widespread support for producing Mode 2 knowledge and there was some resistance to multidisciplinary research projects. There was scepticism about the Mode 2 way of evaluating knowledge production, particularly the possibility that non-academics may evaluate research quality. On the other hand, she found that funding for collaborative research increased significantly over the previous decade, particularly for multidisciplinary projects. She points out that rather than projects focusing on finding solutions to societal problems (as may be expected in Mode 2), the projects focused on 'the expansion of knowledge derived from working in a multidisciplinary group and learning other disciplines' perspectives and methodologies' (184). This also resonates with the case study of my teaching practice, in which students from different disciplinary backgrounds such as engineering, medicine, graphic design, computer science, public relations, journalism and so on, frequently cited the benefits of knowledge sharing and problem solving, through working with and learning about each other's disciplinary perspectives and approaches.

Conclusion

The debate around Mode 2 continues in higher education, particularly with regard to research. There has been some interest in Mode 2 for coursework, notably in undergraduate programs in South Africa for example. Given the emergence and demands of the new networked world of work, it is clear that Mode 2 knowledge capability is needed for this environment. This is not to say that graduates do not also require Mode 1 capability; to the contrary. However, especially at the graduate program level, a broad range of knowledge and skills relevant to the new industry setting is important.

The collaborative model presented – in which graduate students undertake progressively complex coursework *with and within* industry as part of a global knowledge network – provides a cohesive and strategic framework for graduate education linked to industry. It is not an enhancement approach for single subjects or projects within a program, though such endeavours may well be valuable. Curriculum that incorporates the development of Mode 2 knowledge capability, building on underpinning disciplinary specialisations, prepares graduates for leadership positions in the globalised environment, because the ability to generate socially distributed knowledge is regarded by organisations as a vital source of productivity (Garrick and Usher 2000). The development of Mode 2 knowledge capability is achieved in multiple organisational

project and communication settings in the strategic knowledge network; it is not confined to the workplace of an employee undertaking the graduate program.

The network is strategic in its intention and action to help shape, influence or create professional practice and to position graduates as leaders with new Mode 2 leadership capabilities. It is a communications network, able to transfer its work into implementation through publication, conference conversation, and the practice of participants in the other organisations, communities and networks to which they belong. The academic program leader is the network manager and relationship manager, or these roles may be shared. The educator who has these pivotal roles fosters the growth of social capital between and among students, graduates, teachers, international advisers, and self. Intellectual capital is stimulated through learning, practice, new knowledge and innovation.

The model presented suggests that a strategic approach to graduate education that is linked to the industry, drawing on the potential of technology as it influences communication and collaboration in a learning community, can contribute to transforming the preparation of graduates for leadership in a global context.

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