Academics Wrestling with the Dynamic Impact of Social Connectivity to Integrate Emerging Technologies into Higher Education Curricula

K. J. Matthews, University of Southern Queensland, Karl.Matthews2@usq.edu.au

P. A. Danaher, University of Southern Queensland, patrick.danaher@usq.edu.au

Abstract

This article considers how academics wrestle with integrating emerging information and communication technologies (ICTs) into their teaching, and the benefits that they reap as a result. The effective integration of these emerging ICTs into higher education curricula poses a significant challenge for academics to manage the complex interactions that support teaching and learning in higher education. Emerging ICTs create unprecedented opportunities for academics to collaborate on a widespread scale, crossing campus, disciplinary and institutional boundaries to create educational resources and design innovative curricula, yet ongoing effort is required to maximise the potential advantages of those opportunities. This article proposes the authors' contemporary updating of Latané's (1981) Dynamic Social Impact Theory (DSIT) in order to assist in explaining the post-2010 reality with which higher education professionals wrestle to reap the benefits of integrating emerging ICT capabilities into their respective higher education curricula. The implications of this connectivity are explored with reference to knowledge management processes, namely how academics deploy ICTs effectively to create, improve, store, use and share aspects of their curricula with students and peers, thereby enhancing teaching and learning outcomes in contemporary universities.

Keywords: Dynamic Impact of Social Connectivity (DISC) theory, Dynamic Social Impact Theory (DSIT), emerging technologies, higher education curricula, knowledge management

Introduction

This article provides a theoretical perspective on why academics wrestle with integrating particular technologies into their teaching and learning. Such a perspective is necessary, and the metaphor of wrestling signifying grappling or struggling is appropriate remains invisible to policy-makers because much of that integration requires hidden work that often entails hours of additional labour that

and university administrators (Smith, Underwood, Fitzpatrick, & Luckin, 2009). A key element of the work of contemporary academics is the requirement to engage with current and emerging Information and Communication Technologies (ICTs). ICTs offer many advantages, such as the development of pedagogical innovations in new teaching and learning environments (McAleer Balkun, Zedeck, & Trotta, 2009), the harnessing of the distinctive affordances of specific technologies (Warburton, 2009) and the promotion of collaboration among students (Kamel Boulos, Maramba, & Wheeler, 2006) and among scholars (Willis, Baron, Lee, Gozza-Cohen, & Currie, 2010). At the same time, the use of such technologies does not necessarily align closely with existing management policies (Chalke, 2010), and is characterised by considerable complexity (Hanseth & Ciborra, 2007; Zhang & Sun, 2009).

Academics must wrestle with this ICT complexity to achieve their higher educational teaching commitments; however, the benefits reaped enable those academics to engage effectively, efficiently and (as far as possible) equally with students all around the world. This phenomenon is described in this article through a contemporary updating of Latané's (1981) Dynamic Social Impact Theory (DSIT) to account for the special case of ICT connectivity, and the article highlights how, through wrestling with the integration of ICT capability into their higher education curricula, participating academics reap significant benefits for their students and themselves. These benefits include the ability to maintain rich interpersonal interactions and influence between many academics and students, regardless of their physical separations, and to manage knowledge in ways that are generative, productive and sustainable.

The article is divided into three sections:

1. A review of current literature about emerging ICT capabilities

2. The updating of theory to introduce the special case of Dynamic Impact of Social Connectivity (DISC) theory

3. Selected implications of this updated theory for higher education academics engaging with ICTs

It is intended in future publications to apply the conceptual framework elaborated and justified here to a range of contemporary higher education teaching and learning issues.

Literature review

Despite the diversity evident in the current literature about educational technologies, and without subscribing to an uncritically celebrationist discourse about such technologies, a common theme in the literature is the increasing reach and influence of the emerging ICTs and the ways in which they enhance existing capabilities and create new ones across multiple fronts of human activity. Furthermore, this literature demonstrates how academics wrestle with emerging technologies, exploring how best they can reap knowledge management benefits from the capabilities of those technologies for enhancing teaching and learning effectiveness and outcomes.

These emerging technologies constitute something of an enigma in contemporary universities. They are regarded by particular groups of administrators, academics and students with cautious scepticism and as a trendy fad, not necessarily to be taken seriously and sometimes being seen as inimical to teaching and learning

(Brabazon, 2002, 2007). Others are committed to exploring the pedagogical potential of such technologies, even if that potential is not always direct or easily realised (Johnson, Levine, Smith, & Stone, 2010). Still others have situated specific technologies in complex webs of interactions where some elements are clear but others are invisible and tacit except when examined by means of certain conceptual lenses. This certainly applies in the case of online provision (Kehrwald, 2007; Reushle, 2005; Rossi, 2008, 2010) and videoconferencing (Luck, 2004a, 2004b, 2008), for example.

There is a considerable array of fields of endeavour to which emerging ICTs are seen as potentially contributing. These fields range from construction project teams (Brewer & Gajendran, 2009) to managing customer-supplier relations (Ciappini, Corso, & Perego, 2008) to ICT infrastructure expansion in developing countries (Ngwenyama & Morawczynski, 2009) to introducing such infrastructure to schools in those countries (Rubagiza, Were, & Sutherland, 2011). It is particularly noted from this literature that ICTs assist in the management processes of creating, improving, storing, using and sharing knowledge (Matthews, 2010).

Educators wrestle with ICTs as they engage in the processes of managing their curricula. For example, the use of integrated ICTs in teaching and learning is an official requirement for schools in Australia (Fetherston, 2006), which places additional pressure on teachers already struggling with overcrowded curricula, standardised testing, behaviour management concerns and several other challenges. In the higher education context, whilst ICTs may not be officially required, they certainly form part of the essential infrastructure needed to perform academic operations at a post-2010 standard. To that end, the effective use of ICTs in higher education curricula is vital for content, delivery and management alike.

"Post-2010" is used here to signify the contemporary world and the current situation with regard to ICTs and their educational implications. In the age of the Internet, information is the lifeblood of government, commerce and education (Jaeger & Burnett, 2010). We contend that post-2010 ICT capacity has reached a critical limit in terms of bandwith, mobility and potential applications that commonly did not exist in the academic community previously. Indeed, we must constantly remind ourselves (including members of Generations Y, Z and Alpha) that only 150 years ago virtual connectivity was limited to drums, signal lights and telegraphy (Gleick, 2011).

Post-2010 ICT capacity, therefore, defines the era of convergence towards ubiquitous connectivity amongst academics. It is likely that this connectivity will continue to increase, enabling the future of "tele-presence". More specifically, we argue that a key feature of the second decade of the 21st century is the practical enactment of the proposition of "interpersonal distance = 0" that we elaborate below for many individuals and communities around the world. So we use "post-2010" not to evoke a 'brave new world' or millennialist connotations but rather to highlight a particular ICT capacity with which academics (among others) will continue to need to engage and wrestle in order to reap its maximum benefits. It is, therefore, important to understand as comprehensively as possible this capacity of ICT connectivity. Connectivity is defined here as the capacity for individuals to connect across space-time either physically (when all entities are in the same space-time dimension) or virtually (through an ICT wormhole into other space–time–cultural dimensions). ICT virtual connectivity enables the capacity to increase the knowledge management capability of individuals, particularly for academics and their higher education curricula. One method of increasing this understanding of

ICT connectivity impact is to apply DSIT, and to adapt it to account for the special case of ICT connectivity.

Conceptual framework

In developing the conceptual framework outlined in this section of the article, the literature on emerging ICT capabilities was reviewed, overlain by a synthesising theoretical lens that the authors founded on DSIT. This approach aims to assist comprehension of why contemporary academics wrestle to integrate ICTs into their higher education curricula. The aforementioned literature on emerging ICT capabilities is linked here with our contemporary updating of DSIT.

Latané's (1981) DSIT provides the foundation for "explaining the emergence of cultural phenomena from the bottom up" (as cited in Harton & Bourgeois, 2004, p. 43) and for "adapt[ing] a theory of social influence among individuals … to explain how cultures varying in size from dyads and triads to countries and continents develop and change over time" (p. 43; see also Conway & Schaller, 2007; Shepherd, Patzelt, & Haynie, 2010). The conceptual roots in Latané's (1981) DSIT are relevant to modelling how multiple academics individually wrestle with ICTs in higher education curricula. In drawing on DSIT, Wragg (2006) emphasised the importance of the three attributes of the source–target relationship:

1. Strength: the social strength, credibility, or status of the agents involved

2. Immediacy: the physical or psychological distance between individuals

3. Number present: the number of sources a target is exposed to. (Wragg, 2006, p. 5)

Taking Wragg's (2006) argument further, when an individual agent or actor is a target of one or more people's influence, DSIT asserts that the level of social influence experienced by that individual can be expressed as a mathematical function that is indirectly proportional to the interpersonal distance between individual actors i and j, where i is the influenced actor (target) and j the influencing actor (source.

Equation 1 *Latané's [1981] DSIT elaborated by Wragg [2006]*

$$I_i = -S_i\beta - S_{M_i}O_iO_M - \sum_{j=1, j\neq i}^{N} \frac{S_j O_i O_j}{d_{i,j}^{\alpha}}$$

where

I_i represents the amount of social pressure exerted upon individual agent/actor i, ($-\infty < I_i < \infty$).

O_i represents individual agent/actor i's opinion (±1) towards a proposition, where $+1$ and -1 represent support for or opposition to the proposition respectively.

S represents the individual agent/actor's strength or influence ($S > 0$).

β represents an individual agent/actor's resistance to change ($\beta > 0$).

d_{ij} represents the "interpersonal social distance" between individual agents/actors i and j ($d_{ij} \geq 1$).

α represents the distance decay exponent ($\alpha \geq 2$).

N is the total number of agents/actors.

S_{M_i} represents the strength/influence of mass media messages on individual i ($S_{Mi} > 0$).

O_M is the opinion of the mass media (± 1)

And if the social pressure (I_i) on individual i is > 0 then that individual will change her or his opinion.

(adapted from Wragg, 2006, pp. 6-9).

Latané's (1981) DSI framework as summarised by Wragg (2006) and outlined above leads to our concern with the equation's denominator "d" representing "interpersonal distance between i and j", especially considering the influence of ICT capabilities on agents/actors in the post-2010 world. Interpersonal distance "d" is elaborated by Wragg (2006) to include geographical distance (d_{GEO}), religious distance (d_{REL}) and potentially other factors such as age, education, occupation and gender. Although these factors and their order of importance may vary from culture to culture, they nevertheless provide a starting point to extend equation 1 to incorporate all measures of interpersonal distance so that, with reference to Wragg (2006, p. 15, equations 4 and 5), the equation assumes a more general form:

Equation 2 *(based on Wragg [2006])*

$$I_i = -S_i\beta - S_{M_i}O_iO_M - \sum_{j=1, j\neq i}^{N} \frac{S_jO_iO_j}{w_1 d_{GEO\ i,j}^{\alpha} + w_2 d_{REL\ i,j}^{\alpha} + \cdots + w_P d_{P\ i,j}^{\alpha}}$$

where
Geographical distance = $dGEO;\ dGEO \geq 1$
Religious distance = $dREL;\ dREL \geq 1$
$w1 + w2 \ldots + wp = 1$
$0 \leq wi \leq 1\ \forall\ i$
$d(i, j) \geq 1\ (\forall$ distances $d_{GEO..}\ ...d_p)$.

In applying this DSIT to the subject of academics integrating emergent technologies into higher education curricula, it was noted that this Equation 2 calculation does not seem to consider explicitly the impact of ICT connectedness on interpersonal distance. Yet in the post-2010 world ICT connectivity is argued to be a significant factor in influencing individuals, leaning towards mass media ubiquity (expressed as $S_{M_i}O_iO_M$ in Equations 1 and 2 above). "Connectivity" implies that there is "negligible interpersonal distance" between i and j, especially on issues of importance that may imply influence. By this we mean, not that the richness and heterogeneity of human diversity are elided, but rather that technologically-enhanced connectivity creates new opportunities for reimagining social relationships in more productive and transformative ways (Goodyear, 2011; Jahnke, 2010). It seems to follow logically that, as ICT connectivity increases, it introduces a special case scenario whereby, as in the mass media calculation in Equations 1 and 2, interpersonal distance becomes irrelevant, and this case applies for academics engaging with higher education curricula.

The article now further considers this special case adaption of Latané's (1981) framework, in order to model more comprehensively the influence of post-2010 ICT connectivity. We argue that this interpersonal connectivity scenario has arisen only relatively recently, whereby the interpersonal distance between individuals has become reduced by the connectivity capacity enabled by post-2010 ICTs, and this connectivity effectively reduces interpersonal time–space–cultural distance to be potentially insignificant. Furthermore, this connectivity is likely to continue to increase as ICTs evolve further (Leach, 2008), resulting in interpersonal distance

becoming progressively less relevant to social impact. At the same time, we acknowledge wholeheartedly the points that "ICTs are not a panacea or cure-all for gaps in education provision" (Ng, Miao, & Lee, 2009, n.p.), and that "The right conditions need to be in place before the educational benefits of ICT can be fully harnessed, and a systematic approach is required when integrating ICTs into the education system" (n.p.). Indeed, this article highlights both the necessity for and the complexity of implementing such "a systematic approach" to ICT integration. For example, in terms of post-2010 connectivity, the spoken or written word can now be transferred at lightning speed via mobile telephones in voice or text formats or via multimedia modalities. Physical or geographical distance becomes less relevant in this utopian reality, as distance is reduced significantly by connectivity through the virtual wormholes that the post-2010 ICTs now enable. This post-2010 reality of ICT connectivity justifies our attempt to adapt Latané's (1981) DSIT conceptually and mathematically to reflect and model the future more effectively with DISC theory as encapsulated in Equation 3 below, which is based on the concept of ICT connectivity.

In an ideal age of equity in diversity, connectivity enables these interpersonal space–time–cultural distances to approach the null limit. We therefore argue that with the potential of ICT connectedness there exists an ideal world special case where the DISC reduces the value of interpersonal distance (*d*) towards unity (with a value of 1), and so social distance as a factor becomes irrelevant. This special case of ICT connectivity unifying interpersonal distance would thus simplify the denominator of equation 2 outlined above to become:

Equation 3 *(DISC theory)*

$$I_i = -S_i\beta - S_{M_i}O_iO_M - \sum_{j=1, j\neq i}^{N} S_jO_iO_j$$

Equation 3 introduces a special case of Latané's (1981) DSIT simulation, where ICT connectivity has reduced interpersonal space–time–cultural distance. Equation 3 represents a significant adaptation of Latané's equation to model post-2010 interactions via emerging ICT capabilities. Extending this proposition, as the number (N) of agents/actors increases, the ICT connectivity relativity among various agents/actors must be maintained so that all can interact at an equalised interpersonal space–time–cultural distance. The adaptation of the equation to unify the denominator therefore simplifies Latané's approach to factor in ICT connectivity as largely overcoming any complex accounting for interpersonal distance; hence, this special case of Latané's theory leading to Equation 3 is called DISC theory.

Equation 3 achieves a simplification of result validation and verification of social simulations, which reduces the issue noted by Wragg (2006, p. 45) that simulations involving a large number of parameters are difficult to explore comprehensively. Rather than moving towards Wragg's (2006) conclusion of creating "more complex rules of interaction … [to] add to the fidelity of the simulation" (p. 47), equation 3 proposes to simplify the simulation by equalising interpersonal interactions, ultimately predicting the potential for ICT connectivity to unify interpersonal social distance.

Whilst this special case adaptation based on ICT ubiquity may be a bold claim with previous technologies, it is likely that further ICT evolution will support this capability. Indeed, it would seem that in the post-2010 academic world, on issues of any influential importance, adequate ICT connectivity capacity between individuals i and j is already presumed to the extent that one remains

'disconnected' only by choice, for example, as demonstrated by the phenomenon of resistance to educational technologies (Blin & Munro, 2008)..

The remainder of this article articulates the implications of this special case of DISC theory perspective defined in Equation 3 as it pertains to academics and their curricula, whereby staff-student interpersonal distance is considered to be potentially unified by ICT connectivity. Specifically, through DSIT and DISC theory, we can now better understand why academics are influenced and encouraged to wrestle with the integration of emerging ICTs into their higher education curricula: so that they and their students can engage with those curricula regardless of their space-time-cultural distance, in order to reap the benefits of higher education impact. The implications of this influence of ICT integration on knowledge management practice, both now and in the future, are significant.

Implications

The implications proposed in this article result from the contention that post-2010 ICTs have reduced interpersonal social distances between actors. DISC theory is the special case that assists our understanding of working across the interconnected, multidimensional networks that universities have become. Adapting Latané's (1981) DSIT to become DISC theory enables analysis of the issue of academics wrestling with integrating emerging ICTs into those academics' higher education curricula. The value that DISC theory adds to the analysis is that it accounts for the relative connectivity between agents or actors in a network, effectively removing the complication of interpersonal distance, an outcome that with emerging ICT technologies is practically possible. In this emerging reality, then, the DISC is a capability that higher education professionals must comprehensively understand.

One method of assessing the implications of emerging ICT capacity is how it influences the knowledge management practices of academics, namely, their ability to create, improve, use, store and share knowledge with their peers and students. This connection between ICTs and academic 'knowledge industry' work can be articulated as follows:

- Create and improve knowledge – with optimum connectivity, access to applications becomes faster and more user friendly, resulting in less wrestling with process and more content reaping by academics. The common use of ICT tools for the articulation of knowledge enables multiple sources of knowledge to be captured and collated by academics and, with that knowledge at their fingertips, their creative sparks can be harnessed to stimulate innovative curricula development within and across institutions, including internationally.

- Store – DISC enables the potential of cloud storage. Also fast connectivity with external storage facilitates the storage of large files electronically, resulting in many academics moving towards e-storage systems rather than paper storage (filing cabinets/bookshelves). Connectivity also poses risks to storage security, as highlighted by wikileaks and cyber-crime (Farwell & Rohozinski, 2011), posing new threats for academics and their curricula in terms of both confidentiality and copyright.

- Use and share – connectivity, particularly wireless ICT connectivity, enables academics to work when they are physically mobile, so they are no longer disconnected when attending conferences away from campus or

even meetings on campus. This potential 24*7 ubiquity grants academics continuous use and sharing of knowledge, noted especially through breaking news feeds, blogs and social network sites such as twitter, facebook and linkedin. Ironically, this connectivity can introduce a downside of connectivity addiction and disconnectivity guilt (Powers, 2010), which can be linked with potential work intensification (Bittman, Brown, & Wajcman, 2009).

More broadly, ICT connectivity can serve both to enable and to disable engagement with significant others. Restricting interactions to members of prespecified groups can minimise unwelcome or unwarranted opinions; however, it introduces the disadvantage that the valid concerns of those outside the cluster might be transmitted but not received. In this way, the phenomenon of the 'ICT cluster' introduces interpersonal distance implications that would be very complex to account for in Equation 2 outlined above.

Moreover, the implications of DISC also include the potential equalisation of all students, removing or at least aligning cultural 'distances' of language, religion, age, gender, disability or other foreseeable social differentials. Furthermore, the advance of mobile telepresence robotics is predicted to extend this connectivity capacity (Boissy, Corriveau, Michaud, Labonté, & Royer, 2007), resulting in academics reaping benefits in their creation, storage, use and sharing of curriculum knowledge with peer academics and their students, and also within and outside the institution. For teachers and learners, the avatar presented by connectivity is one's agent in cyberspace, ideally sharing knowledge on an equal basis (see Franks [in press] for an account of the possibilities of and constraints on this notion of "cyberspace idealism" [p. 1]).

For example, Equation 2 would seem to struggle to explain the influence that student "j", having a disability and living thousands of kilometres away from the university campus with vastly different cultural beliefs from those of the course lecturer, may have on the development of a particular higher education curriculum and that students' active participation in that curriculum. By contrast, DISC theory and Equation 3 support the unifying influence of ICT connectivity capability, and the influence that an individual's virtual opinion (O_j) may have on the reality faced by the contemporary academic (i) wrestling with her or his higher education curricula (or vice versa).

With further research, it may be shown more comprehensively and across a greater range of specific contexts how the DISC theory models this impact of ICT connectivity. The perspectives outlined above suggest that the implications of DISC theory provide a useful conceptual framework to continue exploration of this special case where ICT connectivity ultimately unifies interpersonal space-time-cultural distance. For higher education academics wrestling with the integration and implications of DISC theory, the potential knowledge management benefits that they can potentially reap will hopefully make their efforts worthwhile.

Conclusion

This article has discussed how higher education academics are wrestling with these emerging ICT capacities, striving to reap productivity benefits from added capacities. As lead users of these emergent ICTs gain capability maturity and performance capacity, this wrestling will be likely to result in further productivity reaping. With regard to the question helping to frame the theme issue in which the

article is located, "What are the rewards for staff, students and technologies that can be reaped through the successful integration of emerging technologies into the curriculum?", the benefits of operating across multidimensional contexts may not be inherently obvious, as doing so requires considerable conceptual gymnastics to perceive the networked matrices involved and the potential advantages to be gained. However, DISC theory (based on and extending from Latané's [1981] DSIT) might evolve into a useful tool to model greater understanding of post-2010 reality, and thereby transform the experiences of academics. With this dimensional shift in connectivity capability, the analysis of academia's current wrestling issues is put into a broader perspective.

As the ICT connectivity becomes greater (enabled by post-2010 ICTs), wrestling may lead to further reaping. On the specific issue of higher education curricula, our education ideals to generate wisdom, enlightenment and vision must keep pace with the evolution of human connectivity capacity. Evolution is encapsulated in the DISC theory that this article has articulated. We conclude, then, that higher education curricula must evolve sufficiently and sustainably to embrace emergent ICT capabilities in order to capitalise on their connectivity capacities as suggested by DISC theory.

Wrestling with the dynamic impact of social connectivity within the higher education curricula network that is emerging from ICT capabilities is a daily chore for academics. Fortunately, as the ICT connectivity capacities further expand and evolve, as highlighted by DISC theory, this connectivity effect will enable greater knowledge management capability. This in turn should evolve more collaborative approaches to reaping benefits from ICT capabilities. This article proposes that ICT connectivity as suggested by DISC theory (Equation 3, as a special case of DSIT) will enable academics to reap considerable higher educational curricula benefits.

Acknowledgments

References

Bittman, M., Brown, J. E., & Wajcman, J. (2009, December). The mobile phone, perpetual contact and time pressure. *Work, Employment & Society, 23*(4), 673-691.

Blin, F., & Munro, M. (2008, February). Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education, 50*(2), 475-490.

Boissy, P., Corriveau, H., Michaud, F., Labonté, D., & Royer, M.-P. (2007, January). A qualitative study of in-home robotic telepresence for home care of community-living elderly subjects. *Journal of Telemedicine and Telecare, 13*(2), 79-84.

Brabazon, T. (2002). *Digital hemlock: Internet education and the poisoning of teaching*. Sydney, NSW, Australia: University of New South Wales Press.

Brabazon, T. (2007). *The university of Google: Education in the (post) information age.* Aldershot, UK: Ashgate.

Brewer, G., & Gajendran, T. (2009). Emerging ICT trends in construction project teams: A Delphi survey. *Journal of Information Technology in Construction, 14*, 81-97. Retrieved from http://itcon.org/data/works/att/2009_09.content.05224.pdf

Chalke, J. (2010). Consideration of the uses of e-learning: Does one size fit all? *International Journal of Information and Operations Management Education, 3*(4), 368-381.

Ciappini, A., Corso, M., & Perego, A. (2008). From ICT outsourcing to strategic sourcing: Managing customer–supplier relations for continuous innovation capabilities. *International Journal of Technology Management, 42*(1-2), 185-203.

Conway, L. C., & Schaller, M. (2007). How communication shapes culture. In K. Fiedler (Ed.), *Social communication* (pp. 107-127). New York, NY: Psychology Press.

Farwell, J. P., & Rohozinski, R. (2011). Stuxnet and the future of cyber war. *Survival, 53*(1), 23-40.

Fetherston, T. (2006). *Becoming an effective teacher.* South Melbourne, Vic: Thomson.

Franks, M. A. (in press). Unwilling avatars: Idealism and discrimination in cyberspace. *Columbia Journal of Gender and Law.*

Gleick, J. (2011). *The information; A history, a theory, a flood.* London, UK: Harper Collins.

Goodyear, P. (2011). Affect, technology and convivial learning environments. In R. A. Calvo & S. K. D'Mello (Eds.), *New perspectives on affect and learning technologies (Explorations in the learning sciences, instructional systems and performance technologies Vol. 3)* (Part 3, pp. 243-254). New York, NY: Springer.

Hanseth, O., & Ciborra, C. (Eds.) (2007). *Risk, complexity and ICT.* Cheltenham, UK: Edward Elgar Publishing.

Harton, H. C., & Bourgeois, M. J. (2004). Cultural elements emerge from dynamic social impact. In M. Schaller & C. S. Crandall (Eds.), *The psychological foundations of culture* (pp. 41-76). Mahwah, NJ: Lawrence Erlbaum Associates.

Jaeger, P. T, & Burnett, G. (2010). *Information worlds: Social context, technology, and information behavior in the age of the Internet.* New York, NY: Routledge.

Jahnke, I. (2010, July). Dynamics of social roles in a knowledge management community. *Computers in Human Behavior, 26*(4), 533-546.

Johnson, L., Levine, A., Smith, R., & Stone, S. (2010). *The 2010 horizon report.* Austin, TX: New Media Consortium. Retrieved from http://eric.ed.gov/PDFS/ED510220.pdf

Kamel Boulos, M. N., Maramba, I., & Wheeler, S. (2006). Wikis, blogs and podcasts: A new generation of Web-based tools for virtual collaborative clinical practice and education. *BMC Medical Education, 6*, art. 41. Retrieved from http://www.biomedcentral.com/1472-6920/6/41

Kehrwald, B. A. (2007). *Social presence and learner support: Understanding learners' experiences with mediated social processes in text-based online learning environments.* Unpublished Doctor of Philosophy dissertation, Faculty of Education, University of Southern Queensland, Toowoomba, Qld, Australia.

Latané, B. (1981). The psychology of social impact. *American Psychologist, 36*, 343-356.

Leach, J. (2008). Do new information and communications technologies have a role to play in the achievement of Education for All? *British Educational Research Journal, 34*(6), 783-805.

Luck, J. T. (2004a). Learning doesn't happen only in the classroom: Technology-assisted informal and formal learning. In P. A. Danaher, C. R. Macpherson, F. Nouwens, & D. Orr (Eds.), *Lifelong learning: Whose responsibility and what is your contribution?:* Refereed papers from the 3rd international lifelong learning conference Yeppoon, Central Queensland, Australia 13-16 June 2004: Hosted by Central Queensland University (pp. 224-229). Rockhampton, Qld: Lifelong Learning Conference Committee, Central Queensland University Press.

Luck, J. T. (2004b). Technological agents?: Exploring the ethics, risks and politics of researching non-human actants. In P. N. Coombes, M. J. M. Danaher, & P. A. Danaher (Eds.), *Strategic uncertainties: Ethics, politics and risk in contemporary educational research* (pp. 185-197). Flaxton, Qld, Australia: Post Pressed.

Luck, J. T. (2008, March). *Lost in translations: A socio-technical study of interactive videoconferencing at an Australian university.* Unpublished Doctor of Philosophy dissertation, Faculty of Arts, Humanities and Education, Central Queensland University, Rockhampton, Qld, Australia.

Matthews, K. J. (2010). *A case study of MBTI personality type influence on knowledge management practice.* Unpublished Doctor of Philosophy confirmation of candidature proposal, Faculty of Education, University of Southern Queensland, Toowoomba, Qld, Australia.

McAleer Balkun, M., Zedeck, M., & Trotta, H. (2009). Literary analysis as serious play in Second Life. In C. Wankel & J. Kingsley (Eds.), *Higher education in virtual worlds: Teaching and learning in Second Life* (pp. 141-158). Bingley, UK: Emerald Group Publishing Limited.

Ng, W.-K., Miao, F., & Lee, M. (2009). Capacity-building for ICT integration in education. In S. Akhtar & P. Arinto (Eds.), *Digital review of Asia Pacific*

2009-2010 (pp. 67-76). New Delhi, India: Sage Publications. Retrieved from http://web.idrc.ca/openebooks/456-7/

Ngwenyama, O., & Morawczynski, O. (2009, October). Factors affecting ICT expansion in emerging economies: An analysis of ICT infrastructure expansion in five Latin American countries. *Information Technology for Development, 15*(4), 237-258.

Powers, W. (2010). *Hamlet's BlackBerry: A practical philosophy for building a good life in the digital age.* New York, NY: HarperCollins.

Reushle, S. E. (2005). *Inquiry into a transformative approach to professional development for online educators.* Unpublished Doctor of Education dissertation, Faculty of Education, University of Southern Queensland, Toowoomba, Qld, Australia.

Rossi, D. (2008). Online learning communities: Adopting a learner-centred perspective to frame lifelong learning futures. In D. Orr, P. A. Danaher, G. R. Danaher, & R. E. Harreveld (Eds.), *Lifelong learning: Reflecting on successes and framing futures:* Keynote and refereed papers from the 5th international lifelong learning conference, Yeppoon, Central Queensland, Australia, 16-19 June 2008: Hosted by Central Queensland University (pp. 333-337). Rockhampton, Qld: Lifelong Learning Conference Committee, Central Queensland University Press.

Rossi, D. (2010, January). *Learning relationships in online contexts: A substantive theory constructed from the integrated analyses of learner–learner interaction and knowledge construction in an undergraduate communication course.* Unpublished Doctor of Philosophy dissertation, Faculty of Education, University of Southern Queensland, Toowoomba, Qld, Australia.

Rubagiza, J., Were, E., & Sutherland, R. (2011, January). Introducing ICT into schools in Rwanda: Educational challenges and opportunities. *International Journal of Educational Development, 31*(1), 37-43.

Shepherd, D. A., Patzelt, H., & Haynie, J. M. (2010, January). Entrepreneurial spirals: Deviation-amplifying loops of an entrepreneurial mindset and organizational culture. *Entrepreneurship Theory and Practice, 34*(1), 59-82.

Smith, H., Underwood, J., Fitzpatrick, G., & Luckin, R. (2009). Classroom e-science: Exposing the work to make it work. *Educational Technology & Society, 12*(3), 289-308.

Warburton, S. (2009, May). Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. *British Journal of Educational Technology, 40*(3), 414-426.

Willis, J., Baron, J., Lee, R.-A., Gozza-Cohen, M., & Currie, A. (2010, July). Scholarly knowledge development and dissemination in an international context: Approaches and tools for higher education. *Computers in the Schools, 27*(3-4), 155-199.

Wragg, T. (2006, April). *Modelling the effects of information campaigns using agent-based simulation.* Edinburgh, SA: Command and Control Division, Defence Science and Technology Organisation.

Zhang, P., & Sun, H. (2009, October). The complexity of different types of attitudes in initial and continued ICT use. *Journal of the American Society for Information Science and Technology, 60*(10), 2048-2063.