Jul 1st, 12:00 AM

Knowledge Workers and the Knowledge Economy

David Thorns

Hong Wang

iEMSs 2008: International Congress on Environmental Modelling and Software
Integrating Sciences and Information Technology for Environmental Assessment and Decision Making
4th Biennial Meeting of iEMSs, http://www.iemss.org/iemss2008/index.php?n=Main.Proceedings
M. Sànchez-Marrè, J. Béjar, J. Comas, A. Rizzoli and G. Guariso (Eds.)
International Environmental Modelling and Software Society (iEMSs), 2008

Knowledge Workers and the Knowledge Economy

David Thorns[a] and Hong Wang[a]
[a]School of Sociology and Anthropology, University of Canterbury, Christchurch, New Zealand (david.thorns@canterbury.ac.nz)

Abstract: The paper examines the growth of a new group of workers – knowledge workers seen as critical for the growth of knowledge based economy. The emphasis in much of the literature is upon formal codified knowledge. This focus does not adequately deal with tacit knowledge which is acquired in informal ways from experience and engagement with others. Further when issues of measurement are considered it is around information rather than knowledge that most measures have been based. Currently there is no international agreement on the definition of the ICT sector. The paper reviews definitions adopted by the OECD to show that problem with spillovers from the ICT sector and the difficulty of positioning the ICT sector within existing industry classification persist. The paper concludes by arguing that there is a need for a retheorising of the of the respective roles in the 'new economy of information and knowledge workers and a greater understanding of the interrelationship between explicit formal and tacit informal knowledge

***Keywords*; Knowledge Workers, Tacit Knowledge; Explicit Knowledge; New Economy**

1. INTRODUCTION

In the 1960s and 1970s, a number of scholars began to identify the rise of a new group of workers, which they termed knowledge workers [Machlup, 1962; Drucker, 1969; Bell 1973]. All saw these new workers as essential to the creation of a knowledge economy. More recent work has extended debate about the nature of such workers through looking at the action of knowledge upon knowledge itself as the main source of productivity indicating the significance of abstract thinking for knowledge workers as they need to process symbols as an economic resource [Castells, 1996]. This reflects the greater significance of the symbolic economy in the knowledge age where production has been about the creation of tangible and intangible goods.

Reich [1991] suggested that economic transformation and associated political challenges for the present and next generation required knowledge workers as symbolic analysts who have four basic skills: abstraction, system thinking, experimentation, and collaboration. Pyöriä [2005] held that the symbolic aspects of knowledge work emphasise the abilities of knowledge workers to act as an interface between new technology and human interaction, thus both theoretical and interpersonal knowledge are needed. Finally Stehr [1994] viewed the transmission and application of knowledge as an active process. He emphasised the interaction between theoretical and practical knowledge involved in knowledge-based occupations. A distinction between tacit and explicit forms of knowledge leads to the identification of the range of skills and different forms of knowledge that are now required in knowledge rich economies. This has led to the rapid growth in "knowledge managers" and "change agents" as translators and facilitators of innovation within what has been described as a "knowing capitalism". Thrift sees this as "where circuits of information are embedded in numerous kinds of information technologies" [Thrift, 2005: 1] and the access to data bases, and daily transactional information has increased our capacity to track individual activity and decision making.

2. DEFINING KNOWLEDGE WORKERS BASED ON THEIR KNOWLEDGE AND SKILLS

The emphasis on the codification of theoretical knowledge in the literature has not always been reflected in how knowledge work gets measured. For many there is a retreat back to 'information workers when measurement is required. For example, in their work "The Information Economy", Porat and Rubin introduce the concept of the information sector and define information workers as "those working in occupations whose primary purpose is an output of produced, processed or distributed information, or its infrastructure support" [in Engelbrecht, 2000: 266]. This definition of information workers has some parallels with the idea of a knowledge worker, where the emphasis is on codified knowledge but this does not fully satisfy as it ignores the tacit dimension. The contribution of ICTs to more rapid growth and productivity gains is increasingly recognised albeit with a lagged effect rather than an instant gain [Carlaw et al., 2006]. Although the impact of ICTs differs across countries, studies on the information work force show a steady growth of such workers. A shift from low-skilled information workers (those who handle information in routine ways) to high-skilled information workers indicate that the economy becomes more knowledge-intensive (Engelbrecht, 2000).

The ICT sector

ICT producing industries

Appendix Box 1: Underlying principles

For manufacturing industries, the products of a candidate industry either must be intended to fulfill the function of information processing and communication including transmission and display, or must use electronic processing to detect, measure and/or record physical phenomena or to control a physical process. Components primarily intended for use in such products should also be included.

For services industries, the products of a candidate industry must be intended to enable the function of information processing and communication by electronic means. Furthermore, the service provided should go beyond simply the supply of goods. (OECD, 2003, 1998)

Appendix Box 2: The ICT-producing sector[1]
(ISIC Rev. 3 industries)

Manufacturing:
- 3000: Manufacture of office, accounting and computing machinery
- 3130: Manufacture of insulated wire cable
- 3210: Manufacture of electronic valves and tubes and other electronic components
- 3220: Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
- 3230: Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
- 3312: Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes except industrial process control equipment
- 3313: Manufacture of industrial process equipment

Services:
Goods related
- 5150[2]: Wholesale of machinery, equipment and supplies (where available)
- 7123: Renting of office machinery and equipment (including computers)

Intangible
- 6420[3]: Telecommunications
- 7200: Computer related activities

Source: OECD (2003, 1998).

Notes: 1. Definition of the ICT producing sector, approved at the 1998 WPIIS meeting, and based on the ISIC Rev. 3 activity classification.

2. Where available, countries should only include those sub-sectors of this industry that directly provide ICT wholesaling services. This will avoid the inclusion of extraneous wholesaling activities. For example, using the NACE nomenclature, only NACE categories 5143, 5164, and 5165 should be included.

3. In those circumstances where countries include telecommunication activities as part of radio and television activities (ISIC 9213), radio and television activities (9213) should be included in this definition. Otherwise, it should not be included.

There is currently no agreement internationally on the definition of ICT sector. The OECD, for example, has kept changing its definitions. In 1998, OECD countries reached agreement on an industry-based definition of the ICT sector based on International Standard Industry Classification Revision 3. The ICT sector included "manufacturing and services industries whose products capture, transmit or display data and information electronically" [Working Party on Indicators for the Information Society, 2007: 4]. In this definition, ICT is treated as an output of production. Thus, the ICT sector mainly refers to ICT-producing. In 2003, a new definition was constructed that extends its scope to include both ICT producing and using industries. The updated definition showed the increasing influence of ICTs in economic activities requiring the definition to be widened to include both outputs and inputs. However, such an extension risks creating measurement problems as ICT using industries are not defined explicitly, rather the focus is on the use of ICTS which are now found across several industries in both the manufacturing and service sectors. This may

well be a reflection of the diffusion of ICTs into all aspects of economic activity but leaves problematic the measurement of the significance of such workers within the organisation.

ICT-using industries

Appendix Box 3: ICT using industries[1]
(Identified on the basis of data on capital flows and estimates of capital stocks)

Manufacturing:
- Printing and publishing
- Electronic equipment
- Machinery and equipment

Services:
- Communications
- Whole sale and retail trade
- Finance
- Insurance
- Business services

Source: Pilat and Lee (2001).

Note: ICT using industries identified on the basis of capital flow matrices and capital stock estimates in Pilat and Lee (2001).

Figure 1: The OECD definition of the ICT sector in 2003. Source: *New perspectives on ICT skills and employment*. OECD. p.22&23.

A further version in 2006 seems to go back to the 1998 version but makes it more ambiguous in terms of the distinction between ICT producing and using industries. According to the general definition, "the production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display" [Working Party on Indicators for the Information Society, 2007: 15]. In this definition, one apparent change is that the term 'products" is replaced by 'production'. It indicates that ICTs might be either tools as inputs or products as outputs or both in different industries. Meanwhile, this definition seems to show the intention of narrowing down the scope of the ICT sector. It regards the ICT sector as being 'primarily' intended to fulfil the function of information processing. This is an attempt to exclude industries where dealing with ICTs is not their primary purpose.

In general, the change of the definition reflects two concerns/difficulties in defining the ICT sector. First, the spillover effect of ICTs means that the definition of the ICT sector has to be updated to respond the changing impact of ICTs in the economy. Second, the effort of positioning the ICT sector in the existing industry classification means that the content of the ICT sector would be different due to the application of different industry classification system in different countries. For example, Statistics New Zealand uses the following definition of ICT industry in its Information and Communications Technology Supply Survey:

The information and Communications Technology (ICT) industry includes production and sales of ICT goods and services. ICT goods include: telecommunications equipment, audio visual equipment, electronic devices, computer and related equipment and software. ICT services include: telecommunications, programme distribution, internet access services, IT support, design, development and infrastructure services; and ICT rental, leasing and training services [Statistics New Zealand, 2007].

This definition shows that the ICT sector is defined more narrowly in the New Zealand context. It is mainly concerned with the production and distribution of ICT goods and services. Industries in the designated categories of the Australian and New Zealand Standard Industrial Classification (ANZSIC) are chosen as follows [Information Technology Policy Group, 2003].

ICT manufacturing industries	
2610	Manufacture of electronic components and boards
2620	Manufacture of computers and peripheral equipment
2630	Manufacture of communication equipment
2640	Manufacture of consumer electronics
2680	Manufacture of magnetic and optical media
ICT trade industries	
4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts
ICT services industries	
5820	Software publishing
61	**Telecommunications**
6110	Wired telecommunications activities
6120	Wireless telecommunications activities
6130	Satellite telecommunications activities
6190	Other telecommunications activities
62	**Computer programming, consultancy and related activities**
6201	Computer programming activities
6202	Computer consultancy and computer facilities management activities
6209	Other information technology and computer service activities
631	**Data processing, hosting and related activities; web portals**
6311	Data processing, hosting and related activities
6312	Web portals
951	**Repair of computers and communication equipment**
9511	Repair of computers and peripheral equipment
9512	Repair of communication equipment

Note: The codes and titles above are those found on the UNSD web site (http://unstats.un.org/unsd/cr/registry/isic-4.asp) on 20 November 2006 plus editing corrections known at 25 January 2007. In case of further changes to ISIC, the final official titles will prevail. Differences in titles or codes from those presented earlier in the paper reflect changes from earlier drafts of ISIC Rev. 4.

Figure 2: The 2006 definition of the ICT sector. Source: Information economy, Sector definitions international standard industry classification (ISIC4).OECD. p.15.

ANZSIC Code	Industry Group
C284100	Computer and Business Machine Manufacturing
C284200	Telecommunication, Broadcasting and Transceiving, Equipment Manufacturing
C284900	Electronic Equipment Manufacturing
F461300	Computer Wholesaling
J712000	Telecommunication Services
L783100	Data Processing Services
L783200	Information Storage and Retrieval Services
L783300	Computer Maintenance Services
L783400	Computer Consultancy Services
P912100	Radio Services
P912200	Television Services

Figure 3: ICT Industry Groups in New Zealand. Source: Statistics on information technology in New Zealand (updated to 2003). Statistics New Zealand. p.14.

Differentiation found amongst information workers not only suggests a linkage between knowledge workers and information workers, but also shows the necessity of considering the skill components of information workforce. Lopez-Bassols [2002] categorises IT skills as three sets: professional IT skills, applied IT skills and basic IT skills or "IT literacy": professional IT skills include ability to use advanced IT tools and/or to develop, repair and create them. Applied IT skills are the ability to apply simple IT tools in general workplace settings (in non-IT jobs). Basic IT skills or "IT literacy" is the ability to use IT for basic

tasks and as a tool for learning. Based on these categories, issues and areas for government action for improving ICT skills are summarised in the OECD table:

Table 8. ICT skills: issues and actions

	Skills formation (which skills?)	Skills acquisition/renewal (when and where?)	Main issues	Areas for government action
Professional ICT skills	Skills required to develop, use or service ICTs professionally	Post-secondary education, IT vendor certification	- Balancing specialist ICT skills with other more generic skills - High mobility - Recognition of non-formal qualifications	- Improve attractiveness of ICT careers - Assist in providing labour market information - Examine options for using foreign labour
Applied ICT skills	Ability to use ICTs in non-ICT jobs	Post-compulsory education, workplace training	- Importance of integrating ICT into a sector/profession	- Help identify emerging ICT skill requirements for non-ICT jobs - Provide incentives for firms to train workers
Basic ICT skills	Strong life-long learning skills: fluency to use ICT for learning, working, recreation	Learning context: schools (children), training (adults) [at work, formal courses, informal exposure]	- Developing common standards - Building core ICT competencies in curricula - Enhancing teacher skills	- Promote ICT skills as important "generic" skills for life-long learning - Facilitate roll-out of ICTs in schools - Promote ICT skills among teachers

Source: OECD based on Multimedia Victoria (2000).

Table 4. Source: ICT skills and employment. OECD 2002. p. 25.

Meanwhile, Lopez-Bassols's analysis of the channels for acquiring skills show that formal education is not the only channel for acquiring ICT skills. According to him, skills are acquired through a variety of ways such as natural abilities, formal education, work experience, on-the-job and external training, and informal learning. Thus, he holds that IT work requires individuals to master codified and tacit knowledge. They need to not only understand technical abstract concepts, which are gained through various formal education but also acquire skills from non-formal ways such as work experiences and interpersonal communications. Surveys from countries such as the United States, Canada, Ireland and the United Kingdom, concur with the finding that IT firms tend to seek a combination of three main types of skills. Technical skills refer to primarily IT, quantitative analysis/data modelling digital media and technical writing. Business/management skills include marketing, strategy and business writing. Personal skills refer to communication, leadership, teamwork, problem-solving ability [Lopez-Bassols, 2002].

In this view, IT jobs as a new occupation, needs workers to have multiple skills including technical and creative skills, business abilities and personal skills to be flexible and creative. What this suggest is that there is a significant transformation from being an IT worker to being a knowledge worker and this is not well represented in the ways that these groups of workers are conventionally measured. The definition of high-skilled information workers as knowledge workers attempts to reflect this view. Pyöriä [2005] holds that the symbolic aspects of knowledge work emphasise the abilities of knowledge workers to act as an interface between new technology and human interaction and thus, both theoretical and interpersonal knowledge are needed. He defines knowledge workers as "wage earners whose jobs meet the following three criteria: the use of IT, at least upper intermediate vocational training and independent design of important aspects of the job" [Pyöriä et al., 2005: 89]. His definition emphasises the significance of both codified knowledge and practical intelligence (tacit knowledge) involved in the knowledge work process.

According to Stehr [1994], the social constitution of experts and expertise creates a social-intellectual division between 'lay' publics and experts. This suggests not that power is changing hands but that the nature, content or substance of exercising power is being modified. Knowledge-based occupations, he defines as "those who consult, provide guidance to others, counsel or give expert advice - as the group of occupations engaged in transmitting and applying knowledge" [Stehr, 1994: 184]. Although this definition seems to suggest that knowledge-based occupations serve as transmitters between knowledge producers and end-users, he explains that he does not mean the flow of knowledge is a passive process thus requires transfer agents of knowledge workers/managers to facilitate.

Here we can see the rationale for the growth of this new group within management education and practices.

3. KNOWLEDGE WORKERS AS HUMAN CAPITAL AND THE MEASUREMENT

To move from information workers to knowledge requires a retheorising of their respect roles within the "new economy" and the respective roles of theoretical and practical knowledge. A number of studies have emphasised that other forms of knowledge and skills, such as practical knowledge and communication skills, are important in knowledge work. These changes point to difficulties with indicators that identify knowledge workers in terms of existing occupational classifications. In these workers' specialisation and educational qualification are major criteria for determining their status in occupational hierarchies. In some occupational classification systems, managers, professionals and technicians are usually identified as major groups of knowledge workers. For example, the Australian Bureau of Statistics [2002] defines knowledge-based workers as "those employed as managers and administrators, and professionals and associate professionals including those in science and engineering, business and information, health and education". According to Statistics Canada, knowledge occupations fall into the three broad groups including professional, management and technical occupations [Baldwin and Beckstead, 2003]. Others have categorised more occupational groups as knowledge workers. For example, Davenport [2005:10] defines knowledge workers as those who "have high degrees of expertise, education, or experience, and the primary purpose of their jobs involves the creation, distribution, or application of knowledge". He places the following categories as knowledge workers: Management; Business and financial operations; Computer and mathematical; Architecture and engineer; Life, physical, and social scientists; Legal; Healthcare practitioners; Community and social services; Education, training, and library; Arts, design, entertainment, sports, media. These definitions and associated measures have two features. First, the level of knowledge and skills, mainly gained through formal education, is the basis for classifying knowledge workers. Second, knowledge workers are understood merely in an economic framework based on the human capital theory.

Treating human beings as capital allows us to explain the role of knowledge and skills individuals contribute to economic growth. In particular, the emergence and rapid spread of knowledge workers in knowledge economies/societies revitalises the explanatory power of human capital theory. For example, the OECD defines human capital as "the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well being" [Keeley, 2007: 29]. They hold that human capital embodied in people's skills, learning talents and attributes is important for individuals to earn a living and countries to widen economic growth. Such knowledge workers have become in high demand internationally and are subject to competition globally. This is then reflected in the way immigration polices have been restructured. However where these have failed to appreciate that "knowledge" transfer is complex and requires the acquisition of both formal and tacit knowledge and the social and cultural capital necessary to integrate into different national contexts they have often not achieved the desired effect and may result in migrants being recruited on the basis of "skills" that are in fact not easily transferable into the receiving economy and thus may not address the perceived or actual shortages [Wang and Thorns, 2008].

The above definition shows that human capital theory is still the dominant discourse with respect to the relationship between human capital, economic development and social wellbeing. Further endorsement of human capital theory can be found in the various frameworks for measuring the knowledge economy initiated by national and international organisations such as the Australian Bureau Statistics and the World Bank [Chen and Dahlman, 2005; Trewin, 2002]. In this case, human capital is always measured with educational inputs and outputs such as literacy rates, school enrolment rate and the number of graduate students. Thus, formal education and training is central to the policy agenda at all levels consistent with most definitions of knowledge workers, which emphasises formal individual educational attainments. Such a way of differentiating workers could create a

new set of inequalities based on a knowledge divide. To provided a more nuanced understanding recent UNESCO reports have emphasised that "learning societies will need to engage in a study of the different forms of knowledge, distinguishing descriptive knowledge, procedural knowledge, explanatory knowledge and behavioural knowledge" [UNESCO, 2005: 60]. Thus, ways of learning and forms of knowledge are closely linked with each other. Knowledge workers should not be seen as only possessing knowledge and skills gained solely through formal ways of learning. As Bell [1973] notes, work in post-industrial societies is a "game between persons" and thus, persons have to learn to live with each other. Taking this view, we need to recognise the role of social capital in economic production.

Social capital is not separate from other forms of capital. Bourdieu's [2001] analysis of capital highlights the fact that different forms of capital exist. Social capital as a durable network of mutual acquaintance and recognition reflects how effectively a given agent can mobilise other types of capital possessed by him/her and others. However, he notes that:

Economic capital is at the root of all the other types of capital and that these transformed, disguised forms of economic capital, never entirely reducible to that definition, produce their most specific effects only to the extent that they conceal the fact that economic is at their root… [Bourdieu, 2001: 106]

For knowledge workers their contribution to economic growth lies not only in their human capital embodied in their formal knowledge but also in the social capital they possess. Their work involves more person-to-person relationships than labour-machine relationship in industrial societies. Both Stehr's view of knowledge workers as mediators and Pyöriä's emphasis on the significance of teamwork indicate that social capital and tacit knowledge are crucial variables for measuring the contribution of knowledge work. Countries and organisations have put considerable effort into identifying and measuring social capital. For example, Statistics New Zealand developed a framework of measuring social capital in 1997. It defines social capital as "relationships among actors (individuals, groups, and/or organisations) that create a capacity to act for mutual benefit or a common purpose" [Spellerberg and Statistics New Zealand, 2000: 9]. The framework focuses on four themes: behaviours (what people do), attitudes and values (what people feel), population groups (what people are) and organisations. In the UK the Office for National Statistics identifies five constructs of social capital: views about the local area, civic engagement, reciprocity and trust, social networks and social support. The Australian Bureau of Statistics (ABS) suggests the following data items for the measurement of social capital: social networks and support structures, social and community participation, civic and political involvement and empowerment, trust in people and social institutions, tolerance of diversity and altruism, philanthropy and voluntary work [Statistics New Zealand, 2001]. These frameworks for measuring social capital have been criticised as not being comprehensive as each just grasps some characteristics of social capital. Despite this, it is necessary to bring the concept of social capital into consideration when defining knowledge workers in order to fully understand their role in knowledge economies.

4. CONCLUSIONS

The difficulties of identifying knowledge workers in existing occupational classifications have now been explored. The final question is whether we need more radical changes to the way we define and measure knowledge workers within the "new economy" that is emerging if we are to effectively document the nature of the transformation currently taking place in many economies. To fully explore the transnational movement of skills and the policy platforms required to build a workforce to create a knowledge based economy we need improved understanding of the role of different types of knowledge and different forms of knowledge work.

ACKNOWLEDGEMENTS

We wish to acknowledge support from the NZ Marsden Fund and NZ Foundation for Research, Science and Technology which aided completion of this research.

REFERENCES

Australian Bureau of Statistics, *1370.0-Measuring Australia's Progress, 2002*.

Baldwin, J.R. and D. Beckstead, *Knowledge Workers in Canada's Economy* 1971-2001, Statistics Canada, Ottawa, 2002.

Bell, D., *The Coming of Post-industrial Society: A Venture in Social Forecasting*, Basic Books, New York, 1973.

Bourdieu, P., The forms of capital. In M. Granovetter and R. Swedberg (Eds.), *The Sociology of Economic Life*, 96-111, Westview Press, Colorado and Oxford, 2001.

Carlaw, K., L. Oxley, P. Walker, D. Thorns and M. Nuth, Beyond the hype: Intellectual property and the knowledge society/knowledge economy, *Journal of Economic Surveys*, 20(4) September, 633-690, 2006.

Castells, M., *The Rise of the Network Society*, Blackwell Publishers, Cambridge, 1996.

Chen, D. H. C., and C. J. Dahlman, *The Knowledge Economy, the KAM methodology and World Bank Operations*, The World Bank, Washington, 2005.

Davenport, T.H., *Thinking for Living: How to Get Better Performance and Results from Knowledge Worker*, Harvard Business School, Press Boston, MA, 2005.

Drucker, P. F., *The Age of Discontinuity: Guidelines to Our Changing Society*, Heinemann, London, 1969.

Engelbrecht, H.-J., Towards a knowledge economy? Changes in New Zealand's Information Work Force 1976-1996, *Prometheus, 18*(3), 265-282, 2000.

Keeley, B., *Human capital: How What You Know Shapes Your Life*, OECD, Paris, 2007.

Information Technology Policy Group, *Statistics on Information Technology in New Zealand [Updated to 2003]*, Ministry of Economic Development, Wellington, 2003.

Lopez-Bassols, V., *ICT Skills and Employment*, OECD, Paris, 2002.

Machlup, F., *The Production and Distribution of Knowledge in the United States*, Princeton University Press, Princeton, N.J, 1962.

Pyöriä, P., The concept of knowledge work revisited**,** *Journal of Knowledge Management*, 9 (3), 116-127, 2005.

Pyöriä, P., H. Melin., and R. Blom, *Knowledge Workers in the Information Society*, Tampere, Finland: Tampere University Press, Tampere, Finland, 2005.

Reich, R. B., and R. B. Reich, *The Work of Nations: Preparing Ourselves for the 21st Ccentury Capitalism*, Alfred A Knopf, New York, 1991.

Spellerberg, A., and Statistics New Zealand, *Framework for the Measurement of Social Capital in New Zealand*, Statistics New Zealand, 2001.

Statistics New Zealand, *Information and Communications Technology Supply Survey*. Statistics New Zealand, Wellington, 2007.

Stehr, N., *Knowledge Societies*, Sage, London, 1994.

Thrift, N., *Knowing Capitalism*, Sage, London, 2005.

Trewin, D., *Measuring a Knowledge-Based Economy and Society: An Australian Framework*, The Australian Bureau of Statistics, Canberra, 2002.

Working Party on Indicators for the Information Society, *Information Economy—Sector Definitions Based on the International Standard Industry Classification (ISIC4)*, OECD, Paris, 2007.

UNESCO, *UNESCO World Report: Towards Knowledge Societies*, UNSCO Publishing, Paris, 2005.

Wang, H., and D. C. Thorns, Different Forms of Knowledge and New Chinese Skilled Immigrants' Adaptation to New Zealand's Knowledge Society ISSJ 2008.