

21st-Century Competencies and Their Impact: An Interdisciplinary Literature Review

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Executive Summary

What worker competencies are most important for the 21st century? And can it be shown that to possess them makes a difference in educational or economic outcomes for individuals and organizations? This report summarizes key insights and empirical findings from a wide range of literature on these questions. The report's sponsor, the Hewlett Foundation, asked us to focus on 15 general competency areas. These are reviewed under 5 broad categories: analytic skills, interpersonal skills, ability to execute, information processing, and capacity for change/learning.

We find widespread consensus among policymakers and researchers across the Organization for Economic Co-operation and Development (OECD) that all five of these general competency areas are important for workers in the 21st century; however, there is surprisingly little evidence of the relationship between these competencies and individual or organizational outcomes. In contrast with the large literature on the economic returns to education, there are few studies that directly assess the effects of competencies on outcomes, in part because of the lack of common measures of these competencies.

The clearest evidence for the growing importance of these competencies in the OECD countries comes from long-term shifts in the occupational structure. There has been a decline in lower-skilled, manual labor, and a growth in knowledge work and service occupations where these broad competencies are in greater demand. In these occupations, possession of general competencies becomes a prerequisite for securing employment. It is important to note, however, that many of the largest service occupations, as currently defined in the US (e.g. home healthcare

worker, cashier), are considered low-skill jobs where there is limited opportunity or reward for skill development.

Future research is needed to demonstrate the relationship between these competencies and outcomes, and to explore what mechanisms are most effective in developing generic skills.

Our review provides guidance on core elements for this future research and policy agenda:

1) focus on the demand-side of the skill equation, looking at how the design of organizations and jobs impacts skill requirements and performance;

2) recognize that general competencies should not be studied in isolation from occupation-specific contexts – e.g. problem-solving in engineering may entail very different skills from those needed to solve problems in social work;

3) treat some competencies – problem-solving, capacity for change – as advanced stages of development within a range of specific skill areas, rather than as discrete competencies;

4) explore inclusion of other competencies – cross-cultural fluency, systems thinking, financial literacy – that appear to be growing in importance in today’s global economy;

5) expand research in the US in comparative perspective – a great deal of the work directly measuring competencies has been done in the UK, Australia, and New Zealand, where they have national competency frameworks and regular, nationally representative workplace and skill surveys. It would be useful to compare US skill levels with these and other nations.

Clarification of which competencies enhance performance, and how best to enable their development, benefits both companies and their workers. There is value to being able to “unpack, at various levels, the skills often simply called communication, prioritizing or problem-solving,” observe Hampson et al. (2009, 25). “This allows the creation of job families and sequences linked by the development of proficiency in key under-recognized areas, broadening the options for internal sourcing of skills.”

Introduction

While it is not the business of education to prove every statement made, any more than to teach every possible item of information, it is the business to cultivate deep-seated and effective habits of discriminating tested beliefs from mere assertions, guesses, and opinions; to develop a lively, sincere, and open-minded preference for conclusions that are properly grounded, and to ingrain into the individual's working habits methods of inquiry and reasoning appropriate to the problems that present themselves. John Dewey, *How We Think*, p. 27-28, 1910.

What competencies will enable individuals, firms, and nations to compete successfully in the global economy of the 21st century? As the quotation from John Dewey illustrates, the debate about the role education and training should play in preparing individuals to succeed as citizens and economic actors is not new. This paper will distill, from a variety of different literatures, the findings on what competencies are believed to be most important for the 21st century, and what evidence exists that possession of these competencies makes a difference in educational or economic outcomes for individuals and organizations.

We adopt the OECD's usage, in its *Definition and Selection of Competencies (DeSeCo) Project*, of 'competency.' A competency is

...more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context. For example, the ability to communicate effectively is a competency that may draw on an individual's knowledge of language, practical IT skills and attitudes towards those with whom he or she is communicating" (OECD, 2005, 4).

This definition of competency avoids "the narrow perspective of competencies embedded in most interpretations of human capital, [which has] led to a growing dissatisfaction, primarily because so much of what people need to do to succeed in work and life goes beyond this interpretation" (Schuller and Desjardins 2007, 40). An important facet of the OECD's definition is the assertion that "despite the fact that competencies comprise more than just taught knowledge,... a competency can itself be learned within a favorable learning environment" (OECD, 2005, 85).

What is the difference between a competency and a skill? The short answer is, in an economy that demands flexibility from its workers, not much. The concept of ‘skill’ has changed from the “technical knowledge and skills required of a particular job or occupation, to one that includes an array of general and personal capacities and attitudes” (Chappell et al. 2003, 5). Many terms are now used to describe the ability to read, write, undertake basic arithmetic, and communicate effectively: examples are “foundation skills,” “core skills,” “transferable skills,” and “key competencies.” For the purpose of this paper, the terms ‘skill’ and ‘competency’ will be used interchangeably. It is important to note, however, that the current construction of ‘skill’ in much of the literature is “a distinctly ‘Anglo’ concept – individualistic, defined by employers, and not contested by (or embedded in) other social forces” (Hampson and Junor 2009, 3).

We review a wide range of literatures that discuss the development, measurement, and outcomes of 21st-century competencies. We start with the literature on human capital, where economists measure the rates of return to investments in different skills. Unfortunately, they typically rely on proxies – most often, time spent in education and training or possession of a formal qualification – because standardized, direct measures of competencies are not available. Closely associated with this are labor market projections regarding the changing occupational structure, and what skills the future will demand. Then we examine the literature on work readiness and literacy from a number of vantage points, including research on the effectiveness of vocational education and training, the levels of literacy of the working population, and the extent to which individuals use their skills at work.¹ As part of the broader discussion on vocational education and training, special attention will be paid to both career technical education (CTE) and the apprenticeship model of learning. The latter area will be important for

1. The literature on measurement of competencies within firms is being reviewed in a related paper by Cascio (2010).

tracing the relationship between what is known and what is able to be performed in the workplace, and how capabilities may positively impact employment training (which in turn should produce improved work outcomes). We also discuss the sociology of work and management literatures as it relates to the use of competencies in the workplace.

Increasingly, national bodies have begun to look at the larger trends in the world of work and to craft national frameworks of competence-based, sectoral skill-qualification to help guide the workforce development efforts of individuals, firms, and governments. The United States is notable for the lack of a common qualifications framework. The implications of this for the United States will be discussed in an Appendix, since it does not relate directly to outcomes.

What Are 21st-Century Competencies?

The influential 1991 SCANS report *What Work Requires from Schools* defined the agenda for much of the subsequent work on what general competencies are required for work. The Commission spoke with a wide range of managers and workers: “Their message to us was the same across the country and in every kind of job: good jobs depend on people who can put knowledge to work.” The SCANS (1991, i) report identified a five-competency framework that built on a three-part set of foundation skills and personal qualities for success in the modern workplace. Individuals in the workplace should be able to productively use: 1) resources, 2) interpersonal skills, 3) information, 4) systems, and 5) technology. These competencies require an underpinning of: a) the basic skills of reading, writing, arithmetic, speaking, and listening; b) the thinking skills of solving problems and reasoning (among others); and c) the personal qualities of individual responsibility, sociability, self-management, self-esteem, and integrity.

A great deal of subsequent international research has confirmed the importance of the initial SCANS list and identified a range of other related competencies that appear relevant for

21st -century work. For the purposes of this review, the Hewlett Foundation asked us to cover a list of the following 15 competencies, focusing on the five most commonly found in international and national skills assessment: Critical thinking, problem solving, communication, collaboration, and flexibility and adaptability (see Figure 1). Based on an examination of the cross-national literature, and in an attempt to regroup some often discussed competencies based on common underlying attributes, this paper offers an alternative approach to grouping the set of 21st-century competencies. This accords, for example, with approach of the OECD's DeSeCo Project (2005, 5), which integrates many of the separate competencies defined above into a broader construct: "individuals need to be able to use a wide range of tools for interacting effectively with the environment: both physical ones such as information technology and socio-cultural ones such as the use of language. They need to understand such tools well enough to adapt them for their own purposes – to use tools interactively (see also Darr 2004)." Our proposed framework groups the 15 competencies under 5 broad categories: analytic skills, interpersonal skills, ability to execute, information processing, and capacity for change/learning (see Figure 1).

Figure 1
List of 21st-century competencies - Original

- Creativity/innovation;
- **Critical thinking**;
- Information literacy;
- **Problem solving**;
- Decision making;
- **Flexibility and adaptability; learning to learn**
- Research and inquiry;
- **Communication**;
- Initiative and self direction;
- Productivity;
- Leadership and responsibility;
- **Collaboration**
- ICT operations and concepts;
- Digital Citizenship;

- Media literacy;

List of 21st-century competencies – Revised Grouping

Analytic skills	Interpersonal skills	Ability to execute	Information processing	Capacity for change
Critical thinking	Communication	Initiative and self direction	Information literacy	Creativity / innovation
Problem solving	Collaboration	Productivity	Media literacy	Adaptive learning / learning to learn
Decision making	Leadership and responsibility		Digital citizenship	Flexibility
Research and inquiry			ICT operations and concepts	

Our discussion of 21st-century competencies will define each broad competency and examine available evidence of the outcomes associated with greater competence in this area.

Analytic Skills

One of the most common competencies mentioned in the surveyed literature was problem solving. The description of problem solving offered in the examination of the Adult Literacy and

Life (ALL) Skills survey by Murray, Owen, and McGaw (2005) speaks to the role that analysis plays in that competency:

Problem solving – Problem solving involves goal-directed thinking and action in situations for which no routine solution procedure is available. The problem solver has a more or less well-defined goal, but does not immediately know how to reach it. The incongruence of goals and admissible operators constitutes a problem. The understanding of the problem situation and its step-by-step transformation, based on planning and reasoning, constitute the process of problem solving (16).

Problem solving has become a key component for workplace success in an economy that demands flexibility and innovation instead of repetitive manufacturing tasks. In their analysis of the ALL Skills survey, Murray, Owen, and McGaw (2005) made profiling and comparing problem-solving skills a major focus among those surveyed.² A number of skill domain assessments were built into the survey, but “only the problem-solving domain was shown to meet the high empirical standards set for directly assessing skills in the ALL study” (2005, 26). Osterman’s (2006) study of the positive wage effects of high-performance work organization (HPWO) suggests that as organizations adopt more elements of HPWO, including “self-managed teams, quality programs and job rotations” (188), “soft skills such as problem solving or interaction skills may become increasingly important in HPWO settings” (189). For example, in their study of 1066 trainee truckers at a large US trucking firm, Burks et al. (2009, 4) found that a greater ability to problem-solve³ had a clear positive correlation to job retention, performance and satisfaction. And in a survey of 2765 Dutch workers, Groot and Maassen van den Brink (2000) found a wage premium for problem solving among male workers but not for female

2. The Adult Literacy and Life Skills Survey (ALL) is a large-scale co-operative effort undertaken by governments, national statistics agencies, research institutions and multi-lateral agencies to build on the IALS. Seven countries or regions took part in the first round of the survey in 2003: Bermuda, Canada, Italy, Norway, Switzerland, the USA, and the Mexican state of Nuevo Leon.

3. Burks, et al. (2009, 4). employ the term “planning” to describe the “ability of the individual to effectively reason backward from a goal about how to reach it.” This is remarkably similar to the definition of problem solving offered by the ALL survey discussed earlier in this report and will thus be discussed as problem solving.

workers. Specifically, male workers who “have to ask for help from colleagues to solve problems earn 4% less, while workers who need instructions from a supervisor earn 7% less” (Groot and Van, 2000, 581) than those who can problem-solve on their own. Notably, Groot and Van (2000) also found that “a year of education increases the probability of solving problems on your own by .8%” (579).

A second, often discussed area of desirable analytical skills is critical thinking. The Society for Human Resource Management (SHRM) and WSJ.com/careers undertook a study of critical skill needs and resources for the changing workforce (2008). They surveyed 407 HR professionals and 334 employees (contacted through the *Wall Street Journal* Careers website), and found that “overall, employers placed the greatest weight on employee adaptability and critical thinking skills. HR professionals and employees both reported that adaptability/flexibility and critical thinking/problem-solving skills were of greatest importance now compared with two years ago” (2008, 6). Notably, the study also found that “fewer than one out of 10 organizations did not provide or pay for skills training or professional development for their US workforce” (2008, 6). The World Bank (2008) also argues that critical thinking skills be made a feature of education systems the world over, as those skills are increasingly in demand in the global labor market. We could find no direct studies showing the outcomes of enhanced critical thinking skills, although proponents of liberal arts education have long argued that one of its greatest strengths is developing graduates who can think critically, a competency that enables success in a wide range of occupations and leadership roles.

Interpersonal Skills

Competency in the realm of communication is seen as a necessity for success in the job market, regardless of level of education or type of work. As noted, the DeSeCo project's first key competency

concerns the effective use of spoken and written language skills, computation and other mathematical skills, in multiple situations. It is an essential tool for functioning well in society and the workplace and participating in an effective dialogue with others. Terms such as 'communication competence' or 'literacies' are associated with this key competency (2005, 10).

The importance of communication competency was echoed in every national framework surveyed.

Communication skills are seen as vitally important in the growing service sector. In the high-end retail service sector, for example, Gatta (2010, 16) found that employers were willing to train workers in the practical knowledge needed to function in the context of the store, but that they "were less likely to provide training on the ... basic customer service, aesthetic and emotional work demanded of retail work. [Employers] instead viewed this as something the prospective worker had or did not have, and was a prerequisite to hiring." Gatta also found that communication manifests in both the ability of a worker to interact with customers and how they communicated via their appearance – what is referred to as aesthetic skills. Drawing on Nickson et al.'s (2004) work on retail in Glasgow, Gatta argues that in the service sector, "indeed the right appearance and personality took precedence over technical qualifications of staff. Such work requires more than just technical and social skills, but also aesthetic skills – forcing workers to look good and sound right" (2010, 9).

Not possessing the correct communication competency, especially as related to the previously discussed aesthetic skills, may have a direct, negative economic outcome that further supports their importance. As discussed by Hampson and Junor (2009, 16), aesthetic skills "[cede] the definition of 'aesthetic' (beautiful) to employers, with real dangers of employment

discrimination based on body shape and age... the concept of aesthetics goes beyond (or should go beyond) mere visual or aural aesthetics to include a sense of ‘situational appropriateness,’ even ethical responsiveness (cf Bolton and Houlihan 2005).”

Communication skills are equally vital to effective operation within knowledge-based manufacturing enterprises. In their survey of 10 organizations in the hi-tech, pharmaceutical, and medical devices sectors, the Irish Expert Group on Future Skill Needs (2003, v) found that communication skills in those areas were of “ever-increasing importance in the workplace,” but that such “soft” skills were more difficult to train.

Collaboration can be viewed as a broader concept that requires both effective communication skills and also a broader sensitivity to co-workers: “In an increasingly interdependent world,” DeSeCo notes (OECD, 2005, 5), “individuals need to be able to engage with others, and since they will encounter people from a range of backgrounds, it is important that they are able to interact in heterogeneous groups.” A survey of Australian undergraduate students echoes the value of engagement with others to developing communication and collaboration skills (Crebert et al. 2004). Respondents to the survey noted that “group work was their preferred option for the development of oral communication, problem solving, teamwork, leadership, assuming responsibility and making decisions and [developing] high ethical standards” (153). Several studies and surveys (Gordon, 1992; Cohen and Bailey, 1997; Peterson, Mitchell, Thompson, and Burr, 2000) have noted the growth in the use of teams in the workplace, with some estimates showing that more than 80% of companies with 100 or more employees use teams as part of their work structure (Gordon, 1992; Cohen and Bailey, 1997). This paper has previously discussed that certain areas of competency support self directed or autonomous group work, which Wall et al. (1986) note require “a high degree of self-determination by employees in the management of their day-to-day work” (280). In their study

of two sites within a large, nonunionized British confectionary company, Wall et al. (1986) found that in a manufacturing environment “productivity benefits [were] possible because autonomous workgroups reduced indirect labor costs; a side effect was increased dismissals” (298) as some workers did not readily fit into the new structure, in terms of attitudes to the new system. As Gittell (2001a, 2001b) outlines, this finding is in line with the larger body of work on post-bureaucracy theory and that “with high levels of task interdependence, performance is expected to benefit significantly from strong group process” (Gittell 2001a, 468). Gittell (2001a, 471; 2000) offers an extensive discussion of “the management of task interdependencies - carried out in the context of relationships with other group members” (Gittell 2001a, 471), which she describes as follows:

Relational coordination includes a communication component, reflecting the frequency and timeliness of communication among group members. In addition, it includes a relational component, reflecting the strength of problem solving, helping, mutual respect, shared goals, and shared knowledge among group members involved in the same work process” (471).

Ability to Execute

The third of the DeSeCo Project’s key competencies speaks to the importance of initiative: “Individuals need to be able to take responsibility for managing their own lives and situate their lives in the broader social context and act autonomously” (2005, 5). Like many of the competencies discussed, initiative, as defined above, readily connects and interacts with other competency areas. Hampson and Junor (2009) discuss the related concept of “articulation work skills” as “‘supra’ or ‘second order’ skills needed to manage the exercise of other skills. They are of two types: those used to organize and manage one’s own work in time, and those used to integrate a particular ‘line of work’ with others, in order to create a coordinated workflow” (2009, 17).

Literacy and Information Processing

The role of information processing in skill frameworks has grown with recent international survey work. Both the ALL skills survey examined by Murray, Owen, and McGaw (2005) and the International Adult Literacy Survey (IALS) report (OECD, 2000) discuss literacy as a function of processing information: “The ability to understand and employ printed information in daily activities, at home, at work and in the community – to achieve one’s goals, and to develop one’s knowledge and potential.” The ALL survey aimed to go beyond the IALS results to measure “foundation skills”—the prose and document literacy and numeracy, but also the skills of problem solving and an indirect measure of “familiarity and use of information and communication technologies” (Murray et al. 2005, 15). Bishop and Mane (2004, 389), found that computer skills were valuable even for those in non-computer career-technical education: students who took one computer course earned \$828 (3.1%) more annually and 1.4% more per hour than their peers who took none. Dickerson and Green (2004) also found a wage premium existed for computing skills⁴ in the UK and that it was greatest for the highest level of computing skills (26% for programming), while the premium for straightforward usage (such as utilizing email) was a much lower 11%.

Likewise, for unemployed workers, “the results clearly indicate that persons with higher proficiency in document literacy are capable of finding employment sooner” (Murray, Owen, and McGaw, 2005, 114), and that document and numeracy skills were rewarded more than others for workers of all ages found across all 7 countries. Using the Armed Services Vocational Aptitude Battery (ASVAB), Bishop (1995, 4) found that one standard deviation increase in

4. These returns are measure through Dickerson and Green’s (2004) use of “two specially designed surveys which deploy a job analysis approach that has been borrowed and adapted from commercial psychology” (1), like those used by commercial firms such as Hay and Novations designed to examine the “changes in skill utilisation and their association with pay” (1).

mathematical ability increased productivity by 5.3% in all non-clerical military occupations and raised compensation by \$1,906 (also in 1993 dollars), and raised productivity and wages for clerical workers by 10.8% and \$3,277 respectively (in 1993 dollars). Smaller effects were seen in related academic categories, including verbal ability, scientific knowledge, and computational speed.

Both the IALS and the ALL skills survey are crucial to understanding the central role information processing is and will continue to play in the formation of 21st-century competencies. As Kirsch, et al. (2002) note, the 23 countries and territories surveyed in the IALS found that higher levels of information processing ability (*prose, document and quantitative*) on real world problems are significant predictors of not only success in education, employment and earnings, but also in lower crime rates and higher levels of participation in community activities. The United States ranks in the middle of the IALS results.

Media literacy, as defined by Tornero (2008) and cited by Martinsson (2009), is “the ability to access, analyze, evaluate, and create media content” (2009, 3). Both Tornero (2008) and Martinsson (2009), argue that media literacy is vital in its assistance in the acquisition of other skills, including “critical thinking, problem solving, personal autonomy, and social and communicative skills” (2009, 3), as well as its role in encouraging “informed discussion in the public sphere [that] can engage citizens as active stakeholders in governance reforms” (2009, 3). Given the volume of media now available in digital form, Martinsson (2009) notes that “physical access is only one aspect of technology adoption; perhaps more important is access to quality content and ability to analyze, evaluate, and apply it” (6). An individual’s exposure ICT operations and concepts varies by country and socio-economic status, as evidenced by the 26% of Americans who reported not using the internet in 2009 (Pew Internet and American Life

Project, 2010). The ALL skills survey was designed to offer a first attempt at measuring the impact of ICT at the individual level across countries. These results illustrate how many 21st-century competencies directly impact one another. The ALL skills survey found that

as prose, document, numeracy and problem solving levels increase, adults' perceived usefulness and attitude toward computers, Internet use, and use of computers for various tasks also increase. In most countries, respondents with medium to high literacy have between two and three times the odds of being a high-intensity computer user" (Murray, Owen, and McGaw 2005, 182).⁵

Mossberger, Tolbert, and McNeal (2007, 5) were able to use national US data to show that the likelihood of voting and civic engagement increases as use of the Internet increases, and that "for workers who are lower paid and less educated, computer and Internet skills may be one factor needed for mobility into better-paying jobs, with greater job security, health insurance benefits, and full-time hours. For those who are seeking new or better jobs, Web sites have become a tool for finding job openings and researching employers." These benefits are especially pronounced for African Americans and Latinos.

Capacity for Change

Given the rate of technological innovation and frequency of organizational restructuring, work process knowledge theory argues that the ability of individuals to adapt to and innovate is now vital at all levels of the economy. For example, Boreham, Samurcay and Fischer (2002) found that today's manufacturing employees "are now expected to use their technical and generic knowledge and skills to contribute to the production of new knowledge within the workplace on an ongoing basis, rather than merely applying existing knowledge to workplace activities" and as a consequence, must understand the "wider societal concerns that impact on the work of the

5. It is important to note that digital competency depends not only on skills, but also access to relevant technology; the issue of unequal access of low income groups to ICT, or "the digital divide" can exacerbate inequality (Mossberger, Tolbert and McNeal, 2007).

business such as sustainability and environmental damage.” This is an example of the broader competence of “adaptive learning” or “Reflectiveness: the ability to apply routinely a formula or method for confronting a situation, but also the ability to deal with change, learn from experience and think and act with a critical stance” (OECD, 2005, 5).

If a worker is to be adaptive, then they must also be flexible. This is important not only when considering the skills a worker needs for success but also what firms need for success. The discussion of employee flexibility as a soft-skills asset runs prominently through the human resources (HR) literature, with discussion of businesses’ need to be more flexible in light of the ever shifting consumer market. With this increased need for flexible business, from an employer or HR perspective the need for workers who are also flexible – in terms of skills and availability—is substantial. The human resources literature views flexibility in a subtly different fashion than other fields, as they argue that “organizations must be occupationally flexible, enabling workers to become mobile between different tasks, in particular by helping them to shift from less to more productive occupations” (Philpot 2002, 10).

Determining the Right Competencies and Relationships Among Them

Given this broad overview of the general competencies needed for labor market success in the 21st century, a crucial question becomes how to measure the acquisition of these competencies and how do they relate to each other. Several major studies, including the ALL skills survey and its predecessor the IALS, measured literacy skills along a continuum of proficiency rather than a binary of “literate” or “illiterate.” Using the same measurement scale as IALS, the ALL survey’s spectrum of measurement is comprised of five levels of proficiency for document and prose literacy. For problem solving, four levels of proficiency were developed. Each of these rests on respondents being at a static, numeric value in the ability scale. Hampson and Junor (2009, 18) offer a compelling alternative view. Rather than separating out the concept

of “learning” as an individual skill, they see “learning as fundamental to the conceptualization of skill levels.” In their taxonomy, based on extensive fieldwork in the New Zealand service sector and developed as the New Zealand Department of Labour (2009) Spotlight framework, two of the five priority 21st-century competencies – problem-solving and critical analysis – are viewed as levels of development of many competencies in specific occupational settings rather than standalone competencies (see Figure 2).⁶

Figure 2
New Zealand Spotlight Competence Framework

Skill Elements

<p><u>A.</u> <u>Shaping awareness:</u> <i>Capacity to develop, focus and shape your own and other participants’ awareness, by</i></p> <ul style="list-style-type: none"> A1 Sensing contexts or situations A2 Monitoring and guiding reactions A3 Judging impacts
<p><u>B.</u> <u>Interacting and relating:</u> <i>Capacity to negotiate inter-personal, organisational and inter-cultural relationships by</i></p> <ul style="list-style-type: none"> B1 Negotiating boundaries B2 Communicating verbally and non-verbally B3 Connecting across cultures

6. Concerned with the under recognition of so-called soft skills, a research team led by Junor and Hampson conducted 57 in-depth interviews over three waves of site visits in New Zealand 2006. This information was analyzed in light of relevant skills literature and 94 position descriptions “in which managers had clearly sought specific employee input” (Hampson and Junor, 2009,17) to develop a taxonomy where workers are “able to build a base of experience through practice and reflection... in which ‘supra’ work yields ‘lower level’ skills” (Hampson and Junor, 2009, 19). The goal of this framework is to assist in identifying and valuing often overlooked skill areas by mapping three central skill sets onto five learning levels.

C. Coordinating:

Capacity to organise your own work, link it into to the overall workflow and deal with obstacles and disruptions, by

C1 Sequencing and combining activities

C2 Interweaving your activities with others'

C3 Maintaining and/or restoring work-flow

Learning Levels- Definitions and Basis

Descriptor	Familiarisation	Automatic fluency	Proficient problem-solving	Creative solution sharing	Expert system-shaping
Capacity to:	<i>Build experience through practice, reflection and learning from others</i>	<i>Apply experience automatically and independently</i>	<i>Use automatic proficiency while solving new problems</i>	<i>Help create new approaches by exchanging solutions</i>	<i>Embed expertise in an ongoing work system</i>
Basis	Participating as a novice, by building expertise through observation, practice and reflection	Participating as a practiced performer, independently applying operational knowledge to the point where activity is automatic	Participating as an experienced problem-solver, able to carry out operations already learned, whilst applying widening knowledge and experience to creating new solutions	Participating as a sharer of practical knowledge, in the exchange of 'local knowledge' through stories or notes about trial-and-error solutions	Participating as a knowledge creator or system innovator, helping to spread or change systems of practical knowledge (and possibly also its theoretical basis)

Source: New Zealand Department of Labour, 2009; Hampson and Junor, 2009.

The review of the literature also suggests some competencies that may be vital for the 21st century that were not on the original list. **Systems thinking** is seen to be growing in importance as disciplines become more integrated, organizations shift from vertically integrated to more network based, and more work within them is performed in cross-functional projects. This is supported by the emergence of new professional science masters degrees to develop “T-shaped professionals” who possess both “‘contributory knowledge’ (deep learning in the science) as well as ‘interactional/articulatory expertise’ (breadth of workplace skills)” (National Research Council, 2008, 14; IfM and IBM, 2008; Palmer, 1990). Systems thinking corresponds closely to the highest level in the New Zealand ‘Spotlight’ framework (New Zealand Department of Labour, 2009). Another general skill area of growing importance is **financial literacy** as laid out by Lusardi and Mitchell (2005), which appears to be needed along with general literacy and numeracy, especially as it relates to long-term and retirement planning. Many households, the study notes, lack the basic financial literacy skills to make appropriate financial decisions, which negatively impacts long-term economic outcomes for these households. **Cross-cultural fluency** and global acumen is seen to be more salient as the economy has become more global, but defining this competency has proven to be difficult. Australia’s Mayer Committee (1992,13), tasked with developing a set of “key competencies,” for example, failed to come to a consensus on how to define this competence.

Emotional intelligence and Emotional Labor -- “managing feelings so that they are expressed appropriately and effectively, enabling people to work together smoothly towards their common goals” – has been recognized as a key competence for an increasingly knowledge and service-based economy since Goleman’s (1998,7) seminal work. Philpot (2002, 9) notes in order to remain competitive organizations need to “guarantee to customers the personal touch, whether in terms of a ‘can do’ approach to service delivery, a friendly voice on the customer service

phone line, or a helpful or caring attitude in the shop, restaurant, railway, post office or hospital.” Hochschild, (1983), Bolton (2005) and Hampson and Junor (2009, 6) offer an alternative to Goleman’s perspective, arguing the terms ‘appropriately’ and ‘effectively’ embody corporate value judgments,” and that workers in frontline service jobs are now often compelled to display certain emotions as part of their “emotional labor,” causing stress and job dissatisfaction.

Are Competencies Universal and Equally Valuable?

Recent research on business strategy challenges the basic premise of focusing on the value of a set of generic competencies. Becker, Huselid, and Beatty (2009), for example, drawing on data from more than 3,000 firms over more than a decade, argue that businesses should not value all talent equally, but should differentiate the value (and thus compensation level) of skills among its workforce in relation to the key elements of its firm strategy that differentiate it from competitors. By definition, generic capabilities cannot create a sustainable competitive advantage versus competitors (Prahalad and Hamel, 1990). The study cites Porter (1996), and endorses the idea that an effective strategy “means performing *different* activities from rivals or performing similar activities in *different* ways” (ibid, 31). In terms of competency development, this suggests that depending on the situational context not all competencies are created equal. Their taxonomy, intended for firms to use to better prioritize workforce needs, offers four stages of differentiation and value of competencies: 1) One size fits all; 2) Generic fit; 3) Differentiate by strategic capability; and 4) Differentiate by jobs within strategic capabilities (ibid 2009, 10). The workforce strategy for some organizations might reflect elements from several stages simultaneously.

What’s the Relationship Between Education and Training, Competencies and Outcomes?

The relationship between worker competencies and individual and organizational outcomes is complex and contested. There is wide agreement among policymakers about the need for basic skills and competencies, but much less evidence about where such skills are best acquired. Additionally, the inconsistent measures of competencies from one survey to another make blanket statements about labor market outcomes difficult. Murray, Owen, and McGaw (2005, 167) found that skills and education were rewarded at different levels in terms of pay in the different countries surveyed in the ALL. For example, in Bermuda and Italy, returns to skill are far higher⁷ than the returns to education,⁸ suggesting that “skills are highly valued on the labour market and that education is rewarded only in so far as it is associated with these skills.”

The research suggests that the way in which competencies are developed – in particular, whether employers are cooperating with educational institutions – may be as important as the competencies themselves. Crebert et al. (2004, 153) found that undergraduate students felt that, while a university setting was the best place to develop the competencies of “oral and written communication skills, critical analysis and evaluation, problem solving and teamwork skills,” students’ experiences in employment-based learning opportunities were the most beneficial for subsequent success in the job market. Bishop and Mane (2000, 14) found in their analysis of data from the National Educational Longitudinal Survey of 1988 (NELS-88) that school-business collaborations “significantly reduce unemployment in the two years after leaving high school and significantly increase employment, annual earnings and hourly wage rates.” These programs may achieve this by signaling to employers involved in their design and implementation “that the

7. Murray, Owen, and McGaw (2005) note that in Bermuda and Italy “every increase of 10 percentiles in the ranking of the distribution of prose, document, numeracy or problem solving skills is associated with between 15 to 55 per cent higher weekly earnings, depending on the skill domain considered” (167).

8. In Bermuda and Italy, Murray, Owen, and McGaw (2005) found that, “returns to education that are not statistically different from zero or are negative imply that if additional years of schooling are not associated with higher skill proficiencies, then those extra years of schooling are not rewarded on the labour market” (167).

school is doing a good job of preparing young people for work” (Bishop and Mane 2000, 10). These findings are supported by Mason, Williams, and Cranmer’s (2006) study of efforts to foster “employability skills” for 3589 graduates from eight UK universities. They found that participation in structured work experience was associated with a 29% increase in the probability that graduates would find employment appropriate to their level of education (“graduate-level”) within six months of graduation, while explicit teaching and assessment of so-called employability skills was not found to have a clear impact on graduate labor market outcomes.

The effects of general skills may also be cumulative, because they increase the likelihood individuals will receive and benefit from subsequent training in the workplace. Research has shown consistently that more qualified people receive most employer-provided training that is on offer (e.g. Philpot, 2002). As Murray, Owen, and McGaw (2005, 118) note:

for many, the link between foundation skills and employability is not necessarily direct. Employability also depends on the willingness and capacity of workers to participate in training Many lack the basic skills to engage in training that maintains their employability, including younger and older workers.

Likewise, Bertschy, Cattaneo, and Wolter (2009, 129) found that, among the upper-secondary vocational students they examined,⁹ higher scores on the academic PISA assessment¹⁰ were

associated with more intellectually demanding vocational training, and that at the same time students who pursued vocational training with higher intellectual demands [were]

9. Bertschy, Cattaneo, and Wolter (2009) drew on a longitudinal data set that followed a group of 642 vocational students and apprentices in Switzerland. This data set came from the “PISA survey 2000, and from five waves of the Transitions from Education to Employment Survey (TREE). The TREE data come from a longitudinal survey of all participants of the PISA 2000 survey and they contain information on educational and occupational choices and outcomes during the post-compulsory school period up to the age of 22” (Bertschy, Cattaneo, and Wolter, 2009, 117).

10. The Programme for International Student Assessment (PISA) is an international effort of Member countries of the OECD to survey their population of 15 year old students as they approach the end of their compulsory schooling. PISA includes measures of competency in reading, mathematical and scientific literacy. In 2003, PISA added a problem solving domain. See Hanushek et al (2010).

more likely to have a smoother education-to-work transition, meaning that they [had] a higher probability of finding an adequate job.

Training design and assessment design is also important. In formal workplace training scenarios, the Kirkpatrick model of training evaluation (cf Kirkpatrick, 1959) is still a generally accepted standard. Kirkpatrick and Kirkpatrick (2009, 23) note that “learning leaders still try to demonstrate their value to the[ir] business by using attendance, [Kirkpatrick model] Level 1 reaction data and [Kirkpatrick model] Level 2 testing scores.” The authors go on to argue that a narrow focus on immediate reactions to a learning event is not indicative of a worker processing or critically assessing new knowledge, required elements of workers progressing to effective application of new training or skills (level three of the Kirkpatrick model) or reaching the final, desired outcome (level four). Phillips (1996) built on the original Kirkpatrick framework by adding a fifth level: measuring return on investment (ROI). Using this five-level framework, the Skillnets pilot project (IMC, 2005a, 1), funded by the Irish National Training Fund, found that among 18 different firms operating in Ireland, use of the Kirkpatrick/Phillips training evaluation system “greatly improved the quality, efficiency, and effectiveness of training.” For example, at Braun Oral B Ireland (IMC, 2005b, 12), the manufacturing employees who underwent training designed to facilitate development of problem-solving skills and the sharing of ideas¹¹ discovered “a significant variation in stock take [inventory] that would not have been noted without the higher levels of engagement of the trained employees.”

Bishop (1988, 2) found that training-related employment is key to benefiting from occupation-specific education. If a training-related job is not obtained, then there are no

11. The full list of training goals were "Ownership and understanding of KPIs [key performance indicators] and business needs; Enhanced engagement /involvement; Increased commitment; Appreciation of Departmental functions; Cross fertilization of ideas; Understanding Business needs and the 'bigger picture'; Improved employee relations; Problem Solving skills; Conduct effective meetings" (IMC, 2005b, 11).

economic benefits of such vocational training. Bishop found that, though occupation-specific skills obtained through vocational education are not a substitute for basic skills (the ability to read, write, speak, compute, and reason), there were positive impacts on graduation rates and that “monthly earnings [were] 7- 8% greater” when training-related employment is secured.¹²

Emerging trends in education support the idea that industry needs have an increasingly important role in the success of an individual in the labor market, reinforcing the benefits of on-the-job training. Taking into account Mason, Williams, and Cranmer’s (2006) previously discussed positive labor market outcomes for UK graduates who took part in courses designed in cooperation with employers, MacCluer and Seitelman (2005, 2) note that industry pressures to do more with less favor programs that offer “a strong technical background together with a knowledge of business practices [that] will equip students for substantial roles in both product development and organizational management.” The call for professionals with T-shaped competencies is supported by industry players like IBM, who offer training packages designed to help develop T-shaped employees and note that “it’s no longer enough for a programmer to be just a programmer” (IBM, 2010); it is reinforced by industry’s work with academia (see Institute for Manufacturing, University of Cambridge and IBM, 2008).

The relationship between skill, education, and earnings is further fleshed out in the ALL survey report, which notes that certified “skills have a large effect on earnings in the majority of countries. The extent to which economic rewards are attributable to either skill or education is

12. In subsequent work, Kang and Bishop (1989, 143) found that there “[are] decreasing returns from specialization and that a complementarity exists between academic and vocational education”(143) and are able to illustrate what mix of courses would maximize earnings for males and females. For males who took a total of 12 full-year courses, “earnings in the calendar year after high school are maximized when approximately 36% of academic and vocational courses are vocational” (Kang and Bishop, 1989, 143). For females, 48% of academic and vocational courses should be vocational to maximize earnings the year after graduation. The study also shows, however, that there are diminishing returns to increasing the number of vocational courses in relation to academic courses.

mixed and varies by country.... In Canada and the United States, the labor market appears to separately reward both the skills measured in ALL [prose literacy, document literacy, numeracy and problem solving] and additional schooling” (Murray, Owen, and McGaw, 2005, 165). In Canada, “each additional year of schooling is on average associated with about five percent higher weekly earnings even after adjusting for directly observed skills” (167). The US saw similar results, with returns ranging from six to nine percent. This can be compared to the previously discussed results in Italy and Bermuda where skills are rewarded, but there are no discernible returns to additional education.

Individual Outcomes -- Obtaining a Job

A major reason for the focus on 21st-century competencies is that the majority of recent and future job growth in OECD nations has been, and is projected to continue to be, in services and knowledge work occupations, jobs which are thought to require higher levels of these general skills than manual work. The UK National Skills Surveys of 1997 and 2001¹³ show a growth in demand for and actual use of generic skills (Dickerson and Green, 2002). In the United States, the Bureau of Labor Statistics (BLS, 2009) projects that, between 2008 and 2018, “more than half of the new jobs will be in professional and related occupations and service occupations.” BLS also projects that “occupations where a postsecondary degree or award is usually required are expected to account for one-third of total job openings during the projection period.” Increasing levels of education is a complex component of skills analysis, because

13. The UK National Skills Surveys were “large-scale cross-sectional representative survey[s] of individuals aged between 20 and 60 in Britain in paid work at the time of interview... Interviews were conducted face to face in respondents’ homes, and the achieved samples of 2467 and 4470 respectively were each representative of the British population” (Dickerson and Green, 2002, 4 -5). These are different assessments than the UK National Employment Skills Surveys.

“although education and skills are strongly related, exclusive reliance on measures of educational attainment to predict adult skills will lead to considerable error” (Murray, Owen, and McGaw, 2005, 61). These trends toward higher skill demands are being magnified by globalization, as not only lower-skilled jobs, but even the highest levels of research and development work in the US – e.g. jobs performed by PhD chemists and biologists – may now be offshored (Finegold et al. 2009).

The changing nature of what competencies workers require is also being shaped by technological developments. Drawing on the UK Labour Force Survey, Kirby and Riley (2006, 7) estimated the impact of Information and Computer Technology (ICT) on general and occupational-specific skill returns in different industries in the UK between 1994 and 2001. Using schooling and potential work experience as proxies for general skills and job tenure as a proxy for job-specific skills for 16 industry groups in the UK data, the study’s results

lend support to the notion that ICT is biased towards general skills, which are useful in acquiring new skills and in performing a broad range of activities, and biased against skills that are less transferable between jobs. The findings reported here are consistent with the interpretation that recent technical change, although skill-biased, renders some job-specific skills obsolete.

Using data from O*NET, Elliott (2007) projects that advances in a range of technologies (computers, AI, optics, robotics) could combine to substitute for human abilities in nearly 60% of the jobs currently held by the US workforce.

The pressure for increasing levels of skill is not limited to jobs requiring high levels of education for entry. Drawing on a data set from the Bay Area Longitudinal Study (BALS), Maxwell (2006) found that there was a strong argument to be made that even low-skilled jobs require English, math, communication, and problem-solving skills, along with certain job-specific skill sets (like physical and mechanical ability). Maxwell did not find, however, a conclusive link that computer skills “are an identifiable skill set widely used in low-skilled jobs,

at least at entry level” (53). Likewise, in a West German study, Spitz-Oener (2006) showed that service tasks are also increasing in complexity, with analytical and interactive tasks overtaking routine and manual tasks. Spitz-Oener builds on the model for assessing changing skills-needs proposed by Autor, Levy, and Murnane (2003), which drew on analysis of the Current Population Survey (CPS) job titles in light of data from the Dictionary of Occupational Titles (DOT). Spitz-Oener’s main concern with the Autor, Levy, and Murnane approach is that it “precludes, to a large extent, a discussion of task changes within occupations” (p.236, 2006) in part because the DOT underestimates “true changes in job content” (p.242, 2006).

Many of the largest categories of service workers – e.g. cashiers, home health workers -- are in low-wage, low-skilled areas that get little skill development. Lloyd and Payne (2008) challenge the assertion that call centers¹⁴ offer ‘skilled’ jobs based on the need for workers to be adept in emotional or articulation work skills. Echoing an earlier study in the US of low-wage service work (Appelbaum, Bernhardt, and Murnane 2003), they note that “there is a worrying trend within these discourses to equate ‘skill’ with the ability to cope with badly designed jobs and stressful working conditions” (Lloyd and Payne 2008, 21). In other cases, differences in national institutional contexts can result in jobs with similar titles – childcare and home health workers – being treated as skilled professionals requiring recognized qualifications and paying a living wage (France/Scandinavia) versus the US, where the competencies required are generally unrecognized and unrewarded.

Wage Premiums

14. Lloyd and Payne (2008) report “44 face-to-face interviews with senior managers, team leaders and call centre operators were conducted across the two call centres, which we label C1 and C2. The interviews were recorded and ranged in length from one to two hours with managers and team leaders to 30 to 45 minutes with individual agents” (8).

Technological and economic changes appear to be increasing the returns to certain types of general skills. Murnane, Willet, and Levy's (1995) analysis of the National Longitudinal Study of the High School Class of 1972¹⁵ and the High School and Beyond survey of 1980¹⁶ found that the increasing wage premiums between 1972 and 1980 were tied to "the increase in return to cognitive skills" (1995, 259). Looking at the returns to completing higher education, the study showed that, by the time 1972 high school graduates reached age 24 in 1978, each year of college completed carried a 2.2% wage premium for men and a 5.5% wage premium for women (as compared to those graduates who had only a high school education). For the class of 1980, by age 24 in 1986 there was a 4.5% wage premium for men and a 6.7% wage premium for women for each year of college completed.

Ananiadou, Jenkins, and Wolf (2004) undertook an expansive literature review of work derived from the UK on the effects of so-called "basic skills" of literacy and numeracy on individual workers' wages and employment probability. Based on analysis of IALS and the longitudinal National Child Development Study¹⁷, they found "that the wage effects of higher numeracy skills are greater for men than for women, and that the reverse is true for literacy, while, in terms of employment, higher numeracy skills seem to have more impact on women's employment chances than men's."¹⁸ Results of the UK's Skills for Life Survey¹⁹ confirm that

15. Survey included information on the labor market experiences of 22,652 students first surveyed as high school seniors in 1972.

16. Survey included information on the labor market experiences of 11,500 students first surveyed as high school seniors in 1980.

17. The NCDS is "one of the major longitudinal surveys of people living in Great Britain who were born at a particular point in time: in this case, between 3 and 9 March 1958" (Ananiadou, Jenkins and Wolf, 2004, 292). The sample discussed in Ananiadou, Jenkins and Wolf (2004) includes 1714 respondents (or 10% of the cohort) who were 37 years old in 1995. Respondents were "assessed using a specially developed literacy and numeracy test that provided a direct measure of their basic skills as adults" (292).

18 They find that 42% of men with very low and low literacy fell in the low-income group (less than £200 per week) compared to 24% for those with good literacy. The respective figures for women were 53% (low or very low

“those with lower-level numeracy (level 3 or below) earned £8,000 less than those with Level 2 numeracy or above”²⁰ (Williams et al. 2003, 22).

In terms of the return on specific skills, De Anda and Hernandez (2008, 240) utilize data from the 1992 National Adult Literacy Survey²¹ to show that different races and genders benefit differently from levels of literacy. They find “the effect of literacy skills on the earnings of black males [in the US] is bifurcated: literacy skills seem to be more significant for less-educated black males than those with college degrees” (241). Black males are seen to benefit most from literacy competency, which is accompanied by a weekly earnings increase of 18%. This is compared to the return on literacy skills for white females (13% earnings increase), white males (12% earnings increase), and black females (9.8% earnings increase).

literacy) in the low-income group (less than £150 per week) compared to 39% of those with good literacy. An even more marked effect was found with respect to numeracy skills for men: 49% of men and 52% of women with very low numeracy fell in the low-income group compared to 19% of men and 30% of women with good numeracy skills.

19. The UK Skills for Life survey “was carried out between June 2002 and May 2003. The survey was commissioned by the Department for Education and Skills. The aim was to produce a national profile of adult literacy, numeracy, ESOL, and information and communications technology (ICT) skills over five broad levels of competence” (Williams et al. 2003, 12). The UK Skills for Life survey population “was all adults aged between 16 and 65 and normally resident in England. Residents of institutions were excluded for practical reasons. BMRB completed 8,730 first interviews although, in some cases, respondents did not fully complete tests and, in others, previously unidentified problems with the test programmes prevented final scores from being computed. In total, 7,873 respondents completed the literacy test and 8,041 respondents completed the numeracy test. 7,517 completed both. A total of 4,656 took part in the second interview, with 4,464 assigned levels in both ICT assessments” (Williams et al. 2003, 13).

20. Numeracy at “Level 2 or above” in the UK Skills for Life survey is defined as “Understands mathematical information used for different purposes and can independently select and compare relevant information from a variety of graphical, numerical and written material” (Williams et al. 2003, 11)

21. The National Adult Literacy Survey (NALS) is a representative random sample of 26,000 adults in the US. NALS respondents are asked to complete “background items (e.g., demographic characteristics, education, and labor force participation) and ... a series of diverse literacy tasks measuring their prose, document, and quantitative skills. Each group of tasks was scored separately, so that respondents received scores along a prose scale, a document scale, and a quantitative scale. The tasks were designed to measure a person’s ability to succeed in common, practical, and analytical problems encountered in daily life or at work” (De Anda and Hernandez, 2008, 235).

Dearden et al. (2000) found in their survey of three major UK data sets²² that earnings associated with academic qualifications are generally higher than those associated with vocational qualifications of the same level. When time required to obtain these qualifications was factored in, however, the returns per year on vocational qualifications “move closer on average to those accruing to academic qualifications” (3). For males, there is a labor market return of 10-28% for holding an academic degree and a return of 6-9% for a vocational qualification like the National Vocational Qualification (NVQ) at levels 3-5. For women, an academic degree saw labor market returns of 21-26%, while NVQs at levels 3-5 saw a return of 1-5% in two of the data sets, and a return that was statistically insignificant in the IALS sample.

Organizational Outcomes, Skill Shortages, and the Demand for Skills

A review of the literature on employer benefits from enhanced basic workforce skills finds that research showing direct firm outcomes is scant and that what research there is often suffers from significant weaknesses (Ananiadou, Jenkins, and Wolf, 2003). The authors examine Gallup’s 1992 effort (ALBSU, 1993) to quantify the economic losses of UK employers caused by deficiencies in workers’ basic skills.²³ The study focused on companies with over 50 employees, finding firms on average lost £166,000 per year in 1993 figures due to skill

22. Dearden et al., (2000) drew on “the 1991 sweep of the National Child Development Study (NCDS), the British data from the 1995 International Adult Literacy Survey (IALS), and the 1998 Labour Force Survey (LFS)” (7) for their study. The Labour force survey is “a quarterly survey of representative households, which asks respondents about their personal circumstances and labour market status. The LFS covers about 120,000 individuals, in around 60,000 British households and is carried out by the Office for National Statistics” (Dearden et al. 200, 13).

23. Gallup undertook 400 interviews with employer representatives (usually a human resources or training manager) from a random sample of companies employing 51 or more employees in the UK. The interviews were intended to assess the level of their employees’ reading, writing, numeracy and oral communication skills. The total cost to industry of poor basic skills among employees was estimated by asking employers “a series of questions relating to specific aspects of their company’s business. Specifically, they were first asked to indicate how many customer orders were cancelled per year because of errors/problems, how many orders were dispatched/produced incorrectly and the number of customers lost per year through problems or misunderstandings” (Ananiadou, Jenkins, and Wolf, 2003, 19).

deficiencies (£208,000 in 2002 prices), with the losses of large firms (over 1000 workers) over five times that of smaller firms (51-100 workers). Ananiadou, Jenkins, and Wolf (2003) note, however, that these estimates have come under heavy criticism for both the methodology employed and the approach taken in extrapolating the figures from the small sample (cf Robinson, 1997).

The impact of skill shortages varies by skill-type and industry. Utilizing firm interviews and “information from an ICT benchmarking survey of British enterprises with post-survey financial data for the same enterprises,” Forth and Mason (2006, 2) “found strong evidence that internal ICT skill shortages – skill gaps among existing employees – have negative indirect effects on firm-level performance because of the ways in which such skill deficiencies restrict companies both in terms of ICT adoption and the intensity of use of ICTs once they have been installed” (27). But the study did not find support for a direct link between skill constraints, ICT training and financial performance. Stevens (2004, 7) found considerable heterogeneity across industries in how skill shortages affect employment practices. Some industries experience only intermittent skill shortages in the workforce, while others, like the metal manufacture and metal products sector experience “pro-cyclical skill shortages.” This heterogeneity suggests that “industry-specific skills play a part in explaining labor market behavior” (2004, 9) and influence firms’ employment practices. Shury et al. (2009, 30) found that one in five UK employers reported a skills gap for some portion of their workforce. Of these skills gaps, 7 in 10 can be attributed to “a lack of experience and staff having been recently recruited.” The survey found that the effects of skill mismatch can include “an increased workload for other staff...increased operating costs, difficulties meeting quality standards, and difficulties introducing new working practices.”

An influential series of studies by the UK's National Institute of Economic and Social Research (NIESR) has used an innovative matched establishment methodology to explore the relationship between skills supply, firm strategy, work organization, and uses of technology, and productivity and other measures of performance in many manufacturing and service industries.²⁴

Across multiple sectors, German firms seemed to be able to secure higher-value-added niches in global markets, because their frontline skilled workers were highly productive and flexible thanks to the mix of strong general and occupation-specific skills they had developed through the apprenticeship system. Mason and Finegold (1997) examined the linkage between productivity and intermediate or sub-baccalaureate skill levels, by comparing the relatively low-skilled yet highly productive manufacturing sector of the US with matched samples from Dutch and British metal working firms²⁵ and food manufacturers in Britain, the Netherlands, Germany, and France.²⁶ They attributed the US lead in labor productivity to scale economies of production, while Western European firms used greater supplies of skilled workers, especially in the case of Germany, to produce smaller batches of higher-value-added products.

Carr's (1992) work compared skills and productivity in vehicle component manufacturing in Japan, the US, UK, and Germany, finding a large Japanese performance advantage. Japan trailed Germany in terms of the initial technical qualifications of shop-floor workers, and all three countries in the technical skills of graduates, but more than made up for it by subsequent in-company training based around a team-based organization. Workers at various

24. See Mason and Finegold (1995); Finegold and Wagner (1997); Prais (1981); Prais and Wagner (1983) and Prais and Wagner (1988).

25. This sample included visits to twelve British plants and nine Dutch plants during 1991 (see Mason and van Ark, 1993).

26. This sample included 29 visits to European biscuit factories between 1989 and 1991: ten in Britain, eight in Germany, six in France and five in the Netherlands (see Mason, van Ark, Wagner, 1994).

levels were able to move between jobs to gain experience of different production and technical fields, providing a general skill set that helped foster quality and flexibility.

The skills present in the workforce may impact the organization of the work engaged in, along with the outcome for the firm. In their discussion of high-involvement workplace strategies, Benson and Lawler (2010, 7) note that high involvement practices, which include “teams, employee development, gain sharing plans, and participative leadership... are correlated with variety of organizational performance measures including return on assets, sales, entrepreneurial growth, customer satisfaction, and productivity.” Combs et al. (2005) conducted a meta-analysis of 92 studies that found “high-performance practices including participation were significantly related to a number of financial and operational performance measures,” and held true in large firms and small start-ups, unionized and non-unionized firms alike. Benson and Lawler (2010, 8) note that “[t]aken together this research shows that employee involvement increases individual, team, and unit productivity in industries as diverse as professional services, steel manufacturing, apparel, medical imaging and semiconductor fabrication.” Adoption of these practices, however, is uneven, occurring in only a relatively small percent of all US employers. Benson and Lawler (2010) also point out that, in the service sector, where costs must be aggressively kept down for firms to compete, employee involvement may not make short-term economic sense.

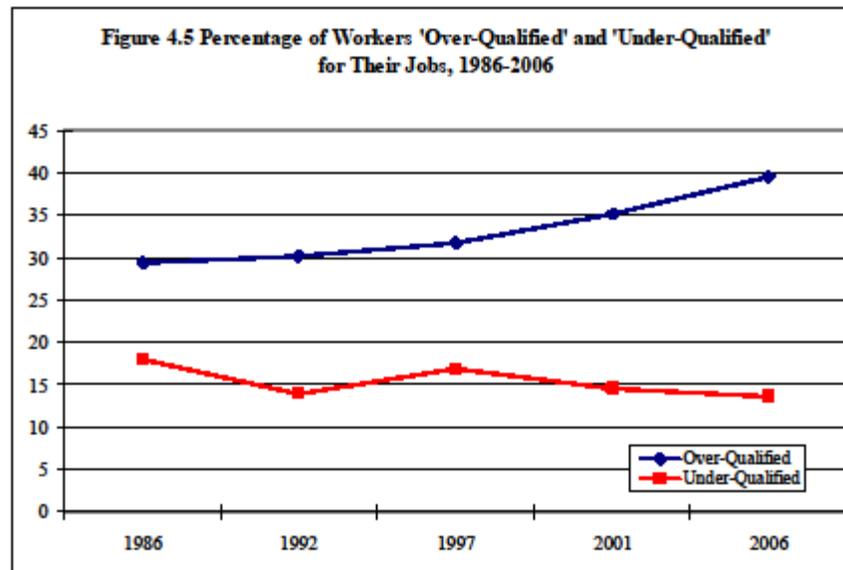
Investing in improving individuals general capabilities is unlikely to yield a positive return if jobs are not designed to use them. As Murray, Owen, and McGaw (2005) note in their examination of the ALL survey, this can create the problem of skills mismatch: “despite the strong associations between skill and economic outcomes...there are significant proportions of workers who have medium to high levels of skill but who nevertheless occupy low-paying jobs. Naturally the opposite is also true. There are low- to medium-skilled workers who are

nevertheless well paid” (166). Individuals who are over-educated for the position they occupy suffer (as compared to those with a match of skills, education level and occupational need) a wage penalty, and that women suffer a greater penalty when mismatch occurs (Green and Vignoles 2002, 802; Williams et al. 2003). To illustrate this issue, Green and Vignoles (2002, 795) offer the example of a university graduate in a secretarial role, where “that graduate may be no more productive than a less educated secretary. The graduate's skills will be under-utilized, and he or she will be less productive and earn less than s/he would in a graduate job.” The scale of this problem is reaching alarming proportions in the UK, where 2 out of every 5 workers report they are over-qualified for their jobs, up 10% over the last two decades, reflecting a large increase in the supply of graduates, but also casting doubt on the extent to which employers have created jobs that demand high skill levels (Felstead et al. 2007, 63).²⁷

27. The UK's 2006 Skills Survey is designed to measure a wide range of skills used in the workplace by individuals in Britain between the ages of 20 and 65. It utilizes “survey-based measures of job skills adapted from the general principles of job analysis” (Felstead et al. 2007, 8) carried out over seven months and involving “4,800 productive interviews with individuals aged 20-65 years old and in work” (Felstead et al. 2007, 15). For greater detail, see Felstead et al. 2007, pp 5-15.

Figure 3

Growth in Over-Qualified UK Workers



Drawing on a much simpler, one-question questionnaire and a smaller sample size²⁸ in each country, Bevan and Cowling (2007) compared the UK to other European countries; they found that, in both 1996 and 2000, the UK had the worst rate of job matching in the EU-15 although a much lower level of over-qualification (8%) than Felstead et al (2007) found. Bevan and Cowling found an overall reduction in the rate of over-skilling among the EU-15 between 1996 and 2000 (from 8.8 to 7.4 percent, respectively). The difference in education systems among the EU-15 is cited as a possible factor in the difference in over-skilling, specifically “differences in the degree to which individuals can stay voluntarily in education” (Bevan and Cowling 2007, 22) as well as in the success in reforms to decrease such a skills mismatch.

28. Bevan and Cowling (2007) drew on the European Working Conditions Survey, which covers respondents who are 15 years or older in each EU Member State. In the 1996 survey, “around 1,000 workers were interviewed in each Member State, a total of 15,800. For the 2000 Survey, around 1,500 workers were interviewed in each Member State, a total of 21,703 interviews [the EU had expanded its membership between 1996 and 2000]. Luxembourg has a reduced sampling requirement due to its smaller population size” (Bevan and Cowling, 2007, 16-17).

The problem of skill mismatch cuts both ways, however. As Williams et al. (2003, 82) note, one third of those surveyed as holding high managerial or professional occupations did not test at the highest level of literacy (Level 2 or above). Their study suggests that these respondents “successfully worked around their weaknesses or that the level of literacy demanded at Level 2 or above is not essential for their work.” This concern is likely to decline as the supply of graduates to fill these positions increases across OECD nations (Felstead et al. 2007).

National Outcomes

Evidence also suggests skills have a major effect on national economic performance. Hanushek, et al, (2010, 6) “relate cognitive skills – as measured by PISA and other international instruments – to economic growth.” They found:

The relationship indicates that relatively small improvements in the skills of a nation’s labor force can have very large impacts on future well-being. Moreover, the gains, put in terms of current Gross Domestic Product (GDP), far outstrip the value of the short-run business-cycle management. This is not to say that efforts should not be directed at issues of economic recession, but it is to say that the long-run issues should not be neglected.

Conclusions and Areas for Future Research

This review of the literature suggests that there is widespread consensus among policymakers and researchers across the OECD on the key competencies that workers require in the 21st century, yet surprisingly little evidence of the relationship between these competencies and individual or organizational outcomes. In contrast with the large literature on the economic returns on education, there are few studies that directly assess the effects of competencies on outcomes, in part because of the lack of common measures of these competencies.

This suggests a strong need for future research to demonstrate the relationship between these competencies and outcomes, and to explore what mechanisms are most effective in

developing these generic skills. Our review provides guidance on core elements for this future research and policy agenda:

- focus on the demand-side of the skill equation, looking at how the design of organizations and jobs impacts skill requirements and performance,
- recognize that general competencies should not be studied in isolation from occupation-specific contexts – e.g. problem-solving in engineering may entail very different skills than in social work,
- treat some of these competencies – problem-solving, capacity for change – as more advanced stages of development within a range of specific skill areas, rather than as discrete competencies,
- be open to including other competencies – cross-cultural fluency, systems thinking, financial literacy – that appear to be growing in importance in today’s global economy.
- research these issues in the US context – to date, a great deal of the best work directly measuring competencies has been done in the UK and Australia/New Zealand, where they have both national competency frameworks and regular, nationally representative workplace and skill surveys.

Companies and their workers would benefit from a clarification of what competencies enhance performance and how best to develop them. As Hampson et al. (2009, 25) note, there is a value to HR professionals of being able to

unpack, at various levels, the skills often simply called communication, prioritizing or problem-solving. [Drilling down to the essence of skills] allows the creation of job families and sequences linked by the development of proficiency in key under-recognized areas, broadening the options for internal sourcing of skills [which] is likely to enhance staff retention.

Appendix 1

Implications for the US: National Qualification and Training Systems

Assessing and providing for skill needs in the workforce is, by several measures, directly tied to the health of a country's broader economy. Hanushek et al. (2010, 10) argue that "the human capital influence on growth is best characterized by the relationship between direct measures of cognitive skills and long-term economic development. The evidence suggests that differences in cognitive skills as an explanation of a majority of the differences in economic growth rates across OECD countries." Through the OECD's (2005, 19) DeSeCo Project international experts came together "to identify an agreed set of fundamental ideals with which a framework of key competencies needs to be compatible. This reflects a commonality of aspiration while accepting a diversity of application." Building on the OECD's work, the European Qualifications Framework (EQF) (European Parliament and European Council, 2008) defines "skills" as "the ability to apply knowledge and use know-how to complete tasks and solve problems ... skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments)," and "competence" as "the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development ... described in terms of responsibility and autonomy" (European Parliament and European Council, 2008, 4). Some scholars, e.g. Hampson and Junor (2010), have raised questioned the conceptual clarity and challenges of implementing these distinctions.

Many countries have instituted programs and systems to assist in the acquisition and assessment of the skills that they identify as critical to the economy. England, Australia, and

Ireland have created qualification frameworks and begun assessing future skill requirements in key economic sectors (food and beverage; creativity, design and innovation; education and training outputs; etc.).²⁹ Government efforts to align individual skills and the needs of business through national competence frameworks have not been without their difficulties. The vocational education and training (VET) policies Australia has developed, after much policy frustration and failure (cf Hampson, 2002), are intended to “integrate all forms of work-related learning into a coherent and unified system of recognition” (Chappell et al., 2003, vi) based on collaboration between industry groups and institutions of higher education. These Australian Training Packages represent “nationally endorsed industry standards against which training can be developed and flexibly delivered to meet particular local, individual, industry and enterprise requirements” (Service Skills Australia, 2007). VET policies in this context take on a much broader role than in other discussions of skills development. These policies include the commonly discussed problem solving and communication, but also encompass, “curiosity, motivation and risk taking. This suggests that contemporary vocational learning should be as much in the business of constructing new worker identities as providing workers with vocational knowledge and skills as traditionally understood” (Chappell et al., 2003, 4). Schofield and McDonald (2004, 4) note that “the Training Package model has the potential, with improvements, to facilitate good labor market and educational outcomes for enterprises, industries, individuals and communities.” Problems may arise, however, when training policy is subsumed in employment policy. As Hampson (2002) argues, the goal of training policy is to create a pool of skills, while employment policy focuses on lowering unemployment, and the

29. See Forfas 2009 publications “Future Skills Requirements of the Food and Beverage Sector”, “Skills in Creativity, Design and Innovation”, and “Monitoring Ireland’s Skill Supply – Trends in Education and Training Outputs.”

combination of the two (as he describes in Australia, but has also occurred in the UK and US) may generate tensions.

The General National Vocational Qualification (GNVQ) and the older National Vocational Qualification (NVQ) in the UK were designed to recognize the “core skills to support vocational competence” (Smith, 1998, 538). The NVQs range from the Level 1, which certified introductory knowledge of a discipline, to Level 5, which measured an advanced professional understanding of the discipline (Futuremorph.org, 2008). In the case of the GNVQ, students “should have developed the generic skills and competencies needed for both employment and for higher education” (Smith, 1998, 538). The GNVQ framework “covers six core skills; application of number, communication, information technology, working with others, improving own learning and performance, and problem solving.” In Smith’s (1998, 547) small-scale³⁰ study of student perceptions of the GNVQ in relation to its better known counterpart the Advanced Level General Certificate in Education (A-level), GNVQs were viewed as only marginally achieving their goals of increasing student autonomy, fostering team work skills and encouraging “deep and reflective learning.” Smith posits that the bureaucratic structure of the GNVQ assessment procedures detracts from the student autonomy goals as, “assessment procedures may be one reason for ... continuing dependence, as only the teacher can explain and demystify their use.”

Germany, Austria and Switzerland each have strong sectoral skill frameworks and apprenticeship traditions that offer models of vocational education and training systems that have succeeded in developing a strong foundation of general skills combined with an occupational

30. The study was comprised of responses to individual questionnaires and recordings of group conversations of “a 10% sample (40) of second year Advanced GNVQ students in five further education colleges [studying in 9 of the 13 GNVQ areas] ... and a 17% sample (20) of former GNVQ students in Sheffield Hallam University.

focus. Harhoff and Kane (1997, 173) examined if the German apprenticeship model would be appropriate for the US, concluding that:

German apprentices occupy roughly the same place relative to unskilled workers and college graduates as that held by high school graduates in the United States. Further, the age-earnings profiles for German apprentices and US high school graduates are quite similar.

The study concludes that several factors found in Germany, but not the U.S. influence employer willingness to offer apprenticeships³¹ and absent “other inducements (such as a ‘training tax’ or similar public subsidy),” apprenticeships are unlikely to extend beyond their relatively narrow niche in the American context (ibid, 186).

In contrast, the US has limited and spotty implementation of competency standards and associated workforce development efforts to build core generic skills. Most public workforce development efforts focus on getting unemployed individuals into jobs as quickly as possible, with relatively narrow training programs. The National Work Readiness Credential (NWRC) for low- and entry-level skills assessment was launched in 2006 to recognize the “foundational skills of value-creating relationships” (National Work Readiness Credential, 2010). It features online assessments of four competencies: 1) Situational judgment; 2) Oral language; 3) Read with understanding; and 4) Use math to solve problems. A relatively new program, it currently serves six states; it appears too early to tell if it will adequately serve as a way to recognize skills at entry level.³²

31. Those factors were: “Union collusion, works councils and restricted mobility; Unobserved heterogeneity in workers’ costs of mobility; Firing costs, uncertainty and option value” (Harhoff and Kane, 1997, 178). A fourth, less verifiable factor identified by German human resources professionals interviewed by the authors was a social expectation that such apprenticeship programs would be offered.

32. District of Columbia, Florida, New Jersey, New York, Rhode Island, Washington

Why the United States lags in developing a national competency system and to what extent this has affected the actual individuals' attainment of general competencies remain major questions. In part, this appears to be due to the relatively limited role that the US Federal Government has historically played in education and training. According to the Forfas report, (2006, 12):

the US adopted at an earlier stage a broader, more holistic set of generic skills, including basic skills and personal attributes to be applied across the whole spectrum of 21st century living, whereas the Anglo/Australian approach was initially more narrowly focused on workplace requirements and excluded personal attributes and values.

References

- Adult Literacy and Basic Skills Unit (1993). *The cost to industry: Basic skills and the UK workforce*. London: ALBSU.
- Ananiadou, K., Jenkins, A., & Wolf, A. (2003). *The benefits to employers of raising workforce basic skills levels: A literature review*. London: National Research and Development Centre.
- Ananiadou, K., Jenkins, A., & Wolf, A. (2004). Basic skills and workplace learning: What do we actually know about their benefits? *Studies in Continuing Education*, 26(2), 289-308.
- Appelbaum, E., Bernhardt, A., & Murnane, R. J. (2003). *Low wage America*. New York: Russell Sage Foundation.
- Australian Education Council, Mayer Committee. (1992). *Key competencies. Report of the committee to advise the Australian education council and ministers of vocational education, employment and training on employment-related key competencies for postcompulsory education and training*. Canberra: Australian Education Council and Ministers of Vocational Education, Employment, and Training.
- Autor, D. H., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: An empirical exploration. *Quarterly Journal of Economics*, 118(4), 1279-1333.
- Becker, B. E., Huselid, M. A., & Beatty, R. W. (2009). *The differentiated workforce : Transforming talent into strategic impact*. Boston, Mass: Harvard Business Press.
- Bension, G., & Lawler, E. (2010). *Raising skill demand: Generating good jobs*. Unpublished manuscript.
- Bertschy, K., Cattaneo, M. A., & Wolter, S. C. (2009). PISA and the transition into the labour market. *LABOUR: Review of Labour Economics & Industrial Relations*, 23, 111-137.
- Bevan, S., & Cowling, M. (2007). *Job matching in the UK and Europe*. London: The Work Foundation/ UK Commission for Employment and Skills.
- Bishop, J. (1988). *Occupational training in high school : When does it pay off?*. Ithaca, N.Y: Cornell University, Center for Advanced Human Resource Studies, School of Industrial and Labor Relations.
- Bishop, J. H., Center on the Educational Quality of the Workforce, Cornell's Program on Youth and Work, & Center for Advanced Human Resource Studies, New York State School of Industrial and Labor Relations. (1995). *Expertise and Excellence*. Ithaca, NY: Cornell University.
- Bishop, J. H., & Mane, F. (2004). The impacts of career-technical education on high school labor market success. *Economics of Education Review*, 23(4), 381-402.

- Bishop, J., & Mane, F. (2000). *STW in the 1990s: School-employer partnerships and student outcomes*. Unpublished manuscript.
- Burks, S. V., Carpenter, J. P., Goette, L., & Rustichini, A. (2009). Cognitive skills affect economic preferences, strategic behavior, and job attachment. *Proceedings of the National Academy of Sciences*, 106(19), 7745-7750.
- Carr, C. (1992). Productivity and skills in vehicle component manufacturers in Britain, Germany, the USA and Japan. *National Institute Economic Review*, 139, 79-87.
- Chapell, C., Hawke, G., Rhodes, C., & Solomon, N. (2003). *High level review of training packages: Phase 1 report: An analysis of the current and future context in which training packages will need to operate*. Brisbane: Australian National Training Authority.
- Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management*, 23, 239-290.
- Crebert, G., Bates, M., Bell, B., Patrick, C., & Cragolini, V. (2004). Developing generic skills at university, during work placement and in employment: Graduates' perceptions. *Higher Education Research & Development*, 23(2), 147-165.
- Crouch, C., Finegold, D., & Sako, M. (1999). *Are skills the answer? : The political economy of skill creation in advanced industrial countries*. Oxford; New York: Oxford University Press.
- Culpepper, P. D. (2007). Small states and skill specificity: Austria, Switzerland, and interemployer cleavages in coordinated capitalism. *Comparative Political Studies*, 40(6), 611-637.
- Daly, A., Hitchens, D. M. W. N., & Wagner, K. (1985). Productivity, machinery and skills in a sample of British and German manufacturing plants: Results of a pilot inquiry. *National Institute Economic Review*, 111(1), 48-61.
- De Anda, R. M., & Hernandez, P. M. (2008). Literacy skills and earnings: race and gender differences. *Review of Black Political Economy*, 34(3), 231-243.
- Dearden, L., McIntosh, S., Myck, M., & Vignoles, A. (2002). The returns to academic, vocational and basic skills in Britain. *Bulletin of Economic Research*, 54, 249-274.
- Dickerson, A., & Green, F. (2004). The growth and valuation of computing and other generic skills. *Oxford Economic Papers*, 56(3), 371-406.
- Dickerson, A., & Green, F. (2002). *The growth and valuation of generic skills*. SKOPE Working Paper. Oxford University Centre on Skills, Knowledge and Organisational Performance.
- Elliott, S. (2007). *Projecting the impact of computers on work in 2030*. Washington, DC: National Academies.

- European Parliament and European Council. (2008). Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning. (2008/C 111/01).
- Expert Group on Future Skills Needs (Ireland). (2003). *Soft skills for organizational success, fourth report of the expert group on future skills needs*. Dublin, IR:
- Fasih, T. (2008). *Linking education policy to labor market outcomes*. Washington, DC: World Bank.
- Felstead, A., Gallie, D., Green, F., & Zhou, Y. (2007). *Skills at work, 1986-2006*. ESRC Centre on Skills, Knowledge and Organizational Performance.
- Finegold, D. & Wagner, K. (1997). When lean production meets the German model: Innovation Responses in the U.S. and German pump industries. *Industry and Innovation*, 4(2), 207-32.
- Forth, J., & Mason, G. (2006). *Do ICT skills shortages hamper firms' performance? Evidence from UK benchmarking surveys*. London: National Institute of Economic and Social Research.
- Futuremorph.org. *Qualification routes (chart)*. Retrieved 04/16, 2010, from <http://www.futuremorph.org/db/documents/QualificationRoutesOct08.pdf>.
- Gatta, M. *In the "blink" of an eye - American high-end small retail businesses and the public workforce system*. Unpublished manuscript.
- Gittel, J. H. (2000). Organizing work to support relational coordination. *Journal of Human Resource Management*, 11(3), 517-534.
- Gittell, J. H. (2001). *Relational coordination and flight departure performance*. Unpublished manuscript.
- Gittell, J. H. (2001). Supervisory span, relational coordination, and flight departure performance: A reassessment of postbureaucracy theory. *Organization Science*, 12(4), 468-483.
- Goleman, D. (1998). *Working with emotional intelligence*. New York: Bantam Books.
- Gordon, J. Work teams: How far have they come? *IT Training*, 13, 59-65.
- Green, F., McIntosh, S., & Vignoles, A. (2002). The utilization of education and skills: Evidence from Britain. *Manchester School* (14636786), 70(6), 792.

- Groot, W., & Van, D. B. (2000). Education, training and employability. *Applied Economics*, 32(5), 573-581.
- Hampson, I. (2002). Training reform: Back to square one? *Economic and Industrial Relations Review*, 13(1), 149-174.
- Hampson, I., & Junor, A. *Employability and the substance of soft skills*. Unpublished manuscript.
- Hampson, I. and Junor, A. (2010). Contesting Competence: Australia Enters Another Period of Training Reform. Paper prepared for the 28th Annual International Labour Process Conference, Rutgers University, New York. March 15-17
- Hampson, I., Junor, A., Piercy, G., Ewer, P., Barnes, A., Smith, M., et al. (2009). *Spotlight: A skills recognition tutorial*. Wellington: New Zealand Department of Labor.
- Hanushek, E. A., Woessmann, L., Schleicher, A., Duval, R., & Jakubowski, M. *The high cost of low educational performance: The long-run economic impact of improving PISA outcomes*. Organization for Economic Co-operation and Development:
- Harhoff, D., & Kane, T. J. (1997). Is the German apprenticeship system a panacea for the U.S. labor market. *Journal of Population Economics*, 10, 171-196.
- Hochschild, A.R. (1983). *The Managed Heart: Commercialization of Human Feeling*. Berkeley: University of California Press
- IBM. (2010). *Business skills for IT professionals*. Retrieved April 16, 2010 from http://www01.ibm.com/software/websphere/education/business_skills_for_IT_professionals/course.html#business.
- Impact Management Centre (IMC). (2005). *Case studies from the Skillnets pilot project*. Dublin: Skillnets.
- Impact Management Centre (IMC). (2005). *Measuring the impact of training and development in the workplace*. Dublin: Skillnets.
- Institute for Manufacturing (IfM) at the University of Cambridge, & IBM (2008). *Succeeding through service innovation: A service perspective for education, research, business and government*. Cambridge, United Kingdom: University of Cambridge Institute for Manufacturing.
- Kang, S., & Bishop, J. (1989). *Vocational and academic education in high school : Complements or substitutes*. Ithaca, N.Y.: New York State School of Industrial and Labor Relations.
- Kirby, S., & Riley, R. (2006). *The returns to general versus job-specific skills : The role of communication and information technology*. London: National Institute for Economic and Social Research.

- Kirkpatrick D. L. (1959). Techniques for evaluating training programs. *Journal of American Society of Training Directors*, 13(3), 21-26.
- Kirkpatrick, J., & Kirkpatrick, W. (2009). The Kirkpatrick model: Past, present and future. *Chief Learning Officer*, 8(11), 20-55.
- Kirsch, I., de Jong, J., LaFontaine, D., McQueen, J., Mendelovits, J., & Monseur, C. (2002). *Reading for change : Performance and engagement across countries, results from PISA 2000*. Paris: Organization for Cooperation and Development.
- Lloyd, C., & Payne, J. (2008). *What is a skilled job? Exploring worker perceptions of skill in two UK call centres* (SKOPE Research Paper No 81). Cardiff: ESRC Centre on Skills, Knowledge and Organisational Performance.
- Lusardi, A., & Mitchell, O. S. (2007). Financial literacy and retirement preparedness: Evidence and implications for financial education. *Business Economics*, 42(1)
- MacCluer, C. R., & Seitelman, L. H. *Helpful hints for establishing professional science masters programs*. Retrieved 03/28, 2010, from http://www.sciencemasters.com/portals/0/pdfs/Establish_Sustain_PSM_Programs.pdf
- Martinsson, J. (2009). *The role of media literacy in the governance reform agenda*. Washington, DC: World Bank Communication for Governance and Accountability Program.
- Mason, G., & Finegold, D. (1997). The role of productivity, machinery and skills in the United States and Western Europe. *National Institute of Economic Review*, (162), 85-98.
- Mason, G., & van Ark, B. (1993). Productivity, machinery and skills in engineering: An Anglo-Dutch comparison. In D. Mayes (Ed.), *Sources of productivity growth* (). Cambridge: Cambridge University Press.
- Mason, G., van Ark, B., & Wagner, K. (1993). Productivity, product quality and workforce skills: Food processing in four European countries. *National Institute Economic Review*, (147), 62-83.
- Mason, G., Williams, G., & Cranmer, S. *Employability skills initiatives in higher education: What effects do they have on graduate labour market outcomes?*. London: National Institute of Economic and Social Research.
- Maxwell, N. L. (2006). *The working life: The labor market for workers in low skilled jobs*. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.
- Mossberger, K., Tolbert, C. J., & McNeal, R. S. (2008). *Digital citizenship: The Internet, society and participation*. Cambridge, MA: The MIT Press.
- Murnane, R. J., Willett, J. B., & Levy, F. (1995). The growing importance of cognitive skills in wage determination. *Review of Economics and Statistics*, 11, 251-266.

- Murray, T. S., Owen, E., & McGaw, B. (2005). *Learning a living: First results of the adult literacy and life skills survey*. Ottawa: Statistics Canada and the Organization for Cooperation and Development.
- National Center for Vocational Education Research. (2003). *Defining generic skills: At a glance*. Adelaide: NCVET Ltd.
- National Research Council, Committee on Enhancing the Master's Degree in the Natural Sciences. (2008). *Science professionals: Master's education for a competitive world*. Washington, DC: National Academy of Sciences.
- National Work Readiness Credential. (2010). *National work readiness credential*. Retrieved 04/10, 2010, from <http://www.workreadiness.com/nwrc.html>
- Nickson, D., & et al. (2004). *Aesthetic labour and the policy-making agenda: Time for a reappraisal of skills?* No. 48). Coventry, UK: SKOPE.
- Organization for Cooperation and Development and Statistics Canada. *Literacy in the Information Age: Final report of the International Adult Literacy Survey (IALS)*. Paris and Ottawa: OECD.
- Organization for Economic Co-operation and Development. (2003). *Definition and selection of key competencies: Executive summary*. Paris: OECD.
- Organization for Economic Co-operation and Development. (2003). *Employment outlook*. Paris: OECD.
- Osterman, P. (2006). The wage effects of high performance work organization in manufacturing. *Industrial and Labor Relations Review*, 59(2), 187-204.
- Palmer, C. "Hybrids" - a critical force in the application of information technology in the nineties. *Journal of Information Technology*, 5, 232-235.
- Peterson, E., Mitchell, T. R., Thompson, L., & Burr, R. Collective efficacy and aspects of shared mental models as predictors of performance over time in work groups. *Group Processes & Intergroup Relations*, 3, 296-316.
- Pew Internet and American Life Project. *Trend data - online activities, total*. Retrieved 04/01, 2010, from <http://www.pewinternet.org/Trend-Data/Online-Activites-Total.aspx>
- Phillips, J. J. (1996). ROI: The search for best practices. *Training & Development*, 50(2), 42-47.
- Philpot, J. (2002). *Perspectives, productivity and people management*. London: Chartered Institute for Personnel and Development.
- Porter, M. (1996). What is strategy? *Harvard Business Review*, November 1996, 61-78.

- Prahalad C.K. and Hamel, G. (1990). The Core Competencies of the Corporation. *Harvard Business Review*. May-June.
- Prais, S. J., Jarvis, V., & Wagner, K. (1989). Productivity and vocational skills in services in Britain and Germany: Hotels. *National Institute Economic Review*, 130(1), 52-74.
- Prais, S. J., & Wagner, K. (1988). Productivity and management: The training of foremen in Britain and Germany. *National Institute Economic Review*, 123(1), 34-46.
- Robinson, P. (1997). *Literacy, numeracy and economic performance*. London: Center for Economic Performance, London School of Economics.
- Sako, M. (1994). Training, productivity and quality control in Japanese multinational companies. In M. Aoki, & R. Dore (Eds.), *The Japanese firm: Sources of competitive strength*. Oxford: Clarendon Press.
- Schofield, K., & McDonald, R. (2004). *Moving on: Report of the high level review of training packages*. Melbourne: Australian National Training Authority.
- Schuller, T., & Desjardins, R. (2007). *Understanding the social outcomes of learning*. Paris: OECD.
- Service Skills Australia. *What is a training package?* Retrieved 04/03, 2010, from http://www.serviceskills.com.au/index.php?option=com_content&task=view&id=946
- Smith, J. (1998). Beyond the rhetoric: Are general national vocational qualifiers (GNVQs) doing students any good? *Journal of Vocation and Educational Training*, 50(4)
- Spitz-Oener, A. (2006). Technical change, job tasks, and rising educational demands: Looking outside the wage structure. *Journal of Labor Economics*, 24(2), 235-270.
- Steedman, H. (1990). Improvements in workforce qualifications: Britain and France 1979-88. *National Institute Economic Review*, 133(1), 50-61.
- Steedman, H., & Hawkins, J. (1994). Shifting foundations: The impact of NVQs on youth training for the building trades. *National Institute Economic Review*, 149(1), 93-102.
- Steedman, H., Mason, G., & Wagner, K. (1991). Intermediate skills in the workplace: Deployment, standards and supply in Britain, France and Germany. *National Institute Economic Review*, 136(1), 60-76.
- Steedman, H., & Wagner, K. (1987). A second look at productivity, machinery and skills in Britain and Germany. *National Institute Economic Review*, 122(1), 84-95.
- Steedman, H., & Wagner, K. (1989). Productivity, machinery and skills: Clothing manufacture in Britain and Germany. *National Institute Economic Review*, 128(1), 40-57.

- Stevens, P. A. (2004). *Skill shortages and firms' employment behavior*. London: National Institute of Social and Economic Research.
- Tornero, J. M. P. (2008). Media literacy - new conceptualisation, new approach. In U. Carlsson, S. Tayie, G. Jauinot-Delaunay & J. M. Perez Tornero (Eds.), *Empowerment through media education - an intercultural dialogue* (pp. 106-108). Goteborg, Sweden: Nordicom.
- United States Department of Labor - Bureau of Labor Statistics. *Employment projections: 2008 - 2018 summary*
- Wagner, K. (1999). The German apprenticeship system under strain. In P. D. Culpepper, & D. Finegold (Eds.), *The German skills machine* (pp. 37-76). New York: Berghahn.
- Wall, T. D., Kemp, N. J., Jockron, P. R., & Clegg, C. W. (1986). Outcomes of autonomous work groups: A long-term field experiment. *Academy of Management Journal*, 29(2), 280-305.
- Williams, G. A., & Miller, R. B. (2002). Change the way you persuade. *Harvard Business Review*, 80(5), 64-73.
- Williams, J., Clemens, S., Oleinikova, K., & Tarvin, K. (2003). *The skills for life survey: A national needs an impact survey of literacy, numeracy and ICT skills*. London: UK Department for Education and Skills.