



Munich Personal RePEc Archive

Rethinking How Establishment Skills Surveys Can More Effectively Identify Workforce Skills Gaps

Schwalje, Wes

8 March 2012

Online at <https://mpra.ub.uni-muenchen.de/37192/>
MPRA Paper No. 37192, posted 08 Mar 2012 12:07 UTC

Rethinking How Establishment Skills Surveys Can More Effectively Identify Workforce Skills Gaps

Through a multicountry, practice-based review of establishment skills surveys, this article identifies conceptual issues with defining and measuring skills gaps. By harmonizing divergent conceptualizations, an operational definition of skills gaps as a situation in which current employees lack the skills to perform their jobs which results in the compromised ability of a firm to meet business objectives is proposed. This operationalization of the concept offers a more complete answer to how firms are impacted by workforce deficiencies in achieving business objectives implying that understanding job proficiency without assessing the organizational context in which workforce skills are deployed towards market objectives is insufficient. By addressing measurement issues, an alternative approach to establishment skills surveys is advanced that can play a more effective role in determining how workforce skills influence achievement of firm business objectives. The open systems model of the firm is used to explain how skills gaps serve as a bottleneck to the overall functioning of the firm and to demonstrate that firm mitigation strategies are subject to managerial perceptions which can influence the effectiveness and level at which strategies are targeted. A typology of the causes of skills gaps is also proposed as a starting point for government intervention.

Keywords: skills formation, skills gaps, skills shortages, establishment skills surveys, workforce development policy, skills gap causes, skills gap impacts, skills gap mitigation

Wes Schwalje

wesleyschwalje@hotmail.com

Working Paper Version 1

March 2012

Copyright © 2012 by Wesley A. Schwalje

This working paper is in draft form and is distributed for comment and discussion which can be sent to wesleyschwalje@hotmail.com. It may not be reproduced without permission of the copyright holder. This commentary was invited by the Workforce Planning Australia International Conference in April 2012.

Introduction

A multicountry, practice-based review of establishment skills surveys, shown in Figure 1 and 2, reveals a distinction between skills¹ deficiencies found in the external labor market (skills shortages) and deficiencies applicable to a firm's existing workforce (skills gaps). Previous employer surveys conducted primarily in the UK define a skills shortage as an expressed difficulty in recruiting individuals from the external labor market under current market conditions with a particular skill set due to a low number of applicants caused by at least one of the following reasons: lack of required skills; lack of work experience a company demands; or lack of qualifications a company demands. While this is a useful working definition, Richardson (2007) observes that identifying shortfalls in relative supply and demand of skills at prevailing wages and conditions in practice is complicated because the concepts of demand, supply, and prevailing conditions is not straightforward. For example skill supply and demand are influenced by hours worked; the proportion of people qualified for the work who are working in a particular occupation; sub-specializations within broad occupational categories; international worker movements; and geographical location of people with the required skills. Similarly, the definition suggested by previous surveys for the concept of a skills gap lacks conceptual clarity. Two distinct definitions are advanced in previous surveys: a situation in which employers perceive current employees to be less than fully proficient for their current jobs or a gap between the skills of current employees and the skills needed to meet business objectives (Shah and Burke 2003; Paterson, Visser et al. 2008; Education Analytical Services 2010; Shury, Winterbotham et al. 2010). Since skills shortages apply to the external labor market while skills gaps apply internally to the firm, these survey approaches imply the two concepts of a skills shortage and a skills gap are separate and distinct phenomena. Figure 3 shows the distinction between labor market and firm-level skills deficiencies graphically. This analysis will retain the same external versus internal conceptual distinction and primarily concern the latter phenomenon of a skills gap.

The view that skills shortages are ephemeral and disappear as labor markets adjust is widely held (See for example Hay, Faruq et al. 2011). Underpinning this view is a belief that the pricing mechanism, exercised through expected wage returns and premia that motivate individual investment in particular types of skills and the ability of firms to increase extrinsic pay to obtain particular skills, leads to allocative efficiency within labor markets. However, persistent skills shortages over the last decade reported in several countries that began instituting establishment skills surveys in the early 2000s challenge the assumption that skill deficiencies are short lived and the effectiveness of the pricing

¹ The definition of 'skill' has evolved to include personal characteristics and behaviors in addition to qualifications and knowledge that can be gained via formal education and training. There is not a commonly agreed international typology or framework for describing the knowledge, attitudes, and skills required in the workplace. At the firm level and in government policies a generic approach that stresses development of transferrable basic skills, personal attitudes, and competencies required for most jobs in addition to workplace specific, technical knowledge, and skills is common. In many analyses, attitudes or personality traits are considered soft skills, while job specific, technical skills are referred to as hard skills. Several countries have set about trying to establish the basic skills, personal attitudes, and competencies required for success in the workplace as well as to ensure alignment between the national education and training systems with the needs of the labor market. Stasz (1997) finds a great deal of overlap between the basic skills, personal attitudes, and competencies codified in national skills strategies and studies in countries such as the United States, England, Scotland, Australia, and New Zealand. While there is significant commonality on basic skills, personal attitudes, and competencies required generally by the workforce, the reviewed skills surveys very rarely covered job-specific skills demanded by particular occupations and industries. Assessment of job specific skills is complicated methodologically due to a lack of a system of standardized occupation-specific skills requirements such as the US Department of Labor's Occupational Information Network.

mechanism in reducing the occurrence of labor market skills shortages (Shah and Burke 2003; Paterson, Visser et al. 2008; Education Analytical Services 2010; Shury, Winterbotham et al. 2010).

The cobweb theory provides an example of how labor market adjustments related to professions requiring training that delays labor market entry might mitigate the effect of the pricing mechanism on skills supply and complicate reaching market equilibrium. Shifts in the underlying supply of and demand for skills require time to reestablish market equilibrium due to the lag in time it takes to develop particular skills. For example, in analyzing the markets for lawyers and engineers, Freeman (1975; 1976) finds that the duration of the training period to obtain particular labor market skills and accompanying lag in labor market entry due to the training period can result in cyclical shortage-surplus cycles in professional labor markets. Freeman employs the cobweb model to show that supply of particular labor market skills is highly related to the economics of a profession, such as expected salary, and other forces that signal ongoing job opportunities and the state of the market such as R&D, output levels, and competition from others with similar skills. An important finding of Freeman's model is that forces signaling professional opportunity and market health are more influential in motivating the supply of particular skillsets than salaries. The time lag between the duration of the training period and labor market entry may potentially explain how labor market adjustment caused by adaptive expectations could potentially lead to endogenous cyclical cycles of skills shortages.

While there is no equivalent theory regarding the source of skills gaps, empirical studies also cast doubt on the pricing mechanism as a corrective measure to eliminate internal skills deficiencies. In skills surveys across a number of countries, firms consistently rank increasing pay or relying on the market mechanism amongst the least used measures to overcome skills gaps (Young and Morrell 2006; Management 2009; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010). Given the similarly questionable role of price adjustment in remedying internal firm-level skills gaps and the lack of a unified definition of the phenomenon, ensuring conceptual clarity, reconsidering current measurement approaches, and understanding the causes, consequences, and remediation of skills gaps is critical. Rather than an ephemeral shock, both skills shortages and gaps have been a persistent issue seemingly immune to corrective market forces in several countries. Although skills shortages and gaps are both important to study and their remediation is critical to an increasing number of global economies, the focus of the remainder of this article is on understanding the phenomenon of a skills gap.

Some Conceptual Issues With Defining and Measuring Skills Gaps

A review, detailed in Figure 4, of various definitions attributed to the term skills gap from international establishment surveys, government reports, industry association studies, and academic literature suggests that there is not a completely unambiguous understanding of the phenomenon. Figure 5, which further reviews the definitional aspects of the concept, reveals much conceptual commonality but also important divergences.

Conceptual Commonalities

The focus on existing employees and the normative assessment of skills levels relative to a desired reference point were universal conceptual aspects across all of the surveyed definitions.

Skills gaps apply to existing staff, both new and with seniority: All of the consulted definitions describe skills gaps as internal to the firm. The definitions of the Australian Senate Employment, Workplace Relations, and Education References Committee and the European Centre for the Development of Vocational Training underscore that skills gaps apply to the full spectrum of employees at firms. Skills gaps can involve both new employees who are apparently trained and qualified for occupations but who still lack a variety of the skills required as well as more senior employees who require upskilling to emerging skill requirements. Several employer surveys show that transitional phases associated with the beginning of the employee-employer relationship or lack of knowledge of firm-specific skills that require training imparted in the induction process are sources of skills gaps amongst employees (Shury, Vivian et al. 2009; Education Analytical Services 2010). Evidence has also been found of a positive relationship between skills shortages and skills gaps resulting from substitution behavior by employers that face skills shortages hiring staff which require further training or experience to meet the firm's skills needs (Shah and Burke 2003; Department of Education 2010; Sutherland 2010). Such substitution behavior provides a plausible reason why new employees can face skills gaps. In many countries, education and training systems also struggle in response to global macroeconomic forces while failing to create the skills required by employers amongst new entrants into the workforce (Schwalje 2011).

Skills gaps are normative assessments of what is and what should be: Skills gaps are normative judgments as to the perceived internal skills sufficiency of the workforce relative to a desired optimal level. Many of the attempts to formally measure skills gaps have relied on employer surveys of HR representatives or managers which suffer from inconsistent use of terminology, an assumption of preexisting familiarity with the problem, and which are overly reliant on the opinion of only one group of stakeholders (Skinner, Saunders et al. 2004; Watson, Webb et al. 2006). The existing literature points to a number of sources of difficulty operationalizing the measurement of the phenomenon of a skills gap due to the normative way in which it is conceptualized. In addition to being discussed briefly below, these sources of bias are summarized in Figure 6.

HR or Manager Respondent Bias: Watson, Webb et al. (2006) find evidence that the position of the respondent to an employer survey within the company influences the amount of skills issues reported. Specifically they find that skills survey respondents from HR Departments underestimate internal skills gaps presumably to justify the efficacy of training and development budgets and programs. Non-HR affiliated survey respondents to skills surveys, however, report a higher level of skills issues since they do not share a similar conflict of interest. In such a way, internal organizational dynamics aimed at gaining influence and accessing resources may influence the accuracy of skills gap reporting.

Employee skill levels are subjective and require comparison to an equally imprecise performance hurdle to judge the presence of a skills gap. There is a high margin for individual survey respondent subjectivity in terms of assessing staff skills levels relative to performing a job or contributing to business objectives. There is also significant room left for subjectivity regarding the importance of a particular skill to

occupational proficiency or a particular occupational group's importance to contributing towards business objectives. In weighting all skills equally in determining occupational proficiency, the normative aspect suggested by the surveyed skills gaps definitions also ignores whether a particular skill may be more important to performing a job proficiently or whether some occupations might be more important to firms in reaching business objectives. For example, skills gaps in terms of leadership skills on the part of a firm's management staff may have a greater impact upon achieving business objectives and be more important to occupational proficiency for management staff than skills gaps in terms of leadership skills amongst administrative staff. It might also be argued that skills gaps amongst different occupational groups are more detrimental to meeting business objectives than skills gaps in other occupational groups. For example, having managerial staff with all of the skills required to meet business objectives may be more critical to firm success than high levels of skills amongst administrative staff. These examples suggest that more senior level occupational groupings may have a more significant need to be linked with business objectives in addition to occupational proficiency than more junior level occupations for which occupational proficiency may be enough. Importance-weighted skills gaps assessments which assign a weighting to particular skills relative to their importance to occupational proficiency or achieving business objectives have emerged as a methodological approach to mitigate this shortfall (Wickramasinghea and Zoyzab 2009).

Occupation is often used to describe skills required by employees, but respondents may have different perceptions of the tasks and requirements of a job based on their business or workplace. Respondents may also have varying interpretations of the meaning of particular skills or merge skills (i.e. confusing communication and customer handling) since the deployment of skills varies with the requirements of the job, workplace demands, and with organizational structure and practices (Hillage, Regan et al. 2002). Hogarth and Wilson (2001) provide evidence of latent skills gaps which go unrecognized as organizations engage in altering their business objectives or increasing performance. Achieving such revised business objectives or performance enhancement has workforce skills implications that may go unreported as skills gaps. In other cases, skills gaps may go unreported due to skepticism around the ability to resolve a skills problem.

Evolving Business Needs Blur the Normative Threshold: From the definitions surveyed, the performance threshold to conclude a skills gap is either occupational proficiency or an arbitrary skills threshold beyond which employee skills levels contribute to achieving business objectives. A significant shortcoming of current approaches to measure skills gaps is that the goal post, or normative performance threshold, is continuously moving due to internal and external forces such as changing skills needs of occupations, pursuit of more or less skills intensive production orientation and strategies, economic forces, or adoption of high performance work practices that stress continuous improvement. For example, evolving business strategies may require specialized skills that current employees lack resulting in skills gaps. Similarly, changing job requirements due, for example, to technology adoption or job promotion, might mean that a once proficient employee now lacks the skills to perform a new or evolving role. Some companies may also be more demanding of their employees whereby the performance threshold for occupational proficiency or contribution towards business objectives is higher at one company than another (Shury, Winterbotham et al. 2005).

Individual and Peer Evaluation Bias: To reduce reliance exclusively on the evaluation of HR representatives and managers in judging skills sufficiency, a few of the surveys consulted included self-evaluation and peer analysis of skills levels. Evidence from psychology and economics suggests that individual skills assessment is problematic since people may overestimate their abilities in absolute terms; they may perceive themselves more favorably than others do; or they may perceive their

performance more favorably in relative terms to that of others (Hoelzl and Rustichini 2005). Studies have also shown peer evaluation to be biased since respondents rate familiar group members as better than average despite having very little information about the individual or their performance (Klar and Giladi 1997).

Respondent biases associated with the normative measurement of skills gaps and the unfixed, subjective nature of the reference point to which employee skills levels are being compared have consequences for conclusions about the magnitude of skills gaps. The imprecision of establishing a definitive performance reference point beyond which employee skills levels signify full occupational proficiency or contribution to business objectives is a key point of conceptual divergence amongst the surveyed skills gap definitions and is examined in detail below.

Conceptual Divergences

Two operational definitions of skills gaps emerged from the practice-based review of establishment skills surveys. The two definitions encompass distinct scenarios based on the normative reference point to which employee skills are being compared: a situation in which employers perceive current employees to be less than fully proficient for their current jobs and a gap between the skills of current employees and the skills needed to meet business objectives. This section proceeds by examining the operationalization of the two different interpretations to measure and define a workforce skills gap.

Skills gaps occur when employees lack full proficiency to perform their jobs: Several of the definitions from national surveys, government bodies, and academic literature describe skills gaps as an occupationally based measure of whether employees are fully proficient at their jobs. A proficient employee is described as being able to perform their job to a threshold required level that is subjectively determined by the survey respondent (Young and Morrell 2006; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010). A common approach to operationalize the measurement of skills gaps in establishment skills surveys which adopt a proficiency-based definition of skills gaps involves asking survey respondents how many employees within each occupational grouping are considered fully proficient in their jobs. Establishments with one or more employees who are not fully proficient are considered to have a skills gap. The skills-specific upgrading and importance-proficiency gap analysis approaches are also occupational proficiency based measurement approaches for skills gaps, but these approaches have been less frequently employed in establishment skills surveys (refer to Figure 1 for an overview of these approaches).

A significant criticism of proficiency approaches is that they fail to mention skills or suggest the concept of a normative gap that is related to achieving business objectives resulting in an indirect proxy for the incidence of skills gaps (Dignan 2004)². Dignan (2005) finds that proficiency measures of skills gaps are problematic since employers do not always interpret a lack of proficiency to mean a skills deficiency and

² This criticism is particularly relevant to UK-based skills surveys. There are several examples of surveys employing the skills-specific upgrading and importance-proficiency approaches that do specifically mention skills. The concept of a normative gap relating workforce skills levels to achieving business objectives is absent from the majority of surveys consulted which proxy skills gaps using an occupational proficiency measure. However, two notable exceptions are the skills surveys in Northern Ireland and Wales which employ a dual direct question and proficiency approach to proxy skills gaps. Inconsistencies with this dual direct question and proficiency approach are discussed later in the paper.

often associate the term 'proficiency' more with the personal performance, ability, or attributes of individual employees. Empirical results from the United Kingdom support this assertion. For example, in several instances over the last decade the National Employers Skills Survey for England has found that approximately one third of the firms facing skills gaps (as defined by having one or more employees who lack full proficiency) are unable to cite any impact of proficiency shortfalls on their businesses (Campbell, Baldwin et al. 2001; Council 2003; Council 2005; Council 2008; Shury, Winterbotham et al. 2010). The Northern Ireland Skills Monitoring Survey, which includes an identical proficiency-based skills gap measure to the English survey, also finds a similar percentage of firms which report facing a skills gap (as defined by having one or more employees who lack full proficiency) but which do not experience any adverse effects on their business (Learning 2004; Learning 2007; Shury, Vivian et al. 2009). These findings suggest that a sizable portion of businesses are not drawing a causal link between job proficiency and achieving macro firm-level business objectives. While employer surveys do point to a number of measures, like reallocating or shifting work to other staff or increased supervision, that may minimize the impact of non-proficient employees on influencing the achievement of firm level objectives, such findings point to a weakness in proficiency approaches to measuring skills gaps in capturing only addressable areas of skills-related deficiencies rather than issues with personal performance, ability, or attributes of individual employees.

In follow-up interviews associated with the National Employers Skill Survey for England 2002, Hillage, Regan et al. (2002) also find qualitative evidence of the imprecision of using occupational proficiency as a proxy for skills gaps. They found that interviewees associated proficiency with individual performance and were less concerned with skills their employees possess or their ability to deploy skills efficiently and effectively. In many cases, interviewees associated proficiency with aspects of individual performance that were less than adequate involving personal attributes rather than specific skills deficiencies. The qualitative survey also found that many employers define proficiency as being more than just adequate at performing one's job since many expressed the sentiment that there is always room for improvement.

Skills gaps occur when the existing workforce has inadequate skills levels to meet business objectives: Several national and industry association surveys describe the phenomenon of a skills gap as a difference between the skills of current employees and the skills needed to meet business objectives. When this definition for skills gaps is operationalized, it is commonly measured with a single, direct question such as "Would you say that there is a gap between the types of skills that your current employees have now, and those that your company needs to meet its business objectives?" Companies that agree with the statement posed in the direct question are considered to face a skills gap. This business objectives-based measurement approach potentially overcomes the criticism of proficiency-based measures of skills gaps since it draws a more direct linkage between workforce skills and a normative gap that affects the achievement of macro level business objectives. Yet this business objectives-based definition suffers from a similar degree of subjectivity as the proficiency-based definition when operationalized in skills surveys as respondents are also asked to determine an arbitrary skills utilization hurdle beyond which workforce skills contribute to business objectives. With an approach that links employee skills deficiencies to meeting business objectives, there is also an

embedded assumption that skills survey respondents have a high degree of what Reich and Benbsat (1996) refer to as social alignment with organizational objectives. To respond accurately, respondents must be highly aligned with the organization's mission, objectives, and plans to assess workforce skills level sufficiency relative to achieving them. Varying degrees of social alignment with organizational objectives amongst respondents could potentially impact the measurement of skills gaps using an approach that links skills sufficiency to achievement of macro firm-level objectives.

Two surveys highlight that the single, direct question business objectives-based approach which specifically references skills and a normative gap that affects the achievement of macro level business objectives may be as imperfect at proxying skills gaps as proficiency approaches. In the Northern Ireland Skills Monitoring Survey and Future Skills Wales Survey, employers which indicated there was a gap between the type of skills their current employees had and those their organization needs to meet business objectives were asked how significant they felt the gap was. In Northern Ireland 44% of firms and 52% of Welsh firms indicated that a workforce skills gap was having a very significant or significant impact on their ability to meet business objectives. The remainder of firms in Northern Ireland and Wales indicated that skills gaps have only a minor or no effect on their ability to achieve business objectives (Young and Morrell 2006; Shury, Vivian et al. 2009). Similar to the proficiency measurement approach, these findings suggest that the direct, single question business objectives-based approach to measure skills gaps may also not draw a sufficient causal link between workforce skills levels and achieving macro firm-level business objectives. Though inconclusive, such findings may stem from a number of sources such as a lack of familiarity of survey respondents with organizational business objectives or, as in the case of proficiency-based measures, employers have adopted operational workarounds that allow them to minimize the impact of skill deficiencies on achieving business objectives. Based on this analysis, it appears that skills gap measurement approaches which specifically reference skills and a normative gap that affects the achievement of macro level business objectives result in similar conceptual confusion to approaches that stress occupational proficiency when operationalized in establishment skills surveys.

Theoretical Antecedents of Conceptual Divergence and Associated Measurement Approaches

Keane (2010) argues that a preexisting organizing theory which gives facts meaning and guides which facts are important is required before systematic analysis of facts and empirical generalization can occur. Establishment skills surveys are descriptive, empirical primary data collection instruments guided by theoretical frameworks which influence the questions asked and measurement approaches to define quantities that are deemed as important. However, a critical consideration is how well skills surveys measure key constructs of paradigm theories. Another important consideration is how well empirical models can bring more data to bear in order to define policy changes that can alter the economic environment by remediating skills gaps.

From the previous analysis, it is evident that some work is required to fit an updated empirical model to resolve conceptual discrepancies and measurement gaps in present skills survey approaches. Since skills formation, in its ideal state, is a life-cycle underpinned by lifelong learning with deterministic impacts on economic development, such a model would need to coherently explain a wide range of observations

about effective utilization of workforce skills; occupational proficiency; the influence of workforce skills on the ability of firms to meet business objectives and ensuing impacts on economic development; and potential public policy interventions to remediate skills gaps. The intent of such a model would be to further expand the paradigm to make assumptions more specific and the results of skills surveys more interpretable. The aim of this section is to clarify the different conceptual and measurement approaches towards an updated empirical measurement model to identify and remediate skills gaps.

One operationally practical method to attempt to resolve conceptual divergence in skills survey approaches is observed in surveys that include both an occupational proficiency-based and business objective-based measure of skills gaps in the same survey. However, the infeasibility of this strategy can be found when scrutinizing the Northern Ireland Skills Monitoring Survey 2008 and the Future Skills Wales 2005 survey. These surveys employ a dual direct skills related question about business objectives and a proficiency approach. Assuming that a direct skills related question and the proficiency-based approach are both measuring the same phenomenon, similar results would be expected. However, in the case of Wales, 20% of employers indicated there was a gap between the types of skills that their current employees have now and those their company needs to meet its business objectives while 18% of employers were shown to have a skills gap using an occupational proficiency based measure (Young and Morrell 2006). In Northern Ireland, 14% of employers indicated there was a gap between the types of skills that their current employees have now and those their company needs to meet its business objectives, and 22% of employers were shown to have a skills gap using an occupational proficiency based measure (Shury, Vivian et al. 2009). These inconsistent empirical findings suggest that a direct approach, which specifically and directly references skills and a normative gap related to achieving business objectives, as compared to occupational proficiency-based measures of skills gaps, are potentially not equivalent and do not measure the same concepts. The inclusion of two different measures of skills gaps is also a source of confusion when it comes to interpreting results.

While the dual direct question and proficiency approach fails to resolve conceptual ambiguity, examining the underlying theories which underpin the two definitions of a skill gap and which influence measurement approaches may reveal potential areas of complementarity. From an operational measurement perspective, the proficiency-based question approach, which is associated with the conceptual interpretation of skills gaps as a phenomenon where employees lack full proficiency to perform their jobs, is effective for quantifying the number of employees who can be described as having a skills gap. While the direct, business objectives focused question approach, which views skills gaps as a phenomenon where the existing workforce has inadequate skills levels to meet business objectives, is more suited to an establishment measure of skills gaps (Dignan 2004; Dignan 2005). Rather than discarding the two conceptual interpretations and related measurement approaches completely, a more comprehensive conceptual model may permit further refinement and integration of current measurement approaches to derive both an establishment and employee measure of skills gaps.

In attempting to measure skills gaps in establishment skills surveys two competing perspectives emerge which are detailed below and in Figure 7. The two approaches share in common the role of knowledge, in the form of human resources, as a critical productive resource that influences the performance and

strategic direction of firms. However, the two approaches differ in the way in which knowledge is perceived to be used in the firm, whether human resources affect organizational performance through the collective action of individual employees or through the molding of workforce skills into organizational level, market-focused competencies. By exploring these two literature streams, a coherent framework to place these different views will be proposed to more specifically measure the incidence of skills gaps and explore the links between workforce skills and firm performance.

The Resource-based View of Skills Gaps: The literature describing the resource-based view of the firm is concerned with identifying and explaining why particular firm resource endowments can lead to higher profitability and sustainable competitive advantage. Wernerfeldt (1984) describes the role of firm resource endowment, which includes employment of skilled workers, in maximizing profitability through strategies which increase efficiency and effectiveness. Along the lines of Caves (1980), Wernerfeldt defines resources as tangible or intangible semi-fixed assets or skills which influence the choice of corporate strategy (plan for profit maximization) and organizational structure (the internal allocation of tasks, decision rules, and procedures for appraisal and reward, selected for the best pursuit of that strategy) based on senior managers' perceptions of market structure and firm strength and weaknesses. In a similar way, Barney (1991) views resources as idiosyncratic, internal firm attributes that shape competitive position and can generate sustained competitive advantage. Barney identifies human capital, which includes training, experience, judgment, intelligence, relationships, and insights of individual managers and workers in the firm, as one of three resource classifications which can lead to competitive advantage. However, an important nuance of Barney's approach is his emphasis on resource heterogeneity in terms of creating value. From his perspective, firm resources are only valuable if the firm can apply them to conceive or implement strategies that improve efficiency or effectiveness. Managerial input is important in this process since managers are able to understand and describe the performance potential of a firm's resource endowment. Yet Wernerfeldt (1984) acknowledges the limitation of the resource based view in identifying resources and putting in place structures and systems to execute strategies based on resource endowment.

By emphasizing how many employees are fully proficient at their jobs, occupational proficiency measures of skills gaps take a resource-based view of the firm that suggests "firm A is more successful than firm B if A controls more effective or efficient resources than B (Freiling 2004)." The resource-based view stresses accumulation, control over, and efficiency of resources rather than development of competencies adaptable to changing business environments and that may dictate or alter business objectives (Teece, Pisano et al. 1997). The analytical focus is on deriving optimal performance in terms of allocative efficiency and effectiveness of human resources rather than creation, production and alignment of human capital towards a market based outcome. Typical survey measurement approaches which adopt the resource-based view of skills gaps include Proficiency Range/Quantification and to a lesser extent Dual Direct Question and Proficiency, Skills-specific Upgrading, and Importance-Proficiency Gap Analysis. An underlying assumption of this view is that effective utilization of workforce skills requires full occupational proficiency. However, in determining occupational proficiency in terms of an ability to perform a job to a required level, such an approach implies the fungibility and homogeneity of employees as a collection of discrete resources. Such approaches that seek to measure the quantity of

workers who are fully proficient to perform their jobs ignore resource heterogeneity in terms of creating value. These approaches to measuring skills gaps are loosely linked with insights about strategic opportunities relative to human resources endowment and fail to draw a specific causal link between occupational proficiency and the achievement of macro-level firm objectives. Many of the measurement approaches that take a resource-based view of the firm fail to mention “skills” specifically in survey question stems which is problematic since the term proficiency is often associated with non-skills related aspects of job performance, ability, motivation, and personal attributes that affect efficiency and effectiveness. For this reason, resource-based approaches to measure skills gaps fail to operationalize the measurement of the value of skills in generating market-oriented outcomes potentially leading to an overall assessment of personal performance of a firm’s workforce rather than an assessment of skills deficiencies which may influence firm performance and achievement of business objectives. In this sense, proficiency measures of skills gaps may rely upon a proxy variable that perhaps is not valid for measuring the relationship between workforce skills and firm performance. The resource-based view of skills gaps relies on the assumption that organizational performance stems from the combined efforts of individuals, whereas competitive advantage stems from aligning skills and motives with organizational systems, structures, and processes that achieve market-oriented capabilities at the organizational level (Dunford, Snell et al. 2001).

Competence-based View of Skills Gaps: The competence-based view of the firm “emphasizes the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences toward changing environments (Teece and Pisano 1994).” While there is variation in the interpretation of the concept of competence, a common underlying theme is a causal link between competitive performance and endogenous firm characteristics such as people, skills, and technologies (Scarbrough 1998). To enable competitive advantage, the firm’s human resources pool must have both high levels of skills and be motivated to act in the interests of the firm. Human resources practices moderate the relationship between human resources and competitive advantage by developing a highly skilled human capital pool and eliciting productive employee behavior (Wright, McMahan et al. 1994). However, not all employees are endowed with skills that are uniformly valuable and unique to a firm. Thus, there may not be one best set of HR practices for all employees, rather firms may make significant distinctions in HR practices when applied to different skills sets, occupations, and employment modes based on perceived importance to firm performance (Lepak and Snell 1999). Sustainable competitive advantage stems from management’s ability to allocate capital and talent to core competencies to yield the highest possible return on human capital investments, articulate a strategic direction that guides competence acquisition, and build future competences that facilitate adaptation to changing opportunities (Prahalad and Hamel 1990).

While the management strategy literature emphasizes organizational competencies which are unique and firm-specific, public policy makers and the education community, due to the need for common reference points for integrating education and training, aligning education and training needs with the labor market, and promoting labor market mobility, have advocated generic competences required for most jobs or particular occupations (Deist and Winterton 2005). Yet training and development professionals have widely used competency models to identify “organization-specific competencies with

a view in mind towards improving human performance and unifying individual capabilities with organization core competencies (Rothwell and Lindholm 1999).” Similar to the rather imprecise definition of competency in the strategic management literature, the human resources literature also offers varying definitions for what is meant by competency. However, the definitions share several commonalities: competencies are the knowledge, skills, attitudes, or attributes that determine effective job performance; they must be observable or measurable; and they can be used to differentiate high performing employees from other employees (Camuffo and Gerli 2005). In relation to establishment skills surveys, generic competencies are used which are deemed universally applicable across industries and occupations, an approach that is somewhat supported by empirical work (Such as Boyatzis 1982; Labor 1991; Spencer and Spencer 1993; Stasz, Ramsey et al. 1996; Dulewicz and Herbert 1999) and likely driven by practicality considerations of conducting surveys across a wide range of industries and firms. However, such generic approaches have been criticized for lacking sector-specific competencies that reflect what skills organizations require of their employees in their organizational context (Loan-Clarke 1996) and not considering socio-cultural contexts that may shape perception of the importance of particular skills (Osman-Gani 2000; Xiao 2006).

A key difference between the resource and competence-based views of skills gaps and their associated measurement approaches is chain of causality. The competence-based view of the firm links internal workforce skills and the use of these resources in a goal oriented and market oriented way through the development of organizational competencies (Freiling 2004). The resource-based view of skills gaps maintains that superior resources, in the form of workers who are fully proficient to perform their jobs, will cause performance differences among firms while the competence-based view of skills gaps links workforce skills levels more directly with macro-firm level objectives through competency formation. The competence-based view of skills gaps is, therefore, a causal extension of the resource-based view of skills gaps that captures more aspects of the relationship between workforce skills and business objectives.

Typical survey measurement approaches which adopt the competence-based view of skills gaps include Direct Single Question and Dual Direct Question and Proficiency. While competency-based approaches to measuring skills gaps emphasize a more direct link between workforce skills and organizational outcomes, a key failing of the operationalization of this approach in surveys is in not considering variation in the value of different skills sets, occupations, and employment modes to firm performance based on organizational context. In this sense, surveys which employ competence-based measures of skills gaps assume that all skills and occupations contribute uniformly to organizational competencies that influence performance. If core competencies which are specific and distinctive to each organization drives firm performance and competitive advantage, current surveys which impose a condition of uniform value and homogeneity across skills sets and occupations fail to measure how important particular occupations and the presence or lack of workforce skills in specific occupations are to competency formation and ultimately firm performance. Since the environment in which workforce skills are deployed is an indicator of their value to the firm, current competence-based measurement approaches of skills gaps fail to capture organizational distinctiveness in deploying workforce skills toward market-based competencies.

Towards a Measurement Model of Skills Gaps

Figure 8 shows how measuring and resolving skills gaps might be depicted into five separate interrelated steps. The figure describes a causal chain that demonstrates how, by focusing on intermediate theoretical and measurement issues, skills gaps can be measured in a more scientifically meaningful way. Viewing the problem in these terms, a partial list of operational measurement questions that arise are revealed. Ideally, national skills surveys would measure the importance and existence of particular skills that constitute occupational proficiency; determine whether the absence of particular skills in specific occupational groups and contexts impact firm performance; explore how compromised firm performance due to skills deficiencies affects the economy as a whole, specifically high-skills dependent development trajectories such as knowledge-based development; and generate policy relevant data to suggest public policy interventions that might affect the behavior of firms in remediating skills gaps. In order to do this, the conceptual divergence concerning the definition of a skills gap must be resolved.

Both the resource and competence-based view of skills gaps and their associated measurement approaches are theoretically related, with the competence-based view of skills gaps being a causal extension of the resource-based view of skills gaps. However, the theoretical underpinnings of the two views of skills gaps has resulted in skills gaps being defined concurrently as a situation in which employers perceive current employees to be less than fully proficient for their current jobs or a gap between the skills of current employees and the skills needed to meet business objectives. The theoretical relationship of the two views of skills gaps suggests that the conceptual problem of the lack of a unified definition of the phenomenon could be resolved by building on complementarities towards a harmonized approach which proposes that skills gaps can be operationally defined as a situation in which current employees lack the skills to perform their jobs which results in the compromised ability of a firm to meet business objectives. This operationalization of the concept offers a more complete answer to how firms are impacted by workforce deficiencies in achieving business objectives implying that understanding job proficiency without assessing the organizational context in which workforce skills are deployed towards market objectives is insufficient. This proposition stresses the criticality of consolidating human and other resources into market-oriented competencies that allow firms to adapt to changing environments as a means to bridge potential disconnects between the market and the firm rather than simply controlling and allocating human resources.

Skills Gap Causes, Effects, and Mitigation Strategies

A Typology to Classify the Causes of Skills Gaps

Given the lack of an unambiguous definition of what constitutes a skills gap in previous surveys and imperfect measurement proxies, Figure 9 shows that the present understanding of what causes skills gaps is similarly vague. If the intent of national skills surveys is to devise public policy interventions that might affect the behavior of firms in remediating skills gaps, the precision with which the causes of skills gaps are identified is of critical importance. Of the surveys reviewed in Figure 1, seven specifically ask respondents to identify the causes of skills gaps. From these surveys, four areas of thematic overlap emerge as potential causes of skills gaps: recruitment difficulties; HR practices related to employee

development, motivation, and retention; strategic shifts in response to changing business environments; and transitional stages of employee orientation and integration. This section reflects briefly on these four thematic areas to advance a typology which takes into account the present understanding of the source of skills gaps.

Recruitment Difficulties: Recruitment difficulties can arise for a number of different reasons such as: competition from other employers; not enough people are interested in doing a particular job; long training times to develop skills; limited capacity of training organizations in relevant fields; poor terms and conditions offered for jobs such as unsociable hours, unattractive employment modalities, or low pay; poor prospects of career progression; location in a remote location with poor transportation; attitude, motivation, or personality mismatches etc. The multitude of reasons for recruitment difficulties requires the need to distinguish between situations where there are few people in the labor force who have the required skills, work experience, or qualifications to perform a job (a skills shortage) and situations where there are people in the labor market with the requisite skills, work experience, or qualifications but, due to some reason, are not attracted to a particular job (a recruitment difficulty).

An important consideration, however, is whether skills shortages are a symptom of greater problems involving market and institutional failures in the skills formation system rather than a direct cause of skill gaps. Effective government institutions that prevent underinvestment in skills, provide adequate regulation, and coordinate stakeholders are key elements of effective national skills formation systems. These institutions exist to link economic development with the evolution of education and training systems; ensure qualitative and quantitative supply-demand match between outgoing students and the needs of the labor market; facilitate regular, on-the-job training provision and participation in skills formation by the business community; and address policy, informational, or financial sources of individual underinvestment in national workforce skills formation (Schwalje 2011). As governments attempt to influence the technological and industry structure of their countries, the absence or weakness of government mechanisms to coordinate and align skills formation institutions can create a need for skills that cannot be predicted by free market mechanisms which can result in skills shortages.

The effectiveness of formal education and training systems is increasingly measured by production of human capital in the quantity and quality required by the labor market and whether outgoing students meet the expectations of employers (Development 2010). Accessibility to education and training institutions, quality, and the degree to which education and training systems produce employable students influence the preparation of individuals with the skills, work experience, and qualifications to meet labor market needs. In this respect, education and training institutions can impact allocative efficiency in labor markets which can result in skills shortages.

Private rates of return explain the motivation of individuals to pursue different levels and types of education to augment natural abilities with skills subsequently sold in the labor market. Individuals engage in an investment optimization process in which they participate in education and training as long as the value stream of future earnings is more than foregone earnings, training, and equipment expenses. However, empirical studies have shown that wage differentials relative to less skilled workers can be affected by sectoral shifts requiring higher skill intensity (Schultz 1975); when expansion of

educated labor outpaces expansion in employment (Pritchett 2001); and where technological progress is rapid and government policy is conducive to technological progress and skill intensive development (Rosenzweig 2010). Since the impacts of government industrialization policy may be unknown to individuals, information gaps about the future trajectory of industries and emergent skills needs, the returns to investing in particular skills sets, and projecting the future returns of education and training investments can result in market failure. Skilling investments may also be subject to short-termism in which individuals are unwilling to invest in skills with uncertain and longer-term return horizons. The motivation of the labor force to engage in lifelong learning to ensure continued relevancy of skills may similarly be impacted by return uncertainties. Capital market weaknesses in terms of a lack of funding to finance education and training investments can lead to underinvestment. Externalities and labor market rigidities may also alter the incentives and returns to skilling resulting in sub optimal investment in skills formation. The many factors which can alter the expected return to particular skills or which signal sectoral growth or promise affect individual skilling decisions which may result in skills shortages.

Returning to the proposition that recruitment difficulties due to skills shortages are a symptom of greater problems in the skills formation system, it seems probable that skill shortages can result from market and institutional failures in the governance and institutional quality of skills formation systems, the employability of outgoing students from the education and training system, and informational or policy-related sources of uncertainty which motivate individual investment in skills development. Market and institutional failures may influence firms to engage in substitution behavior where they hire employees which they know require additional skills to meet firm needs in the face of skills shortages. Similarly, market failures and institutional quality can result in a situation where new entrants to the labor force appear to be qualified but are subsequently found to lack skills. Both of these scenarios can result in skills gaps as firms absorb employees from the external labor market who do not have the required skills, work experience, or qualifications when facing recruitment difficulties attributed to skills shortages.

HR practices related to employee development, motivation, and retention: Firms provide training to increase and maintain workforce skills levels to support core competencies in addition to developing new skills that can form the basis of future firm competencies. The willingness and ability of firms to provide training and development depends on a number of factors. Managerial calculations of the returns to training may be complicated by informational gaps surrounding technology, future skill requirements, and benefits of training (Lall 1999). In situations of market or institutional failure, staff development may require training to retain competitiveness in addition to remediating inadequate pre-employment skills formation. Employee poaching, the tendency of firms to recruit employees with transferrable skills from other firms, and turnover may serve to limit firm-based training since training firms incur the cost of employee training only to lose the employee and resulting benefits of the training to another firm. Depressed levels of training and development due to a variety of factors can lead to skills gaps that erode creation and production of firm competencies jeopardizing the application of workforce skills toward market-oriented business objectives.

As mentioned in the discussion on the competence-based view of the firm, it is not enough for a firm to have a highly skilled workforce to achieve competitive advantage. A firm's human resources pool must

also be motivated to act in the interests of the firm. In England (30%), Scotland (7%), Northern Ireland (19%), and New Zealand (16%) many firms cite employee motivation as a cause of skills gaps (Zealand 2008; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010). HR practices are both a way to develop workforce skills as well as to ensure alignment between workforce behavior and firm-level goals. HR practices, through their influence on employee motivation, induce productive employee behavior to apply their skills. Similarly, HR practices can affect employee turnover levels. For example, HR systems which promote employee involvement, participation, training in group problem solving, socializing, high concentrations of skilled employees, and higher average wages have been shown to reduce turnover (Arthur 1994; Delaney and Huselid 1996).

Numerous theories and metatheories of workforce motivation exist which propose various sources of motivation leading to individual behavior. By understanding the sources of motivation, firms can design HR policies to encourage productive employee behavior which enables full deployment of workforce skills. The most commonly researched HR policy areas which impact motivation include rewards (such as compensation and promotional systems); task (aspects of job and task design); management style; and social inducement systems (Leonard, Beauvais et al. 1999). Several studies have found that task complexity and whether a task is considered interesting or not may be more suited to certain types of motivational inducement systems (Gagne and Deci 2005). These findings suggest HR practices require tailoring to specific firm, job, and industry contexts to induce productive employee behavior. The consequence of misalignment of HR practices with sources of workforce motivation can affect employees' choices regarding the direction, level of effort, and persistence of behavior which can lead to skills gaps.

Strategic shifts in response to changing business environments: The competence-based view of the firm stresses the criticality of consolidating human and other resources into market-oriented competencies that allow firms to adapt to changing environments. The ongoing renewal of competencies has implications on business processes, market positions, and expansion paths (Teece, Pisano et al. 1997). Competency renewal may involve changes in company strategy, goals, markets, business models, products and services, working practices, or technology. Evolving business strategies in response to the competency renewal process may require specialized skills that current employees lack resulting in skills gaps. Similarly, changing job requirements due, for example, to technology adoption or job promotion, might mean that once proficient employees now lack skills to perform new or evolving roles. Increasing and maintaining workforce skills in light of competency building and renewal in response to changing opportunities implies that skills gaps can emerge as firms struggle to respond to internal and external forces that threaten firm competitiveness.

Transitional stages of employee orientation and integration: A large percentage of employers in several countries highlight recent recruitment, post-merger employee integration, and lack of experience as a cause of skills gaps (Development 2006; Zealand 2008; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010). However, it is unclear to what extent temporary, transitional phases associated with the beginning of the employee-employer relationship can be considered a cause of skills gaps since presumably such transitory skill gaps are likely to decrease as employees complete induction training and gain confidence in their roles. Generally induction training is

firm specific and focused on acquainting new employees with the company structure, specific job requirements, and organization policies (Bijnens and Vanbuel 2007). A more appropriate indicator of causality would be whether an employee exhibits post-induction training persistence of a lack of skills to perform a job which results in the compromised ability of a firm to meet business objectives. Such an output indicator would then point toward an insufficient induction and integration program, rather than state of completion of the induction or integration program, as a potential source of skills gaps. Nevertheless, firms appear to view transitional stages in the employee induction process as a significant source of skills gaps.

A typology of skills gaps that considers this discussion and captures the present understanding of the source of skills gaps is shown in Figure 10 and explained below:

Market and Institutional Failure Induced Skills Gaps: These are skills gaps which stem from market and institutional failures in the skills formation system. When facing difficulty in recruiting employees from the external labor market under current market conditions due to lack of required skills, work experience, or qualifications a company demands, firms engage in substitution behavior by hiring staff who require further training. Firms may also hire new entrants to the labor market who are apparently trained and qualified for occupations but who are subsequently found to still lack a variety of the skills required. Market and Institutional Failure Induced Skills Gaps are caused by

- **Poor Skills Formation Policy:** Government coordination of the skills formation system fails to link economic development with the evolution of education and training systems; ensure qualitative and quantitative supply-demand match between outgoing students and the needs of the labor market; facilitate regular, on-the-job training provision and participation in skills formation by the business community; and address policy, informational, or financial sources of individual underinvestment in skills development or
- **Education and Training System Misalignment:** Accessibility, quality, and the degree to which education and training systems produce employable students are insufficient to prepare individuals with the skills, work experience, and qualifications to meet labor market needs or
- **Insufficient Individual Investment:** The many factors which can alter the expected return to particular skills or which signal sectoral growth or promise negatively impact individual skilling decisions.

Human Resources Management Related Skills Gaps: These are skills gaps which are a result of inadequate HR practices related to employee development, motivation, and retention. Human Resources Management Related Skills Gaps are caused by

- **Insufficient Staff Development:** Depressed levels or inadequately planned training and development that erode creation and production of firm competencies jeopardizing the application of workforce skills toward market-oriented business objectives or
- **Poor Retention and Motivation Practices:** HR practices that inadequately address employee retention or a misalignment of HR practices with sources of workforce motivation.

Structural Skills Gaps: These are skills gaps which are a result of strategic shifts in response to changing business environments that lead to a mismatch between current workforce skills and the requirements of employers. Structural Skills Gaps are caused by

- Strategic Shifts in Response to Changing Business Environments: Failure to increase and maintain workforce skills to build and renew firm competencies in response to changing business opportunities that may involve adjustments in company strategy, goals, markets, business models, products and services, working practices, or technology. Structural skills gaps can be viewed as a strategy-skills lag in which current workforce skills lag new or expanded skills required by alternative strategic directions associated with competency renewal. Causal ambiguity and environmental complexity makes it difficult for managers to determine the sufficiency of the current human resources pool relative to desired states of the human resources pool to achieve adapted or future business outcomes.

Transitional Skills Gaps: These are skills gaps attributable to the beginning of the employee-employer relationship whether due to recent recruitment or post-merger employee integration. Presumably transitory skill gaps are likely to decrease as employees complete induction training and gain confidence in their roles.

Rationalizing Existing Knowledge on the Effects of Skills Gaps and Mitigation Strategies

Given the operational definition of a skills gap as a situation in which current employees lack the skills to perform their jobs which results in the compromised ability of a firm to meet business objectives, a key role national skills surveys can play is in determining how skills gaps compromise the achievement of business objectives through interference with competency formation and renewal. Of the surveys reviewed in Figure 1, five specifically ask respondents to identify the effects of skills gaps on their businesses. The open systems view of the firm, shown in Figure 11, provides a useful analytical framework to map current thinking from existing skills surveys on how skills gaps can affect firms.

In the Sanchez and Heene (1997) open model of the firm the collective strategic logic of the firm determines deployment of organizational resources such as the human capital pool. Firms must continuously renew knowledge and capabilities through internal development and in response to signals from interaction with other firms and markets. Based on data flows from the market and internally, specific decisions are made regarding the flow of resources to operations, tangible assets, intangible assets, management processes, and strategic logic. An adaptive strategic response is warranted when managers perceive strategic gaps exist between the perceived quality of assets and capabilities and desired states of those assets and capabilities required to achieve business objectives. Perceptions of strategic gaps are formed through feedback loops that relay information to management. Since altering human resources is likely to take longer than changing tangible assets, operations, products, and market positioning and causal ambiguity clouds cause-and-effect relationships between human resources and market outcomes that might prompt corrective responses, workforce skills can impose strategic limitations on a firm's ability to achieve business objectives.

Sanchez and Heene maintain that quantifiable data about products, operations, and tangible assets is easier to obtain which biases firm data collection towards production and marketing of products. In response to environmental changes and more accessible data on products, operations, and tangible

assets, managers may focus on operational changes rather than intervene in higher-level systems such as human resources in response to skills gaps. According to Sanchez and Heene, the tendency of managers to focus on operational changes to strategic gaps implies a need for higher order feedback loops which reveal the need for organizational adaptation to environmental uncertainty. This proposition points toward the value of establishment skills surveys in revealing human resources problems and providing benchmarking data on implied strategic gaps relative to other competitors that may induce firms to take strategic actions to close skill gaps before current operations are affected and problems become evident from competitive market signals. Over reliance on market and competitive signals to enact strategic changes may turn competencies into rigidities that eventually limit firm performance (Leonard-Barton 1992).

Because an organization's system elements are interdependent, a strategic gap in human resources could potentially serve as a bottleneck to limit the overall effectiveness of the organization as a whole. As shown in Figure 11, current surveys reflect a wide range of organization wide impacts attributed to skills gaps. Several empirical studies show that the operations, product offerings, and market position of firms are negatively affected by skills gaps. Skills gaps have a significant negative impact on productivity, revenue, innovation, and product quality (Harris, Li et al. 2006; Forth and Mason 2004; Harris et al. 2006; Lucifora and Origo 2002). At the market position level skills surveys show that skills gaps can lead to loss of business or orders to competitors, difficulties in meeting quality standards, and lower levels of customer service. Negative competitive signals stemming from these market positioning problems may induce firms to occupy low quality niches and employ lower technology production processes which can restrain the introduction of new products and services. At the operational level, skills surveys show that the negative productivity ramifications caused by skills gaps result in increased operating costs, increased waste, higher levels of outsourcing, and difficulty introducing new working practices. Ashton and Sung (2002), for example, provide evidence that employee skills levels can serve as a binding constraint on the adoption of high performance working practices such as the use of self-managed work teams and multitasking.

Skills gaps are associated with difficulties introducing technological change in skills surveys. Due to the complementarity between tangible assets and workforce skills, underutilization of capital assets may result in insufficient return on investment which reduce firm incentives to invest in tangible capital assets and R&D (Ashton, Green et al. 1999). Intangible resources, which for most firms consists largely of human resources, have been shown to suffer from a number of negative ramifications from skills gaps in surveys such as strain on management, increased workloads, lower morale, turnover, and increased recruitment costs.

Negative market signals and internal data related to resource utilization received at the management systems level can lead to withdrawal from markets or from offering certain products which is reflected in findings from skills surveys. Empirical studies show that firms often adopt a second-best strategy and produce low skill intensive products in the absence of skilled workforces (Steedman and Wagner 1987; 1989). At the strategic logic element of the system, skills gaps can influence strategic planning which might affect the overall competitive orientation of a firm. For example, empirical findings suggest that the industry in which firms choose to compete in is highly related to the skills of its workforce (Bonser,

Daniel et al. 2006). From this perspective, skills gaps influence the ability of firms to adapt, integrate, and configure internal and external organizational skills, resources, and competences in response to changing business and competitive environments.

While progress understanding the impacts of skill gaps on firms is limited to only a few skill surveys, this is an initial attempt to reconcile existing knowledge with the competence-based theory of the firm to demonstrate how skills gaps concurrently affect various systems elements of the firm. By emphasizing the interconnectedness of the various system elements of the firm, the Sanchez and Heene open model provides a theoretical framework which can inform more in-depth survey analysis. The open model of the firm suggest that skills gaps serve as a bottleneck to the overall functioning of the firm as well as impact discrete system elements that can threaten the firm as an institution embedded in the market and business environment.

The Sanchez and Heene model also points to likely significant firm-to-firm variation in attempts to bridge skills gaps due to differences in the way managers perceive strategic gaps. Reliance on lower level system data involving tangible assets, operations, and products as opposed to data concerning higher-level systems such as human resources in remediating skills gaps can lead to different patterns of gap closing actions. Managers focused on mitigating skills gaps through interventions in products, operations, and tangible assets are likely to focus on solutions which fail to expand existing organizational competencies by prioritizing incremental learning, reduced costs, and improved efficiency. However, changes in lower order systems elements may disadvantage firms facing skills gaps as far as they are unable to introduce technological change, innovate, or adopt new working practices when faced with the need for strategic adaptation. Intervention in higher order systems such as human resources are required to maintain distinctive patterns of competency building and maintenance over time (Sanchez and Heene 1997).

Of the surveys consulted in Figure 1, seven inquire about firm strategies to mitigate skills gaps. As illustrated in Figure 12, mitigation strategies take many forms from interventions aimed at firm addressable higher order system elements to operationally focused strategies. At the strategic logic level, skills surveys reveal that firms respond to skills gaps by implementing centralized early warning systems such as predicting future skills needs and skills inventories to assess the productive possibility frontier of their human resource pool. Feedback mechanisms at the management processes level of the firm such as staff appraisal and performance reviews facilitate data gathering regarding the suitability of workforce skills for coordination and effective deployment towards business goals. Through discretionary control of resource allocation relative to organizational goal attainment, management can resort to disciplinary actions, redundancy, or even “do nothing” approaches that stress market mechanisms to resolve skills gaps.

HR practices related to employee development, motivation, and retention are aimed at resolving skills gaps at the intangible resources level of the firm. Skills surveys reveal several HR practices focused on closing skills gaps such as increased training and development activity; expansion of training modalities; sending employees for certification; increased training and development spend; use of government assistance; expansion of trainee programs; internal promotion; implementation of mentoring buddying

schemes; programs to build team spirit and motivation; increased salaries; and incentives. Recruitment practices such as expanding recruitment channels; flexibility when recruiting to look for people with the right core skills base then up skilling them; and hiring experienced staff are used to minimize the likelihood or contain the risks of hiring employees who subsequently become skills gaps. Skill surveys suggest task automation at the tangible resource level of the firm can minimize skills gaps through technical substitution. At the operations level, skills surveys imply that firms alter operational activities, routines, and production practices in response to skills gaps. Operational responses to skills gaps include such practices as changing working practices; subcontracting or outsourcing work; increased supervision; redefining jobs; reallocating work; and providing employees with cross-functional exposure to the business.

Similar to the present understanding of the impacts of skills gaps, information on firm mitigation strategies is limited to a few skills surveys. The Sanchez and Heene open model of the firm provides a theoretically grounded approach to classify various levels at which skills gaps mitigation strategies can focus in an attempt to reduce the impact of skills gaps on the overall functioning of the firm. Classifying mitigation approaches in this way suggests that there is likely no single silver bullet to address skills gaps. Rather the interconnectedness of the various systems elements of the firm implies a range of approaches may be required to address skills gaps at all levels of the firm. For example, the open model demonstrates that in the absence of higher level systems mitigation approaches such as centralized systems for assessing productive possibilities relative to workforce skills, feedback mechanisms and discretionary control at the management level, and responsive HR practices, exclusive reliance on operational and technological substitution interventions to resolve skills gaps could potentially lead to competency erosion in response to changing business and competitive environments.

Conclusion

This analysis exposes a lack of conceptual clarity in regards to how skills gaps are defined in establishment surveys. While the focus on the internal workforce and normative assessment of skills levels relative to a desired reference point are widely shared across various conceptualizations of the phenomenon, measurement operationalization is subject to several biases. Internal organizational dynamics to wield influence and access firm resources can affect objectivity. Assessments of employee skills levels and their contribution to performing a job proficiently or business goals leave much room for respondent subjectivity and individual interpretation. A few surveys have included individual and peer evaluation to expand the evidentiary base, yet such methods are also subject to bias. These findings point toward the need to take into account multiple firm level perspectives in measuring skills gaps. However, the resource and time constraints of operationalizing large scale skills surveys calls into question the practicality of a multi stakeholder survey approach.

From the practice-based review of establishment skills surveys undertaken, two distinct conceptualizations of the phenomenon of a skills gap emerge which differ based on the normative reference point to which current workforce skills sufficiency are compared. Several of the definitions from national surveys, government bodies, and academic literature describe skills gaps as an

occupationally based measure of whether employees are fully proficient at their jobs where proficiency is understood to mean the employee is able to perform their job to the required level. However, in viewing skills gaps in proficiency terms relative to the performance of a discrete job, this conceptualization of skills gaps fails to isolate causality specifically to firm addressable workforce skills and to suggest a normative workforce skill gap that impairs the firm's ability to achieve business objectives. The term 'proficiency' is often associated with individual employee performance, attributes, or abilities that may not be addressable by the firm. While surveys that conceptualize skills gaps as a gap between current workforce skills and those skills needed by a firm to achieve business objectives contextually appear to resolve the criticism of proficiency-based measurement approaches, evidence suggests that such conceptual approaches similarly may not draw a sufficient causal link between workforce skills levels and firm achievement of business objectives.

The lack of definitional clarity in what constitutes a skills gap implies a need to revisit underlying theories which shape the two conceptualizations and their associated measurement approaches. Two streams within the strategic management literature are used to delineate the conceptualizations by the way in which human resources are theorized to affect organizational performance. By emphasizing the quantity of employees who are able to perform their jobs to a required standard, proficiency-based definitions and measures of skills gaps take a resource-based view that stresses accumulation, control over, and efficiency of human resources. While Barney (1991) stresses resource heterogeneity in terms generating value when deployed by firms to implement competitive strategies, the resource-based view of skills gaps in quantifying the ability of employees to perform discrete jobs ignores the value based dimension of human resources endowment described by Barney. In neglecting the linkage between firm human resource endowment and market based outcomes, the resource-based view of skills gaps and associated measurement approaches seem more suited towards an overall assessment of the personal performance of a firm's workforce rather than an indicator of workforce skills sufficiency in terms of realizing business objectives. From this perspective, surveys that define and measure skills gaps in proficiency terms rely on a proxy variable that likely insufficiently measures the relationship between workforce skills and firm performance.

Business objectives-based definitions and measures of skills gaps adopt a competence-based view of skills gaps by drawing a causal link between workforce skills and firm performance. Though the strategic management and human resources literature emphasize the importance of organization-specific competencies to firm performance, most surveys which take a competence-based view of skills gaps rely on probing generic skills which are deemed universally applicable across industries and occupations. Practicality considerations in deploying establishment skills surveys in the widespread absence of standardized occupation-specific skills requirements, such as those compiled by the as the US Department of Labor Employment and Training Administration's Occupational Information Network, are likely behind this measurement compromise. For this reason, surveys which employ a competence-based view of skills gaps can be criticized for their inability to accommodate skills which are deemed more or less important based on sector, industry, or socio-cultural context. In this sense, present surveys which employ the competence-view of skills gaps fail to measure variation in the value of different skills sets, occupations, and employment modes to firm performance based on organizational

context by imposing a condition of uniform value across particular skills and occupations in terms of generating market oriented competencies. This shortfall points toward the need of establishment skills surveys to accommodate organizational distinctiveness of workforce skills deployment towards market-based competency formation.

While the resource and competence-based views of skills gaps and their associated measurement approaches have existed alongside one another in several countries, there is a need to examine intermediate theoretical and measurement issues to devise a more scientifically meaningful way of defining and measuring skills gaps. Due to the common theoretical origins of both the resource and competence-based views of skills gaps, this paper proposes that skills gaps can be operationally defined as a situation in which current employees lack the skills to perform their jobs which results in the compromised ability of a firm to meet business objectives. By advancing a causal pathway to measuring and resolving skills gaps, important operational measurement issues are revealed which must be resolved to harmonize the conceptual and measurement approaches of the resource and competence-based views of skills gaps. These issues highlight several survey design considerations that must be taken into account:

- Due to the normative way in which skills gaps are measured relative to an unfixed performance threshold, several sources of bias must be considered which impact incidence reporting. Ideally surveys should incorporate a multi stakeholder perspective to triangulate and validate findings or control for the position of the respondent within the company.
- The probing of generic skills applicable across industries and occupations is perhaps inevitable in light of a lack of a common framework for describing sector and occupation-specific skills requirements. Survey administration practicality considerations ultimately determine how situationally or organizationally specific surveys can be. If the intended application of national skills surveys is to influence establishment behavior to improve firm and economic performance through public policy interventions, then a comprehensive survey approach that includes generic skills as well as accommodates situationally, organizationally, or occupationally specific skills is required to capture the differing value firms place on particular skills in the building of distinctive competencies. In this respect, a more detailed follow on survey instrument which might focus on situationally, organizationally, or occupationally specific skills, similar to the approach taken by the US Department of Labor Employment and Training Administration's Occupational Information Network, could potentially be a useful follow-up component to establishment skills surveys. In the absence of a standardized system of occupational skill requirements, an operational compromise to proxy firm-to-firm variability in the value of particular skills and occupations to organizational competency formation might be to allow firms to indicate the importance of occupational groupings to achieving business objectives; the value of particular skills to occupational groupings; and then measuring whether employees within each occupational grouping have the requisite skills.
- Since different skills sets and occupations may vary in perceived importance to firm performance, HR practices are likely to differ by occupational grouping. The open systems model of the firm also suggests that different occupational groupings exhibit distinct levels of control over organizational resource allocation and deployment based on their distribution within the various system elements

of the firm. A significant issue regarding whether skills gaps survey questions should be posed at the global establishment level or be occupation-specific arises from these propositions. Differences in perceived importance of certain occupational groupings to firm performance, selective application of HR practices, and varying levels of control over resource allocation and deployment between occupational groupings imply that skills lacking, attributed causes, measures taken to resolve gaps, and impacts on the firm are likely to show significant variation by occupation. While there is certainly an efficiency argument to ask skills gaps questions at the establishment level, empirical evidence suggest an occupational level approach would be more effective in highlighting differences between occupational groups. While isolating the skills lacking, attributed causes, measures taken to resolve gaps, and impacts by occupation may challenge respondents, empirical evidence implies questions should be posed at the occupational level.

By addressing the above operational measurement issues, establishment skills surveys can play a more effective role in determining how workforce skills influence achievement of the macro level objectives of firms. The open systems model of the firm is used to theoretically ground firm level effects of skills gaps observed in skills surveys. The open systems model of the firm suggest that skills gaps serve as a bottleneck to the overall functioning of the firm as well as impact discrete system elements that comprise the firm. The open systems model also demonstrates that firm mitigation strategies are subject to managerial perceptions which can influence the level at which strategies are targeted. Mitigation strategies which target lower level system elements such tangible assets, operations, and products, though easier to implement, are likely to lack effectiveness in the absence of concurrent interventions at higher systems levels. For example, exclusive reliance on operational and technological substitution interventions to resolve skills gaps could potentially lead to competency erosion in response to changing business and competitive environments. These conclusions underscore the value of establishment skills surveys in providing benchmarking data on workforce skills to facilitate the identification of implied strategic gaps relative to other competitors which may induce firms to adopt comprehensive strategic actions to close skill gaps.

Aggregate findings from establishment skills surveys are an important part of the evidentiary base to examine overall impact of workforce skills sufficiency on economic development and suggest targeted areas for potential policy interventions. To this end, a typology of skills gaps is advanced which identifies four thematically consistent causes of skills gaps: market and Institutional failure; human resources management practices; strategic shifts in response to changing business environments; and transitional periods attributable to the beginning of the employee-employer relationship. The typology is frame giving as it serves as a starting point for potential government intervention. A recommended establishment skills survey approach which reflects the above findings and conclusions is advanced as Figure 13.

References

Arthur, J. B. (1994). "Effects of Human Resource Systems on Manufacturing Performance and Turnover." *The Academy of Management Journal* **37**(3): 670-687.

Ashton, D., F. Green, et al. (1999). Education and Training for Development in East Asia: The Political Economy of Skill Formation in Newly Industrialised Economies London, Routledge.

Ashton, D. N. and J. Sung (2002). Supporting Workplace Learning for High Performance Working. Geneva, International Labour Organization.

Association, C. T. I. (2008). Skills Gaps in the World's IT Workforce: A CompTIA International Research Study. Downers Grove, Computing Technology Industry Association.

Barney, J. (1991). "Firm Resources and Sustained Competitive Advantage." 17 **1**(99-102).

Bijnens, M. and M. Vanbuel (2007). Work Based Induction Training and Support in Europe. L. W. S.-M. R. Project. Brussels, European Commission.

Bonser, G., W. W. Daniel, et al. (2006). Multisector Skills Study: Electronics Industry. D. o. T. a. Industry. London, Department of Trade and Industry.

Boyatzis, R. E. (1982). The Competent Manager: A Model for Effective Performance New York, Wiley.

Campbell, M., S. Baldwin, et al. (2001). Skills In England 2001 The Research Report. D. f. E. a. Skills, Policy Research Institute Leeds Metropolitan University.

Camuffo, A. and F. Gerli (2005). The Competent Production Supervisor: A Model for Effective Performance. MIT Industrial Performance Center Boston, Massachusetts Institute of Technology.

Caves, R. E. (1980). "Industrial Organization, Corporate Strategy and Structure." Journal of Economic Literature **18**(1): 64-92.

Council, L. a. S. (2003). National Employers Skills Survey 2003: Key Findings. London, Learning and Skills Council.

Council, L. a. S. (2005). National Employers Skills Survey 2005: Key Findings. London, Learning and Skills Council.

Council, L. a. S. (2008). National Employers Skills Survey 2007: Key Findings. London, Learning and Skills Council.

Deist, F. D. and J. Winterton (2005). "What Is Competence?" Human Resource Development International **8**(1): 27 – 46.

Delaney, J. T. and M. A. Huselid (1996). "The Impact of Human Resource Management Practices on Perceptions of Organizational Performance." The Academy of Management Journal **39**(4): 949-969.

Department of Education, E. a. W. R. (2010). Skill Shortage Methodology. E. a. W. R. Department of Education. Canberra, Australian Government.

Development, A. S. f. T. (2006). Bridging the Skills Gap. Alexandria, American Society for Training & Development.

Development, O. f. E. C. a. (2010). Business Climate Development Strategy. Paris, Organization for Economic Cooperation and Development

Dignan, T. (2004). Towards a Harmonised Skills Monitoring Survey. Belfast, Northern Ireland Department for Employment and Learning.

Dignan, T. (2005). Towards a Harmonised Skills Monitoring Survey: Feedback Report. Belfast, Northern Ireland Department for Employment and Learning

Dulewicz, V. and P. Herbert (1999). "Predicting Advancement to Senior Management from Competencies and Personality Data: A Seven-year Follow-up Stud." British Journal of Management **10**(1): 13–22.

Dunford, B. B., S. A. Snell, et al. (2001). Human Resources and the Resource Based View of the Firm. Working Paper 66. Ithaca, Cornell University Center for Advanced Human Resource Studies.

Education Analytical Services, E., Skills and Lifelong Learning Analysis, Scottish Government (2010). Skills in Scotland 2010. S. a. L. L. A. E. A. S. D. Employability. Glasgow, Education Analytical Services, Employability, Skills and Lifelong Learning Analysis, Scottish Government.

Employment, W. R. a. E. R. C. (20003). Bridging the Skills Divide W. R. a. E. R. C. Employment. Canberra, Commonwealth of Australia.

Forum, H. E. (2010). Survey for the Indian Banking, Financial Services, and Insurance Sector. Matunga, The Higher Education Forum.

Freiling, J. (2004). "A Competence-based Theory of the Firm." International Review of Management Studies **15**(1): 27-52.

Gagne, M. and E. L. Deci (2005). "Self-determination Theory and Work Motivation." Journal of Organizational Behavior **26**: 331-362.

Government, A. (2005). Skill shortages: Concepts, Definitions, and Indicators. D. o. E. a. W. Relations. Canberra, Australian Government.

Government, N. Z. (2011). Skills Challenge Report: New Zealand's Skills Challenges Over the Next 10 Years. D. o. Labour. Wellington, New Zealand Government.

Green, F., S. Machin, et al. (1998). "The Meaning and Determinants of Skills Shortages " Oxford Bulletin of Economics and Statistics **60**(2): 165-187.

Hillage, J., J. Regan, et al. (2002). Employers Skill Survey 2002. U. D. f. E. a. Skills. London, UK Department for Education and Skills.

Hoelzl, E. and A. Rustichini (2005). "Overconfident: Do You Put Your Money On It?" The Economic Journal **115**: 305-318.

Hogarth, T. and R. Wilson (2001). Skills Matter: A Synthesis of Research on the Extent, Causes, and Implications of Skill Deficiencies. I. o. E. Research, University of Warwick.

- Industry, C. o. B. (2007). Employment Trends Survey 2007. London, Confederation of British Industry.
- Keane, M. P. (2010). "Structural vs. Atheoretic Approaches to Econometrics." Journal of Econometrics **156**(1): 3-20.
- Klar, Y. and E. E. Giladi (1997). "No One in My Group Can Be Below the Group's Average: A Robust Positivity Bias in Favor of Anonymous Peers." Journal of Personality and Social Psychology **73**(5): 885–901.
- Labor, U. S. D. o. (1991). What Work Requires of Schools: A SCANS Report for America 2000 U. S. D. o. L. Secretary's Commission on Achieving Necessary Skills. Washington, U.S. Department of Labor.
- Lall, S. (1999). Competing With Labor: Skills and Competitiveness in Developing Countries. D. P. Department. Geneva, International Labour Organization.
- Learning, N. I. D. f. E. a. (2004). Northern Ireland Skills Monitoring Survey 2002. Belfast, Northern Ireland Department for Employment and Learning.
- Learning, N. I. D. f. E. a. (2007). The Northern Ireland Skills Monitoring Survey 2005 Main Report. Belfast, Northern Ireland Department for Employment and Learning.
- Leonard-Barton, D. (1992). "Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development." Strategic Management Journal **13**(1): 111-125.
- Leonard, N. H., L. L. Beauvais, et al. (1999). "Work Motivation: The Incorporation of Self-Concept-Based Processes." Human Relations **52**(8): 969-998.
- Lepak, D. P. and S. A. Snell (1999). "The Human Resource Architecture: Toward a Theory of Human Capital Allocation and Development." The Academy of Management Review **24**(1): 31-48.
- Loan-Clarke, J. (1996). "The Management Charter Initiative – A Critique of Management Standards/NVQs " Journal of Management Development **15**(6): 4-17.
- Management, A. I. o. (2009). Australia's Workforce 'Skills Gap:' Managers give their views on the impact of the escalating skills crisis. Canberra, Australian Institute of Management.
- Office, C. S. (2008). National Employment Survey. I. S. Central Statistics Office. Dublin, Government of Ireland.
- Osman-Gani, A. M. (2000). "Developing Expatriates for the Asia-Pacific Region: A Comparative Analysis of Multinational Enterprise Managers from Five Countries Across Three Continents." Human Resource Development Quarterly **11**(3): 213–235.
- Paterson, A., M. Visser, et al. (2008). South Africa: National Skills Survey 2007. D. o. Labour. Pretoria, Republic of South Africa.
- Prahalad, C. K. and G. Hamel (1990). "The Core Competence of the Corporation." Harvard Business Review **68**(3): 79-91.

- Pritchett, L. (2001). "Where Has All the Education Gone?" The World Bank Economic Review **15**(3): 367-391.
- Reich, B. H. and I. Benbasat (1996). "Measuring the Linkage Between Business and Information Technology Objectives." MIS Quarterly **20**(1): 55-81.
- Richardson, S. (2007). What is a skill shortage? N. C. f. V. E. Research. Adelaide, Australian Government.
- Rosenzweig, M. R. (2010). "Microeconomic Approaches to Development: Schooling, Learning, and Growth." Journal of Economic Perspectives **24**(3): 81-96.
- Rothwell, W. J. and J. E. Lindholm (1999). "Competency Identification, Modelling, and Assessment in the USA." International Journal of Training and Development **3**(2): 90-105.
- Sanchez, R. and A. Heene (1997). "Managing for an Uncertain Future: A Systems View of Strategic Organizational Change." International Studies of Management and Organizations **27**(2): 21-42.
- Scarbrough, H. (1998). "Path(ological) Dependency? Core Competencies from an Organizational Perspective." British Journal of Management **9**: 219-232.
- Schultz, T. W. (1975). "The Value of the Ability to Deal with Disequilibria." Journal of Economic Literature **13**(3): 827-846.
- Schwalje, W. (2011). A Conceptual Model of National Skills Formation for Knowledge-Based Economic Development London, London School of Economics.
- Shah, C. and G. Burke (2003). Skills Shortages: Concepts, Measurement, and Implications. Working Paper 52. M. U. C. f. t. E. o. E. a. Training. Victoria, Monash University Center for the Economics of Education and Training.
- Shury, J., D. Vivian, et al. (2009). Northern Ireland Skills Monitoring Survey 2008 Main Report. Belfast, Northern Ireland Department for Employment and Learning
- Shury, J., M. Winterbotham, et al. (2005). National Employers Skills Survey 2004: Main Report. D. f. E. a. Skills. London, Department for Education and Skills
- Shury, J., M. Winterbotham, et al. (2010). National Employer Skills Survey for England 2009: Key findings report. London, UK Commission for Employment and Skills.
- Skinner, D., M. N. K. Saunders, et al. (2004). "Towards a Shared Understanding of Skill Shortages: Differing Perceptions of Training and Development Needs." Education and Training **46**(4): 182-193.
- Spencer, L. M. and S. M. Spencer (1993). Competence at Work: Models for Superior Performance. New York, Wiley.
- Stasz, C., K. Ramsey, et al. (1996). Workplace Skills in Practice: Case Studies of Technical Work. Santa Monica, Rand Corporation.

- Steedman, H. and K. Wagner (1987). "A Second Look At Productivity, Machinery and Skills in Britain and Germany." National Institute Economic Review **122**: 84-106.
- Steedman, H. and K. Wagner (1989). "Productivity, Machinery and Skills: Clothing Manufacture in Britain and Germany." National Institute Economic Review **128**: 40-57.
- Sutherland, J. (2010). Skills Gaps and Hard to Fill Vacancies at Establishments in Scotland. Working Paper 25. Glasgow, Centre for Public Policy for Regions, University of Glasgow.
- Teece, D. and G. Pisano (1994). The Dynamic Capabilities of Firms: An Introduction. I. I. f. A. S. Analysis. Laxenburg, International Institute for Applied Systems Analysis.
- Teece, D. J., G. Pisano, et al. (1997). "Dynamic Capabilities and Strategic Management." Strategic Management Journal **18**(7): 509-533.
- Training, E. C. f. t. D. o. V. (2008). Employers' Surveys as a Tool for Identification of Skill Needs. Skillsnet Discussion Paper. Brussels, European Centre for the Development of Vocational Training.
- Watson, D., R. Webb, et al. (2006). "Influence Costs and the Reporting of Skill Deficiencies." Human Relations **59**(1): 37-59.
- Wernerfeldt, B. (1984). "A Resource-based View of the Firm." Strategic .Management Journal **5**(2): 171-180.
- Wickramasinghea, V. and N. D. Zoyzab (2009). "An Assessment of Managerial Competency Needs: Empirical Evidence from a Sri Lankan Telecommunication Service Provider." The International Journal of Human Resource Management **20**(12): 2547 — 2567.
- Wright, P. M., G. C. McMahan, et al. (1994). "Human Resources and Sustained Competitive Advantage: A Resource-based Perspective." International Journal of Human Resource Management **5**(2): 301-326.
- Xiao, J. (2006). "Survey Ranking of Job Competencies by Perceived Employee Importance: Comparing China's Three Regions." HUMAN RESOURCE DEVELOPMENT QUARTERLY, **17**(4): 371-402.
- Young, V. and J. Morrell (2006). Future Skills Wales 2005: Sector Skills Survey Main Report E. Department for Children, Lifelong Learning and Skills. Caerphilly, Future Skills Wales Partnership, Welsh Assembly Government
- Zealand, S. N. (2008). 2008 New Zealand Business Operations Survey. S. N. Zealand. Wellington, Statistics New Zealand.

Survey Source	Approach to Measure Skills Gap Incidence	How is a skills Gap Concluded?	High Level Findings
Direct Single Question Approach			
Australian Institute of Management	Asks "Do you think there is a skills gap in your organization?"	A firm faces a skills gap if it answers yes that there is a gap between the organization's skills needs and its current employee capabilities	76% of firms face skills gaps
American Society for Training and Development	Asks "Is there is a skills gap in your organization now?"	A firm faces a skills gap if they answer yes there is a significant gap between an organization's current capabilities and the skills it needs to achieve its goals	79.2% of firms face skills gaps
Confederation of British Industries	"During the last 12 months to what extent did skills gaps or shortages impact on your organization's business performance?" Respondents must rank the impact of Skills gaps amongst existing employees by the severity to which business performance is impacted with the following answer choices: No impact, minor impact, significant impact, severe impact	A firm faces a skills gaps if it reports that a skills gap amongst its present staff is having a severe impact on business performance	20% of firms reported facing a skills gap that has a severe impact on business performance
Proficiency Range or Quantification Approach			
National Employer Skills Survey for England	Respondents are asked how many employees within each occupational grouping are fully proficient in their jobs. A proficient employee is someone who is able to do the job to the required level.	<ul style="list-style-type: none"> A company faces a skills gap if one or more of their staff are felt not to be fully proficient at their job. An employee is considered to have a skills gap if they lack full proficiency to perform their job 	<ul style="list-style-type: none"> 19% of companies face a skills gap 7% of employees are described as having a skills gap
Skills in Scotland	Harmonized approach with England; For each occupational classification, respondents are asked how many employees are considered to be fully proficient in their jobs	Identical to the approach in the National Employer Skills Survey for England	<ul style="list-style-type: none"> 15% of companies face a skills gap 6% of employees are described as having a skills gap
Dual Direct Question and Proficiency Range or Quantification Approach			
Future Skills Wales	<p>Asks two questions to proxy skills gaps:</p> <p>Direct Question: "Would you say that there is a gap between the types of skills that your current employees have now, and those that your company needs to meet its business objectives?"</p> <p>Proficiency Approach: By Standard Occupational Classification, respondents are asked how many employees within each occupational grouping are considered to be fully proficient in their jobs</p>	<ul style="list-style-type: none"> Companies which agree with the statement posed in the direct question are considered to face a skills gap Establishments with one or more employees who are not fully proficient are considered to have a skills gap 	<ul style="list-style-type: none"> 20% of establishments agreed 18% of establishments and 6% of employees are described as having a skills gap based on the proficiency approach.
Northern Ireland Skills Monitoring Survey	<p>Direct Question: Asks the same question as the Future Skills Wales survey</p> <p>Proficiency Approach: Follows the same approach as Future Skills Wales survey.</p>	<ul style="list-style-type: none"> Companies which agree with the statement posed in the direct question are considered to face a skills gap Establishments with one or more employees who are not fully proficient are considered to have a skills gap 	<ul style="list-style-type: none"> 14% per cent of establishments agreed 22% of establishments and 8% of employees are described as having a skills gap based on the proficiency approach
New Zealand Business Operations Survey	Direct question: Asks "Do any of the following factors limit this business' ability to provide goods or services that meet specific customers' requirements?" One of the answer stems is skill deficiencies among existing employees.	<ul style="list-style-type: none"> Does not provide a specific definition of a skills gap. Firms that answered that skills deficiencies limit the business' ability to meet customer requirements would presumably be deemed to face a skills gap 	Results of the direct question are not publically available. 8% of staff have skills gaps based on the broad definition of a skills gap as defined by firms that answered 50% or less of their

	Proficiency approach: Asks “How many of this business’s existing staff have the skills required to do their job?” Ranges are given as answer stems (less than half, half or more, all staff, no staff of this type)	<ul style="list-style-type: none"> Does not provide a specific definition of a skills gap. Firms which answer that less than half of employees have the skills required to do their jobs presumably face a skills gap 	staff had the proficiency to perform their jobs
Skills-Specific Upgrading Approach			
South Africa National Skills Survey	Asks “On a scale from 1 to 5, to what extent were the following skills underdeveloped or lacking in your establishment during the [current year] financial year?”	Options are in the form of a likert scale ranging from (1) not at all to (5) to a large extent. No clear guidance is given on what constitutes a skills gap beyond the contextual definition provided	The overall average ranking across firms is 2.39 indicating that skills gaps are present. Scaled to 100, 47.8% of firms face skills gaps. However, further interpretation is impossible due to lack of analysis in the public report
Ireland National Employment Survey	Asks “Are there acute shortages of a particular skill in the existing workforce?” The survey then asks “For each occupation in your current workforce, indicate which skills areas need upgrading:”	No specific criteria is provided to conclude a skills gap. However, contextually the question implies a firm faces a skills gap if there is any incidence of a skill that requires upgrading in firm’s current workforce.	46.6% of all enterprises reported having at least some “acute shortage” of particular skills.
United States Agency for International Development Tourism Skills and Knowledge Needs Assessment	<p>Surveys both employees as well as managers:</p> <p>Employee Survey: Includes a self-evaluation and evaluation of other staff by asking “In which areas do you feel it is most important for you to upgrade your skills?” and “In which areas do you feel that it would be most important for new hires or current staff members that have been working at your business for 2 years or less to upgrade their skills?”</p> <p>Manager Survey: Includes a self-evaluation and employee evaluation by asking “How important is it for new hires or current staff members that have been working at your business for 2 years or less to improve in the following skill areas?” and “In which areas would you personally like to upgrade your skill level?”</p> <p>The questions ask respondents to rate the need to upgrade skills on a scale of 1-5 (1 being “not important” and 5 being “extremely important”)</p>	The survey does not formally define a skills gap. However, the discussion section operationally concludes a skills gap by using average scores for each particular skill which are higher than 1.	Significant skills gaps are observed across many industries in several skills areas
Importance- Proficiency Gap Analysis			
Survey for the Indian Banking, Financial Services, and Insurance Sector	Assesses the knowledge, skills, and attitudes employers expect of new MBAs and their performance compared to these expectations. The expectation score is on a scale of 1 to 5, where 1 indicates a given attribute is not at all important and 5 indicates the attribute is very important. Similarly, the performance score is on a scale of 1 to 5, where 1 indicates performance on a given attribute is lacking and 5 indicates performance on the attribute is excellent	A skills gap is the difference between the expectation as proxied by the % of respondents who replied very important and important and performance scores as proxied by the % of respondents who replied internal levels of a particular skill was excellent or very good	Survey does not publically provide information on the incidence at the firm level. Skills gaps were found in several skills areas
Skills Gaps in the World’s IT Workforce: A CompTIA International Research Study	Asks the respondent to rate the importance of each skill on a 1-7 scale with 7 being extremely important. Then the survey asks respondents how proficient their employees are on a 1-7 scale, with seven being fully proficient.	Skills gaps are assessed by subtracting the percentage of respondents saying employees are proficient in a particular skill from the percentage saying that the skill is important. This is operationalized by totaling the % of	Survey does not publically provide information on the incidence at the firm level. The survey find significant skills gaps in a number of roles in Australia, Canada, China,

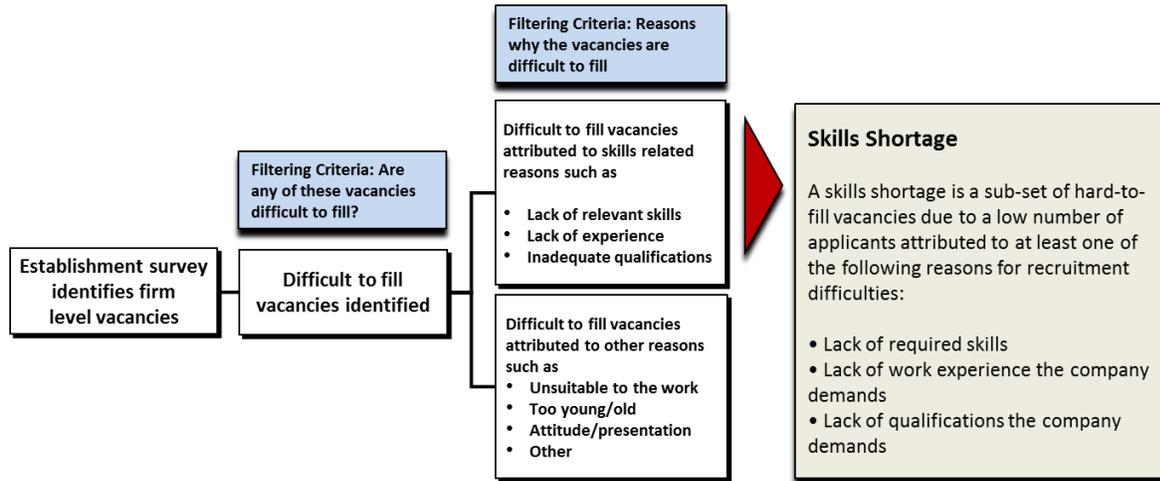
		respondents who responded 6 or 7 for the skill importance and subtracting the % of respondents who answered that employee proficiency was 6 or 7	France, Germany, India, Italy, Japan, The Netherlands, Poland, Russia, South Africa, U.K., and the U.S
Sri Lankan Telecommunication Survey	Managers were asked to self-evaluate perceived levels of current competency expertise, current importance, and future importance on each of the 31 work-related competencies on a 5-point Likert scale	Skills gaps were established by measuring the difference between the level of competency currently possessed by respondents and the level of current competency importance	Survey is focused on a single firm. The study finds a number of skills gaps across a variety of skills

Figure 1. A methodological review and classification of establishment skills surveys

Sources: (Development 2006; Industry 2007; Association 2008; Office 2008; Paterson, Visser et al. 2008; Zealand 2008; Management 2009; Shury, Vivian et al. 2009; Wickramasinghea and Zoyzab 2009; Education Analytical Services 2010; Forum 2010; Shury, Winterbotham et al. 2010)

Note: This review of establishment skills surveys is in no way comprehensive. However, the selected surveys form a representative sample of the diversity of methodological approaches to establishment skills surveys from industry, academia, and government sources.

Skills Shortage Definition Implied by Typical Survey Approaches



Skills Gap Definition Implied by Typical Survey Approaches

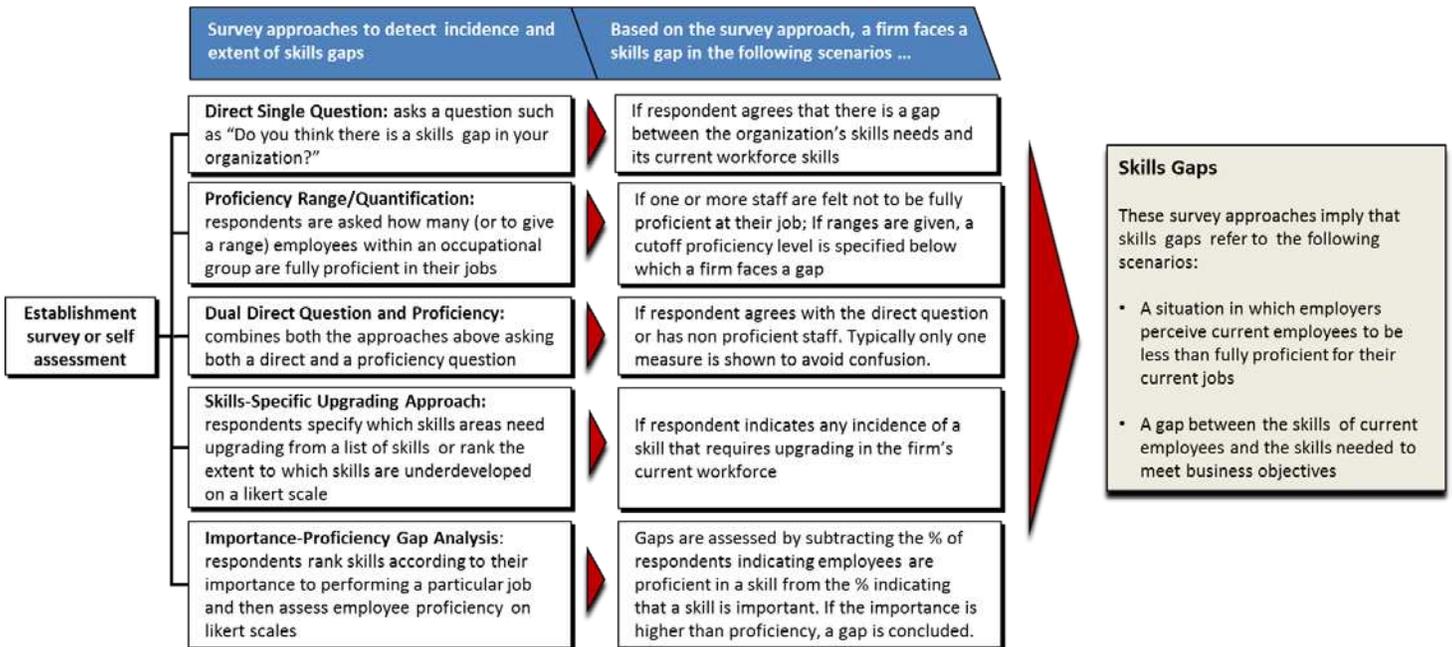


Figure 2. The concepts of skills shortages and skills gaps as implied through typical survey approaches

Sources: (Government 2005; Development 2006; Young and Morrell 2006; Paterson, Visser et al. 2008; Training 2008; Management 2009; Shury, Vivian et al. 2009; Education Analytical Services 2010; Forum 2010; Shury, Winterbotham et al. 2010; Government 2011; Employment 20003)

Assessing Skills Formation Effectiveness in Labor Markets and at the Firm Level

	Skills deficiencies within the external labor market	Skills deficiencies internal to the firm
<u>Skills Formation Objective</u>	Allocative Efficiency	Effective Firm-level Utilization of Workforce Skills
<u>Description of Objective</u>	Preparation of individuals with the skills, work experience, and qualifications in the quantity and quality to meet labor market needs	Workforce skills levels meet the expectations of employers either in terms of full occupational proficiency or in the ability to meet business objectives with current workforce skills levels
<u>Evidence of a Deficiency</u>	Skills Shortages <ul style="list-style-type: none"> • Difficulty in recruiting individuals from external labor markets with a particular skill set due to a lack of skills, work experience, or qualifications 	Skills Gaps <ul style="list-style-type: none"> • Current workforce has inadequate skill types/levels to meet business objectives <li style="text-align: center;">OR • Employers perceive current employees to be less than fully proficient to perform their current jobs <div style="text-align: right; margin-top: 10px;">  </div>

Figure 3. The distinction between labor market and firm-level skills deficiencies

Sources: (Government 2005; Development 2006; Young and Morrell 2006; Paterson, Visser et al. 2008; Training 2008; Management 2009; Shury, Vivian et al. 2009; Education Analytical Services 2010; Forum 2010; Shury, Winterbotham et al. 2010; Government 2011; Employment 20003)

Definition Source	Skills Gaps Definitions
National Enterprise Surveys and Government Bodies	
National Employer Skills Survey 2009 (England)	A skills gap exists when an employer indicates that staff at an establishment is not fully proficient at their jobs.
Skills in Scotland 2010 (Scotland)	A skills gap exists when an employer thinks a worker does not have enough skills to perform their job with full proficiency. Skills gaps apply to existing employees.
Future Skills Wales 2005 (Wales)	<ul style="list-style-type: none"> • Skills gaps refer to the extent to which employers perceive current employees to be less than fully proficient for their current job. • A gap between the types of skills held by their current employees and those that are needed to meet business objectives.
Skills Monitoring Survey 2008 (Northern Ireland)	<ul style="list-style-type: none"> • A gap between the skills of current employees and the skills they need to meet their business objectives. • Self-defined by employers when they perceive that the skills held by an employee prevent them from being fully proficient in their current job role.
Senate Employment, Workplace Relations and Education References Committee (Australia)	Skill gaps occur where existing employees do not have the required qualifications, experience and/or specialized skills to meet the firm's skill needs for an occupation. Workers may not be adequately trained or qualified to perform tasks, or may not have up-skilled to emerging skill requirements. Skill gaps may apply to new employees, or where employers are unable to find suitable applicants for an occupation and recruit workers who need further training and/or experience to meet the firm's skill needs for the occupation. Skill gaps do not simply relate to formal qualifications. Employees in an occupation may have the necessary vocational qualifications for the occupation, but not the specialized knowledge, skills and experience needed to adapt to new technology and new methods of working.
National Skills Survey 2007 (South Africa)	Skills that are considered to be lacking or underdeveloped in enterprises.
Business Operations Survey 2008 (New Zealand)	A gap between the skills of existing staff and the skills required to do their job.
National Employment Survey 2006 (Ireland)	Skills areas that need upgrading in a firm's current workforce.
European Centre for the Development of Vocational Training (European Union Regional Working Group on Skills Needs)	Skill gaps exist where employers feel that their existing workforce has inadequate skill types/levels to meet their business objectives; or where new entrants to the labor market are apparently trained and qualified for occupations but still lack a variety of the skills required.
Academic Literature	
(Shah and Burke 2003)	A skills gap refers to a situation where employers are hiring workers whom they consider under-skilled or that their existing workforce is under-skilled relative to some desired level.
(Green, Machin et al. 1998)	A deficiency in relation to some suitably defined optimal level of skills
(Sutherland 2010)	Skills gaps are identified when an employee does not possess the skills required to do the job he/she does currently proficiently.
(Wickramasinghea and Zoyzab 2009)	A discrepancy or a gap arises when a competency an individual possesses is lower than required for job performance.
Industry Associations	
Australian Institute of Management (Australia)	The gap between an organization's skills needs and its current employee capabilities.
American Society for Training and Development (United States)	A skills gap is a significant gap between an organization's skill needs and the current capabilities of its workforce. It is the point at which an organization can no longer grow and/or remain competitive in its industry because its employees do not have the right skills to help drive business results and support the organization's strategies and goals.
Survey for the Indian Banking, Financial Services, and Insurance Sector (India)	Gaps between the [skills] expectations of employers and the performance of employees.
Confederation of British Industries (UK)	Skills deficiencies amongst existing employees that impact business performance.

Figure 4. A survey of varying definitions of the concept of skills gaps

Sources: (Government 2005; Development 2006; Young and Morrell 2006; Paterson, Visser et al. 2008; Training 2008; Management 2009; Shury, Vivian et al. 2009; Education Analytical Services 2010; Forum 2010; Shury, Winterbotham et al. 2010; Government 2011; Employment 20003)

		Aspects of Conceptual Commonality		Aspects of Conceptual Divergence	
Definition Source		Existing Staff	Normative	Occupational Proficiency	Linkage to Business Objectives
National Surveys and Government Bodies	National Employer Skills Survey (England)	●	●	●	○
	Skills in Scotland (Scotland)	●	●	●	○
	Future Skills Wales (Wales)	●	●	●	●
	Skills Monitoring Survey (Northern Ireland)	●	●	●	●
	Employment, Workplace Relations Committee (Australia)	●	●	●	○
	National Skills Survey (South Africa)	●	●	○	○
	Business Operations Survey (New Zealand)	●	●	●	○
	National Employment Survey (Ireland)	●	●	○	○
	European Union Working Group on Skills Needs	●	●	●	●
Academic Literature	(Shah and Burke 2003)	●	●	○	○
	(Green, Machin et al. 1998)	●	●	○	○
	(Sutherland 2010)	●	●	●	○
	(Wickramasinghea and Zoyzab 2009)	●	●	●	○
Industry Association	Australian Institute of Management (Australia)	●	●	○	○
	Society for Training and Development (United States)	●	●	○	●
	Banking, Financial Services, and Insurance Sector (India)	●	●	○	●
	Confederation of British Industries (UK)	●	●	○	●

○ Not Emphasized ● Specifically Emphasized

Figure 5. A review of definitional aspects of the concept of skills gaps revealing areas of conceptual commonality and divergence

Sources: (Government 2005; Development 2006; Young and Morrell 2006; Paterson, Visser et al. 2008; Training 2008; Management 2009; Shury, Vivian et al. 2009; Education Analytical Services 2010; Forum 2010; Shury, Winterbotham et al. 2010; Government 2011; Employment 20003)

<i>HR or Manager Respondent Bias</i>	<i>Evolving Business Needs Blur the Normative Threshold</i>	<i>Individual and Peer Evaluation Bias</i>
<p><i>Influence Effects</i></p> <p>HR departments may understate skills issues due to the need to justify previous and future training and development budgets. Studies have shown a positive relationship between non HR respondents to skills surveys and the reporting of skills issues.</p>	<p><i>Evolving Business Objectives</i></p> <p>Evolving business strategies in response to the industry competitive environment, technical change, and entry into new markets etc. may require specialized skills that current employees lack. The strategic business response to such forces may mean that current workforce skills do not match changes in company strategy, goals, markets, or business models. Thus, views about skills needs may be more relevant to the present state since defining future skills needs is more speculative.</p>	<p><i>Overestimation of Abilities</i></p> <p>Evidence from psychology and economics suggests that people are over confident regarding their abilities: They may overestimate their abilities in absolute terms; they may perceive themselves more favorably than others do; or they may perceive their performance more favorably in relative terms to that of others.</p>
<p><i>Respondent Subjectivity</i></p> <p>HR/managers may assess staff skills levels differently relative to performing a job or contributing to business objectives. HR/managers may also have different opinions on the importance of a particular skill to occupational proficiency or a particular occupational group's importance to contributing towards business objectives.</p>	<p><i>Changing Job Requirements</i></p> <p>Changing job requirements due, for example, to technology adoption or job promotion, might mean that a once proficient employee now lacks the skills to perform a new or evolving role.</p>	<p><i>Peer Positivity Bias</i></p> <p>Studies have shown that people rate familiar group members as better than average despite having very little information about the individual or their performance.</p>
<p><i>Occupations and Skills Are Contextual</i></p> <p>Occupation is often used to describe skills required by employees, but respondents may have different perceptions of the tasks and requirements of a job based on their business or workplace. Respondents may also have varying interpretations of the meaning of particular skills or merge skills (i.e. confusing communication and customer handling) since the deployment of skills varies with the requirements of the job, workplace demands, and with organizational structure and practices.</p>	<p><i>Some Employers are More Demanding</i></p> <p>Some companies may be more demanding of their employees whereby the performance threshold for occupational proficiency or contribution towards business objectives is higher at one company than another due to, for example, high performance work practices or employee involvement in decision making.</p>	
<p><i>Latent and Unreported Skills issues</i></p> <p>Latent skills needs may exist that HR/managers do not perceive because they are not aware of the skills required for performing a job or to meet business objectives. Unreported skills needs may also occur due to HR/managers having little hope that a skill issue could be resolved.</p>		

Figure 6. Sources of bias in operationalizing the measurement of skills gaps

Sources: (Klar and Giladi 1997; Hogarth and Wilson 2001; Hillage, Regan et al. 2002; Hoelzl and Rustichini 2005; Shury, Winterbotham et al. 2005; Watson, Webb et al. 2006)

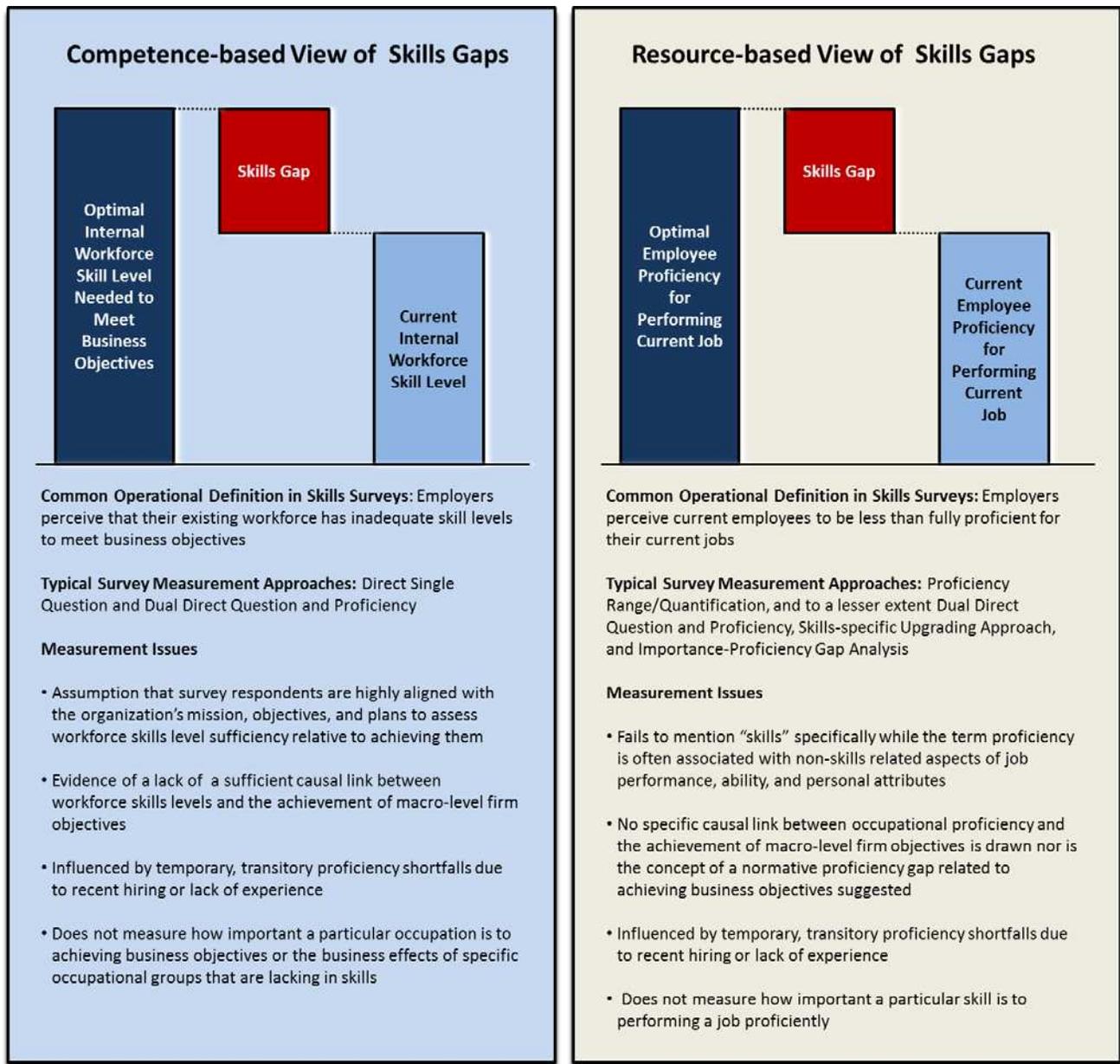


Figure 7. Conceptual views of the concept of a skills gap, associated measurement approaches, and measurement issues

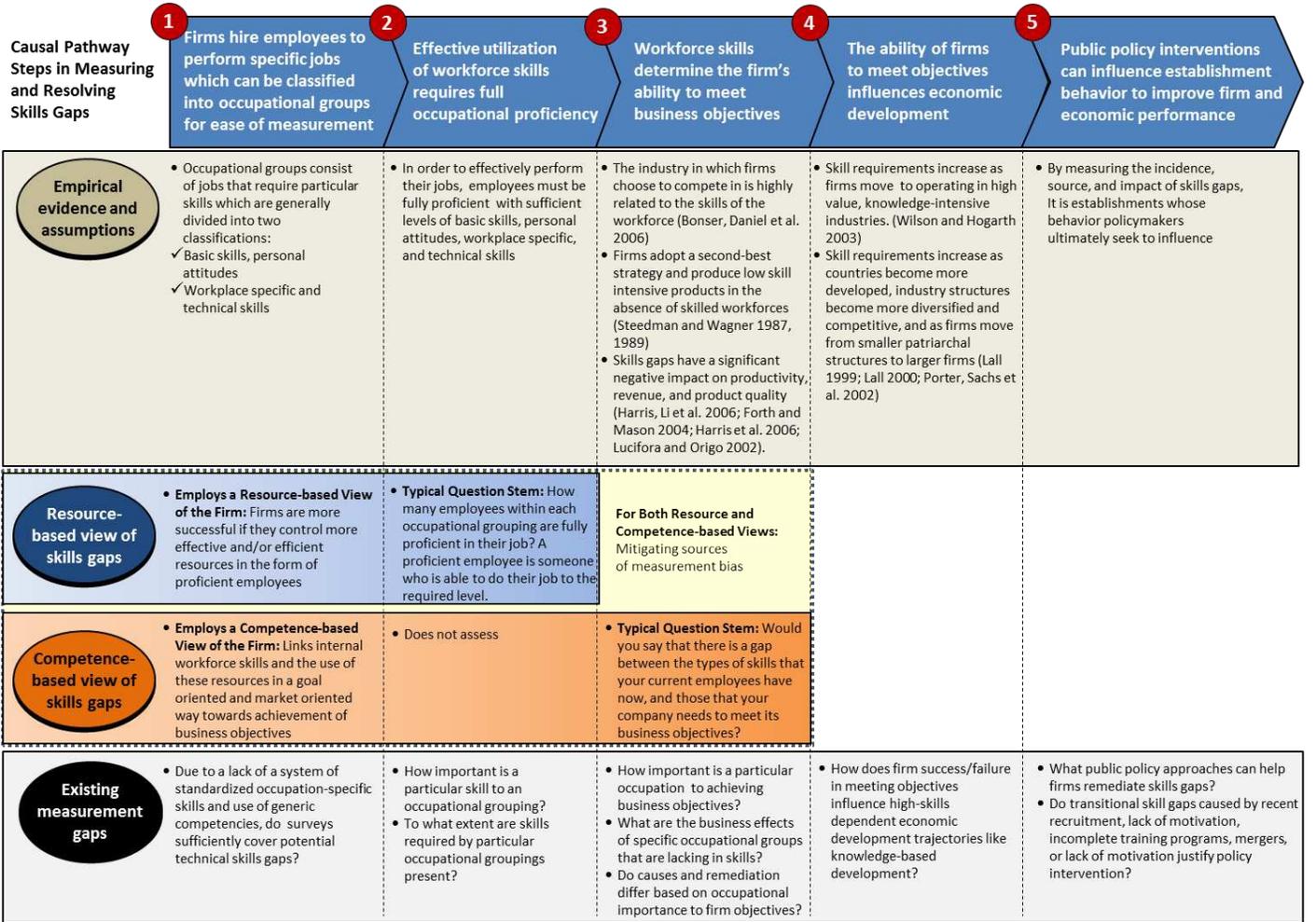


Figure 8. Causal pathway steps in measuring and resolving skills gaps

Causes of Skills Gaps Implied by Questionnaires	Survey Source						
	National Employer Skills Survey for England	Skills in Scotland	Northern Ireland Skills Monitoring Survey	Ireland National Employment Survey	Australian Institute of Management	New Zealand Business Operations Survey	American Society for Training and Development
Recruitment Difficulties <ul style="list-style-type: none"> • Recruitment problems • Poor quality or too few qualified candidates • Insufficient funds to employ qualified candidates 	•	•	•	•	•	•	•
				•			•
					•		
Insufficient Staff Development <ul style="list-style-type: none"> • Failure to train and develop staff • Low or no training budget • Lack of commitment by senior leaders to employee learning and development • Inability of older staff to acquire necessary new knowledge and skills • Inability of workforce to keep up with change 	•	•	•	•	•	•	•
					•		•
							•
				•			
	•	•	•			•	
Lack of Motivation (Staff lack motivation)	•	•	•	•		•	
Retention Difficulties <ul style="list-style-type: none"> • High staff turnover • Retrenchments 	•	•	•	•		•	
					•		
Strategy-skills Lag <ul style="list-style-type: none"> • Changes in company strategy, goals, markets, or business models • New products and services • New working practices • New technology 					•		•
		•	•				
		•	•				
		•	•				
Changing job requirements (Scope of job increasing)						•	
Incomplete Orientation and Integration <ul style="list-style-type: none"> • Lack of experience or recently recruited • Training program partially completed • Recent merger/acquisition 	•	•	•			•	
		•	•				
							•

● Included in survey questionnaire as a potential cause of skills gaps

Figure 9. Causes of skills gaps implied by survey questionnaires

Sources: (Campbell, Baldwin et al. 2001; Learning 2004; Development 2006; Learning 2007; Office 2008; Zealand 2008; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010)

Market and Institutional Failure Induced Skills Gaps	Human Resources Management Related Skills Gaps	Structural Skills Gaps	Transitional Skills Gaps
<p>Poor Skills Formation Policy</p> <ul style="list-style-type: none"> Lack or weakness of government institutions that prevent underinvestment in skills, provide adequate regulation, and coordinate stakeholders <p>Education and Training System Misalignment</p> <ul style="list-style-type: none"> Accessibility, quality, and the degree to which education and training systems produce employable students are insufficient <p>Insufficient Individual Investment</p> <ul style="list-style-type: none"> Unclear returns to particular skills which negatively impact individual skilling decisions 	<p>Insufficient Staff Development</p> <ul style="list-style-type: none"> Depressed levels or inadequately planned training and development <p>Poor Retention and Motivation Practices</p> <ul style="list-style-type: none"> HR practices that inadequately address employee retention or a misalignment of HR practices with sources of workforce motivation 	<p>Strategic shifts in response to changing business environments</p> <ul style="list-style-type: none"> Failure to increase and maintain workforce skills to build and renew firm competencies in response to changing business opportunities A strategy-skills lag in which current workforce skills lag new or expanded skills required by alternative strategic directions associated with competency renewal 	<p>Incomplete Orientation and Integration</p> <ul style="list-style-type: none"> Attributable to the beginning of the employee-employer relationship whether due to recent recruitment or post-merger employee integration. Presumably decrease as employees complete induction training and gain confidence in their roles.

Figure 10. A typology of the causes of skills gaps

Sources: (Campbell, Baldwin et al. 2001; Learning 2004; Development 2006; Learning 2007; Office 2008; Zealand 2008; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010)

An Open Systems Model of Organizations

Effects of Skills Gaps Implied by Questionnaires

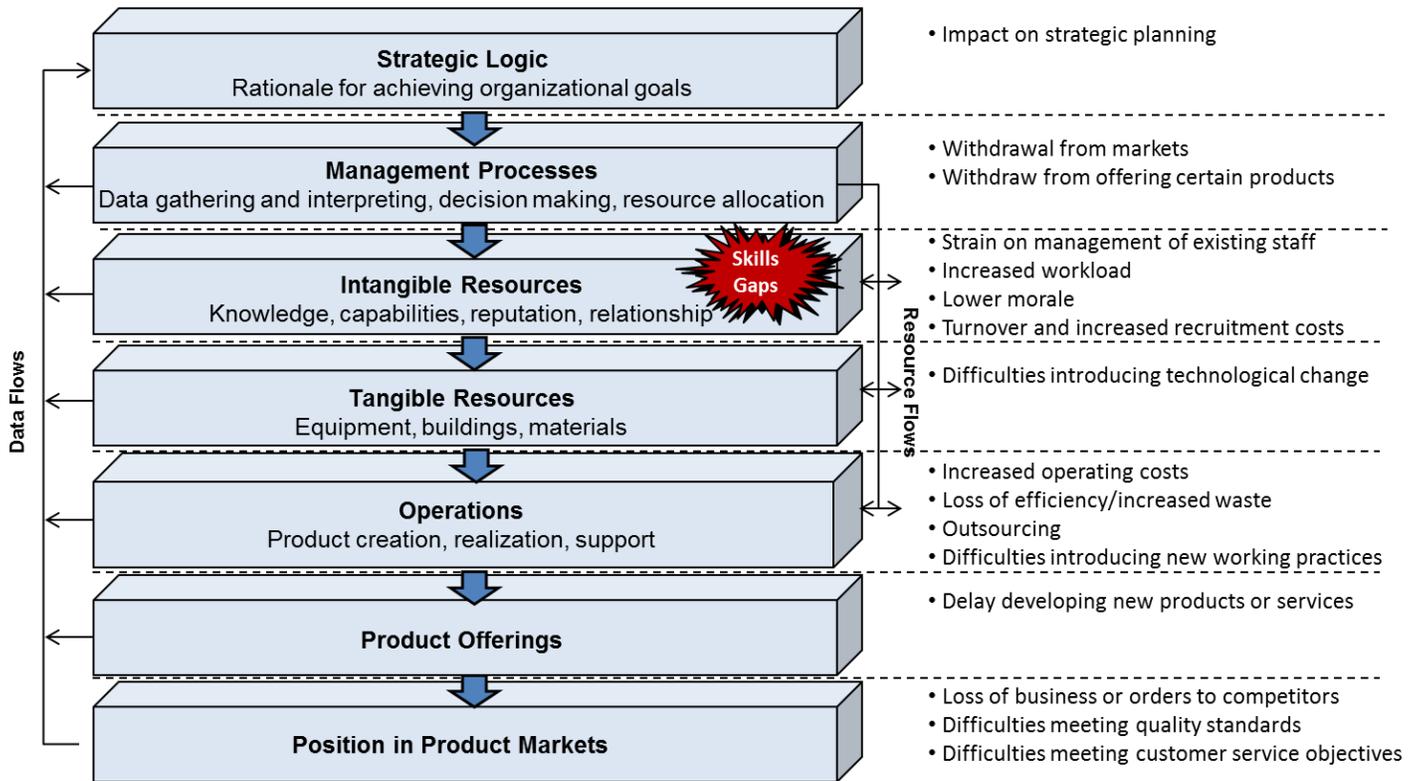


Figure 11. A classification of the impacts of skills gaps

Sources: (Sanchez and Heene 1997; Campbell, Baldwin et al. 2001; Learning 2004; Development 2006; Learning 2007; Office 2008; Zealand 2008; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010)

An Open Systems Model of Organizations

Remediation Strategies for Skills Gaps Implied by Questionnaires

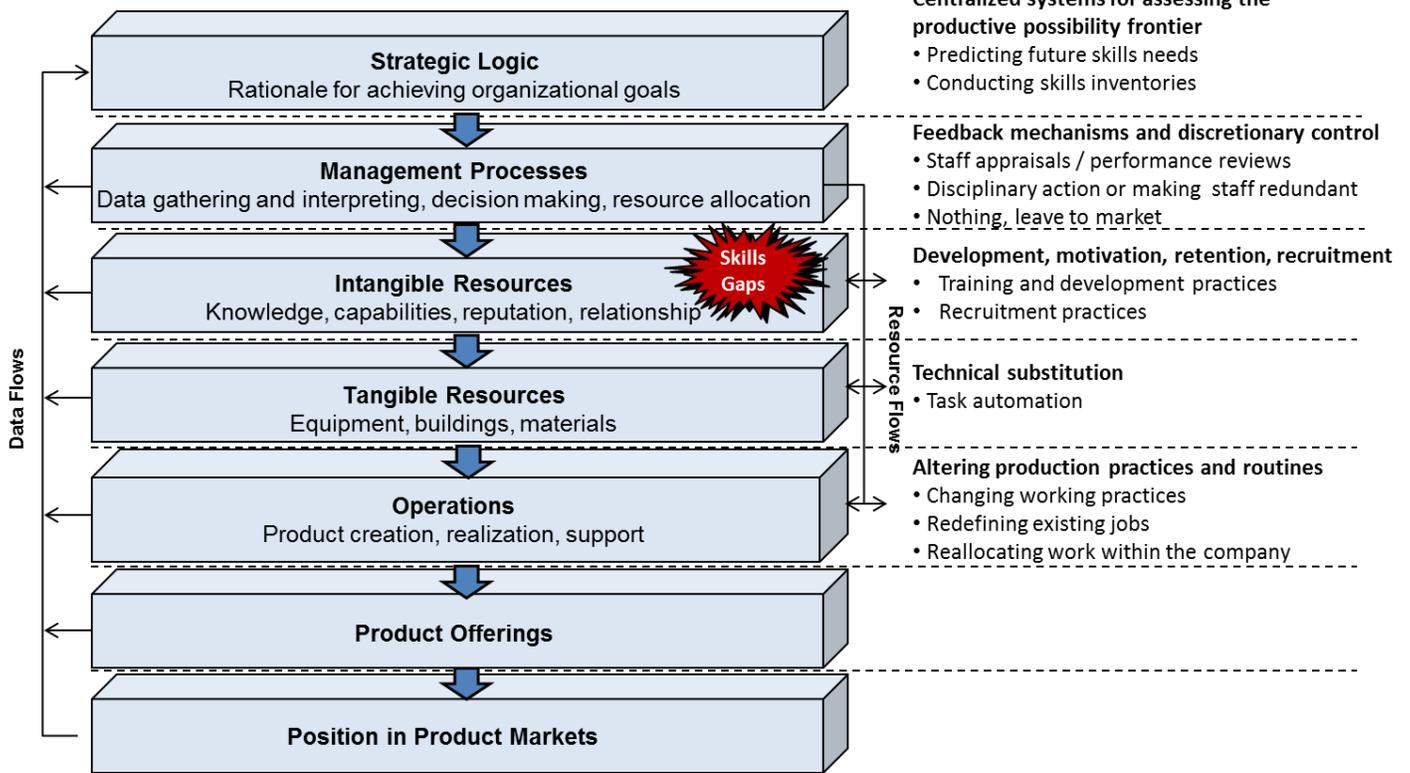


Figure 12. A classification of remediation strategies for skills gaps

Sources: (Sanchez and Heene 1997; Campbell, Baldwin et al. 2001; Learning 2004; Development 2006; Learning 2007; Association 2008; Office 2008; Zealand 2008; Shury, Vivian et al. 2009; Education Analytical Services 2010; Shury, Winterbotham et al. 2010)



Figure 13. A recommended establishment skills survey approach to measure skills gaps