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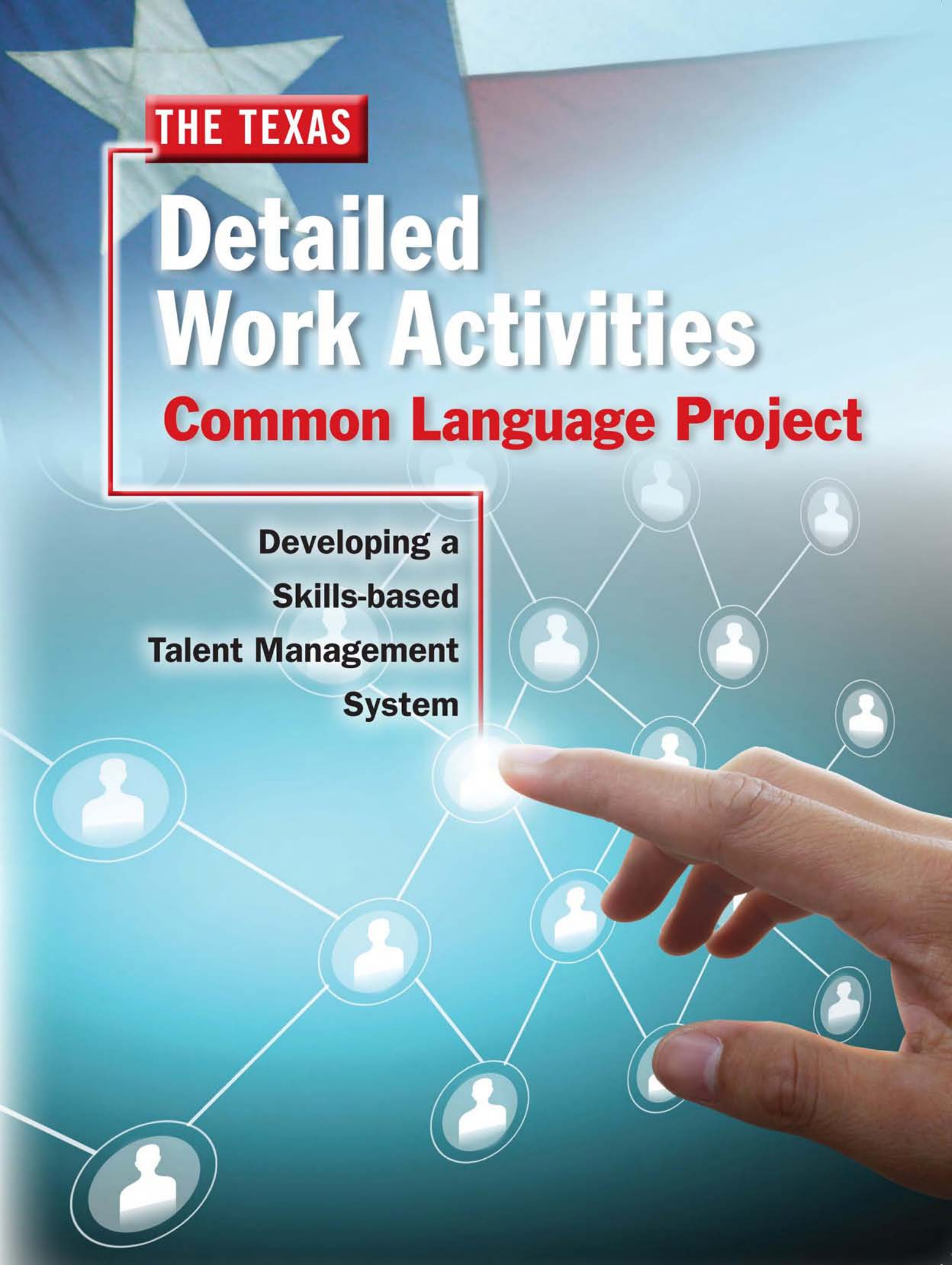
Detailed Work Activities
Common Language Project

Developing a

Skills-based

Talent Management

System

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Preface and Acknowledgements

At a recent conference on labor market dynamics, a U.S. Census Bureau researcher remarked that "the world is a messy place." His observation was in the context of understanding the complex, macroeconomic dynamics of job creation in a global economy. But the reference could just as easily be said about the microeconomic relationship between employers seeking qualified applicants, students and jobseekers trying to find a rewarding employment niche, and educational institutions charged with the responsibilities for making sure that the state has an educated and appropriately skilled workforce. The authors of this white paper contend that much of this messiness is due to the lack of a common language around which to communicate the huge amount of labor market activity that eventually ends in the hiring process.

The Detailed Work Activity (DWA) Common Language Project arose to help facilitate this inherently inefficient and chaotic process that endeavors to connect employer skill needs with the educational system and, ultimately with the talents and capabilities of workers. A major premise behind the project is that when one of the critical stakeholders in the labor exchange process uses the word "skills" it does not necessarily connote the same metric to all. In truth, we have heard the word "skill" used interchangeably to refer to hard technical skills, to workplace basics or soft skills, to innate worker talents, characteristics or behaviors, and to the learning objectives

embedded in an educational curriculum – all in the same meeting! Regardless of the complexities of implementation, the DWA Common Language Project is really just an effort to help all these well-meaning stakeholders better communicate with each other around the concept of talent development and in the form of a common skills language.

This project has had many contributors and collaborators, each of which has helped us move a little closer to our goal. The collaboration between the Texas Workforce Commission and SKillsNET Enterprises has been the epitome of a public-private partnership. I will be forever grateful for the tireless and dedicated efforts of Michael Brown, President and CEO of SKillsNET, to help make the DWA Common Language Project a success. Michael always wanted the best for Texas and gave his time and many talents to the creation of an open source talent management system that could benefit everyone. John Romanek, manager of labor market information applications and development in the Labor Market and Career Information Department of the Texas Workforce Commission, continues to serve as innovator and technical authority on how to make DWAs work in the labor exchange process and for purposes of regional labor market analysis. John is responsible for the vision and expertise that turns a library of skills statements into meaningful and actionable tools and reports. There have been scores of other persons and groups, too numerous to mention here, that have shared their expertise and their talents to help bring the DWA a little closer to the common language facilitator we all hope it will become.

Disclaimer
The views and opinions expressed in this white paper are solely those of the principal authors. They do not necessarily reflect the Texas Workforce Commission's views nor should they be construed as official policy of the State of Texas. This white paper is intended to document the underlying philosophies of the Detailed Work Activity (DWA) Common Language Project and describe the various phases of data development, the labor market context within which this initiative was originated, and the many potential applications for the DWA data sets. It is designed to describe the administrative processes undertaken to date to bring the project to fruition, and to stimulate further thinking about the role of skills in assessing the relationship between worker capabilities and employer hiring requirements. This white paper should be considered as documenting our work-in-progress on the use of DWAs as a translator and facilitator for more efficient labor exchange and educational alignment. Your comments, observations, suggestions and collaboration are invited.

Richard Froeschle, *Director*
Labor Market and Career Information department
Texas Workforce Commission

Background

The Texas DWA Common Language Project

Marathon Oil is making big investments in Texas. They see the potential of the Eagle Ford shale region as a long term profit center and they are building support offices and drilling oil and gas wells throughout the area. They're also making a major investment in human capital, looking for the workforce that will drive profitability in the region. But despite persistently high levels of unemployment in South Texas, Marathon has difficulty finding workers with the right mix of skills. "We post a job and get 400 resumes, 398 of them don't match the skills we need at all, one is close and one is on target" says Rick O'Brien supply chain manager for Marathon, "and that's a waste of time for us."

Marathon's goal is to identify workers with sufficient skills to address a very fluid work environment. If you ask them what skills they're looking for, the list is broad and in constant flux. Yet Marathon is just one of thousands of examples where global economic activity, and human capital investment, is getting increasingly complicated.

And the nature of work is becoming similarly more complex. In 1900, the U.S. Census listed the top four occupations for Americans as Farmers, Planters and Overseers, Agricultural Laborers, Laborers Not Specified, and Servants and Waiters. Over 53 percent of "gainful workers" were employed in these occupations. The labor market has undergone significant upheavals since the turn of the century when 38 percent of the workforce was in farming and 86 percent of Texas workers were men. Today women represent almost 45 percent of all Texas workers and the global economy is ushering in more changes for the role of labor in a productive society.

As the labor market has become more diverse and complex, the various methods business uses to describe the world of work have become similarly convoluted. The federal O*NET database has compiled a list of over 43,000 employer "lay titles" – far too many for which to collect accurate statistics. Moreover, these titles are too disparate and ill-defined to use as the only currency connecting business to the education and workforce training system.

A competitive education and workforce development system must be market driven and responsive to, if not directly aligned with, employer skill requirements. There should be at least minimum core skill requirements, if not standards, around which education curricula can be made responsive to the labor market. The economic backdrop of an increasingly global economy, the recent devastating recession and subsequent tepid recovery, and structural skills mismatches between available jobs and the skills of the unemployed, only punctuates the importance of a comprehensive view of workplace skill requirements.

> **"Only through strong linkages and enhanced collaboration among education, economic development, business and workforce partners will we increase our return on our... investment of public education dollars and increase the business community's satisfaction with the education and workforce development systems."[1]**
>
> **Carnevale, A.** and **Fry, R.A.,** The Economic and Demographic Roots of Education and Training

And it is critical that the private sector is engaged in validating those necessary skills and be involved in creating effective workforce solutions. The Texas economy is among the healthiest in the nation, with diverse and unique comparative advantages within each of the 28 local workforce board regions throughout the state. But to take advantage of the economic strengths of Texas will require an increasingly skilled labor force. Thus, few would argue that the alignment between workforce development, education and skills training is a key economic development strategy.

However the information threads connecting the business community, economic development, education, and workforce preparation programs are not naturally, conceptually or definitionally uniform. Thus, even our best strategies to engage employers in education and workforce development programs or to communicate employer skill needs and hiring requirements to the education community often fall short.

In truth, it is not uncommon for educators, workforce professionals and employers to talk around each other using concepts and jargon unique to their own environments. This hinders effective integration of even the best intentioned program initiatives. The result has been a multitude of compartmentalized workforce and education programs, marginally successful initiatives, wasted scarce resources, poorly focused directives and, most critically, an increasingly alienated employer community.

To be sure, there are no magic bullets to instantly connect these many well-intentioned, and in some cases highly visable education, workforce and economic development initiatives into a single cohesive strategy. Funding with restrictive purposes, vested self-interests and the simple fact that there is no single right way to organize and implement a comprehensive education, workforce and economic development system all share responsibility for the current situation. But while there may be no omnibus solution, it is possible to move the proverbial ball forward by addressing some of the fundamental impediments to effective synergy. Step one in that process is the development of a common skills language.

BEEN THERE, TRIED THAT!

Creating a common language for skills is hardly a unique concept. Building on premises put forward by Dr. Bob Glover in his 1993 work *Developing a System of Skill Standards and Certification for the Texas Workforce,* the Texas legislature unsuccessfully attempted to create a Texas Skills Development Corporation. Texas has a current, but limited effort in the form of the Texas Skills Standards Board, patterned after a similar nationwide effort referred to as the National Skills Standards Board. The European community is in the process of creating a skills

> **A robust economy is one that can supply the right people with the right skills at the right time. Innovative partnerships make this happen — and ensure better news for America's economic future in the century to come.**
>
> **Penny Pritzker,** *chair of Skills for* America's Future

passport system, EuroPass, which includes a common core of skills statements in multiple languages. The U.S. Department of Labor created the O*NET taxonomy and data base as a common framework to describe the world of work. The O*NET is such a significant and ubiquitous resource that the organizing concept of this common language project, the Detailed Work Activity (DWA), is an expansion of a domain of the same name within O*NET. But none of these efforts have successfully engaged the employer community nor addressed the diverse spectrum of workplace skill requirements.

Critics argue that skill sets across all jobs are so diverse that it is impossible to catalog them all. We agree. But rather than be paralyzed by the thought that not every workplace skill can be identified and cataloged, this effort has adopted the longstanding Pareto Principle -- sometimes known as the "80/20 Rule." This initiative presumes that the vast majority of work can be condensed into a manageable body of skill statements, while recognizing that there will always be a periphery of skills, and much more detailed or discipline-specific work tasks, including those unique to individual employers, for which efficient categorization will not be possible. This effort does not ignore these skills, but their reality does not impede the efficient documentation of the vast majority of core workplace skills.

As one of the fastest growing states in the union, Texas will have an enviable labor pool from which to create highly skilled workers. The biggest challenge is to ensure that innate Texas talent is not only well-educated but in possession of the skills and abilities in demand by the employer community. By understanding and applying fundamental principles of how work is organized within the economy, which supply chain partners and inputs are critical to successful business operations, and by leveraging publicly available resources across agencies with common objectives, it is clearly possible to better organize and align an interconnected education and workforce development system with the needs of the business community.

It is with these background premises that the journey began to create a common currency or uniform skills language to improve communication among the various stakeholders in the arena of education and workforce development.

The DWA Common Language Project fits the same progression used to characterize many of U.S. Government's Defense Advanced Research Projects Agency (DARPA) technology advances: first impossible, then improbable, eventually inevitable.

Introduction

Anyone who ever attended a mixed gathering of private business, education or workforce professionals likely noticed one thing: each constituency has its own language. Admittedly, the proprietary language of each stakeholder group works well for that constituency; thus the lack of consistency is not the fault of any single group. But the ability to seamlessly communicate among constituencies is seriously hampered by the lack of a common language. Nowhere is this language barrier more pronounced than in the discussion of "skills" – a term ubiquitous for all groups but without uniform definition.

The term "skills" not only lacks rigorous, consistent definition across these multiple stakeholder groups, but it is often used interchangeably with other words equally ill-defined, including terms such as: talents, technical and/or academic competencies, tasks/duties, job posting or hiring requirements, personal traits, skill objects, proficiencies, knowledge, learning objects, abilities, academic credential/degree, industry certification, qualifications, OJT/experience, performance mastery, general work activities or detailed work activities.

Thus, when a stakeholder uses the word "skills" in mixed company, it is incumbent upon the listener to interpret the speakers' background and meaning before attaching their own operational definition to the term. This exercise is clearly done at the peril of their own misinterpretation – much less with any basis of empiricism. And while this lack of a common language is pervasive across diverse disciplines and professions, the lack of a uniform definition of worker and workplace skills poses a unique problem to the labor exchange process.

Every stakeholder in America has a vested interest in a smooth and effective labor market interchange. Business cannot function and grow without a skilled workforce. Educational intermediaries have a responsibility to prepare the citizenry for future labor market success. Individual jobseekers need a way to communicate what they know and can accomplish, and be able to articulate that skill set to an employer in search of such skills. Clearly a common language is a necessary prerequisite to effective worker preparation and labor exchange.

HUMAN CAPITAL DEVELOPMENT MODEL FRAMEWORK

A common language must have context or a culture in which to operate. Even a common language for skills cannot address every worker preparation challenge in isolation of a whole person development approach. It is evident that occupation-specific skills are just one measure of the talent development process that includes core academics, workplace fundamental skills and firm-specific skills. Thus the common

language for occupational skills must be presented in the context of a multi-dimensional talent development process.

The academic literature is full of multi-tiered competency models that examine every aspect of education and training, from the perspective of industry sectors such as advanced manufacturing to individual professions such as accounting or teaching.

For example, the 1996 *Building Linkages* project attempted to create a voluntary skills standards system, teaming the U.S. Department of Education Office of Vocational and Adult Education (OVAE) with the National School to Work Office and the National Skills Standards Board.

This effort resulted in 16 career clusters, complete with career pathways that facilitate cross-occupation competency attainment. This model was designed to help align core cluster curricula with occupational options across multiple exit points, e.g. occupations that require Associate's degrees and Bachelor's degrees share certain core academic competencies. The U.S. Department of Labor Employment and Training Administration (DOL/ETA) similarly publishes several well-articulated, nine-tier industry competency models that cover everything from personal effectiveness to management competencies
(see www.careeeronestop.org).

Unfortunately, these more extensive and elaborate models lack the three things critical to broad implementation at the grass roots level; simplicity of design, the ability for each stakeholder to easily recognize their potential role in the talent development process, and substantial, continuous business engagement. Thus, before a common language for skills can be created, there must first be a simple contextual framework. Since a major objective of the DWA Common Language Project is practical application and stakeholder engagement, an elemental Human Capital Development Model (HCDM) was created. This model has only four tiers; core academics, workplace basics, occupational skills and firm-specific skills.

The DWA Common Language effort is not intended to encompass every aspect of talent development. The foundation for all work starts with solid academic preparation. Once known as the Three R's (reading, 'riting and 'rithmatic), the ability to read with comprehension, communicate verbally and in writing, the ability to manipulate numbers and to interface effectively with technology, constitute the fundamental requirements for good citizenship and employability. The DWA effort assumes that the academic community has successfully taught these knowledges to every student and builds upon that foundation.

Nor does the DWA effort concentrate on workplace basic skills, sometimes known as soft skills or workplace fundamentals. The architects of the DWA Common Language Project readily admit that when
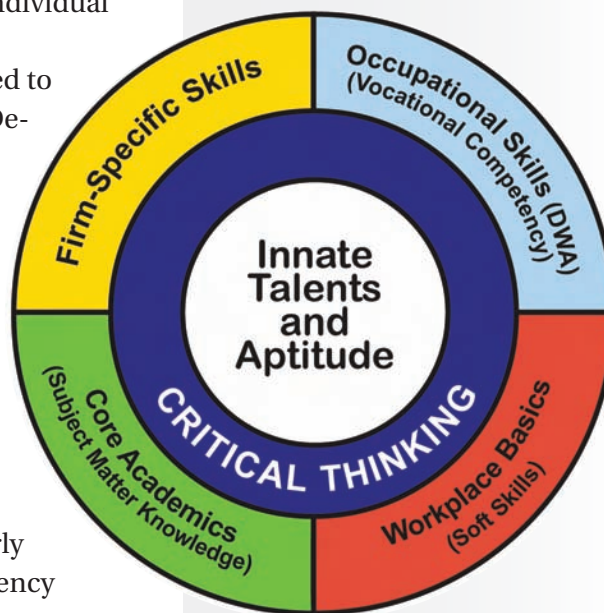
Human Capital Development Model

"The DWA common skills definitions will benefit our students by helping our Texas schools better align curriculum and training to the needs of local employers."

Laura Bledsoe,
Regional Vice President,
Operations for Texas, Kaplan Higher Education Campuses

queried about the kinds of workers they want, employers tend to focus their comments on metrics of social competence such as teamwork, work ethic, leadership skills, honesty, perseverance, etc. Similar to the Academic tier, the DWA Common Language Project presumes the importance of these work behaviors is communicated to all future workers -- but they are not a focus here. It is worth noting however that understanding the behaviors associated with each work activity is critical. This alignment of work activities and measures of social competence is an important part of the DWA Common Language Project. As such, a companion data development project is underway that seeks to attach the principle workplace basic requirements to each DWA statement (note: A list of thirty (30) workplace basic behaviors has been created to serve as a template for this effort. See R. Froeschle and T. Theis *Workplace Basic Skills: Employer Demands and Worker Preparation* at www.lmci.state.tx.us/shared/PDFs/BYN-2009-web.pdf for a template to address the workplace basics issue).

Lastly, there will always be skills that workers can only learn within the workplace of an individual employer. Here again we draw on the Pareto Principle to concentrate on the core of occupational skills that drive the economy. This effort recognizes that no college or training institution will ever be able to keep pace with all the evolving skills in diverse, individual work environments throughout Texas. Business will always have a role in worker training. In fact, the argument could be made that since business profits from having students with strong academics, exemplary work attitude and behaviors and solid, core vocational skills; they should and will be willing to make additional training investments on firm-specific tools, technologies and business processes. The DWA Common Language Project embraces this reality and offers a model for business to build skills-based career lattices within their own organizations that align with external education and training programs.

It is worth a brief digression to reinforce the importance of critical thinking skills within the Human Capital Development Model, which underlie the DWA Common Language Project. At the core of the HCDM model are the innate talents and aptitudes of the individual. Also at the core, and underpinning each of the four tiers, are *critical thinking skills.* Critical thinking is often lumped together with other workplace fundamental skills such as teamwork, work ethic, leadership, integrity, pride in performance, initiative etc. However, the Human Capital Development Model singles out this attribute as fundamental to the mastery of all four tiers of the talent development process.

There are two drivers that reinforce the importance of critical thinking skills: 1) in most cases, a competitive business edge is gained not just by knowing, but in the creative application of knowledge, and 2) the average labor force participant will spend almost 40 years at

work. There is no way for a teacher to know what skill or knowledge will be salient 20 years after a person graduates with a terminal degree. This is the premise behind the importance of lifelong learning. Teaching critical thinking skills is what allows students to excel in the labor market years after they graduate from school. It is no wonder that employers crave workers, at all levels of their organizations, which have augmented their subject matter expertise with strong critical thinking skills.

But while we recognize the importance of critical thinking skills, firm-specific knowledge, workplace basics, and core academics as critical to the intellectual development of a potential Texas worker, the bottom-line is this: ***employers need workers who know how to do certain things.*** Each unfilled job opening has skill requirements that are in search of worker capabilities. The DWA Common Language Project provides the medium to communicate and align worker capabilities with employer skill requirements.

What is a DWA and What Makes DWAs So Important?

> **"Employers have been going for skills, not people; which is why we've seen the enormous vitality in the temp agencies. Employers have decided they can keep up huge productivity gains by hiring skills, not people."**
>
> **Jane Oates,** *Assistant Secretary*, U.S. Department of Labor

We have thus far discussed the importance of a common language and established the context of occupational skills development among other segments of talent development. But what is a detailed work activity and what makes it so important? Very simply, a detailed work activity or DWA is one domain or data category defined within the federal O*NET occupational classification system and frequently used in business talent management systems. The O*NET is the federal government's statistical and taxonomic effort to organize and describe work and the characteristics of workers relative to occupational titles. The O*NET occupational taxonomy is closely tied to another federal occupational classification system called the Standard Occupational Classification system or SOC. The federal Office of Management and the Budget maintains the SOC taxonomy which is mandated for use in the collection of all federal statistics relating to occupational titles. The SOC is used in most federal and state labor market information systems, including the decennial Census and the American Community Survey (ACS), as the common occupational unit for documenting employment and wages and to summarize knowledge, skill and ability (KSAs) requirements of the workplace.
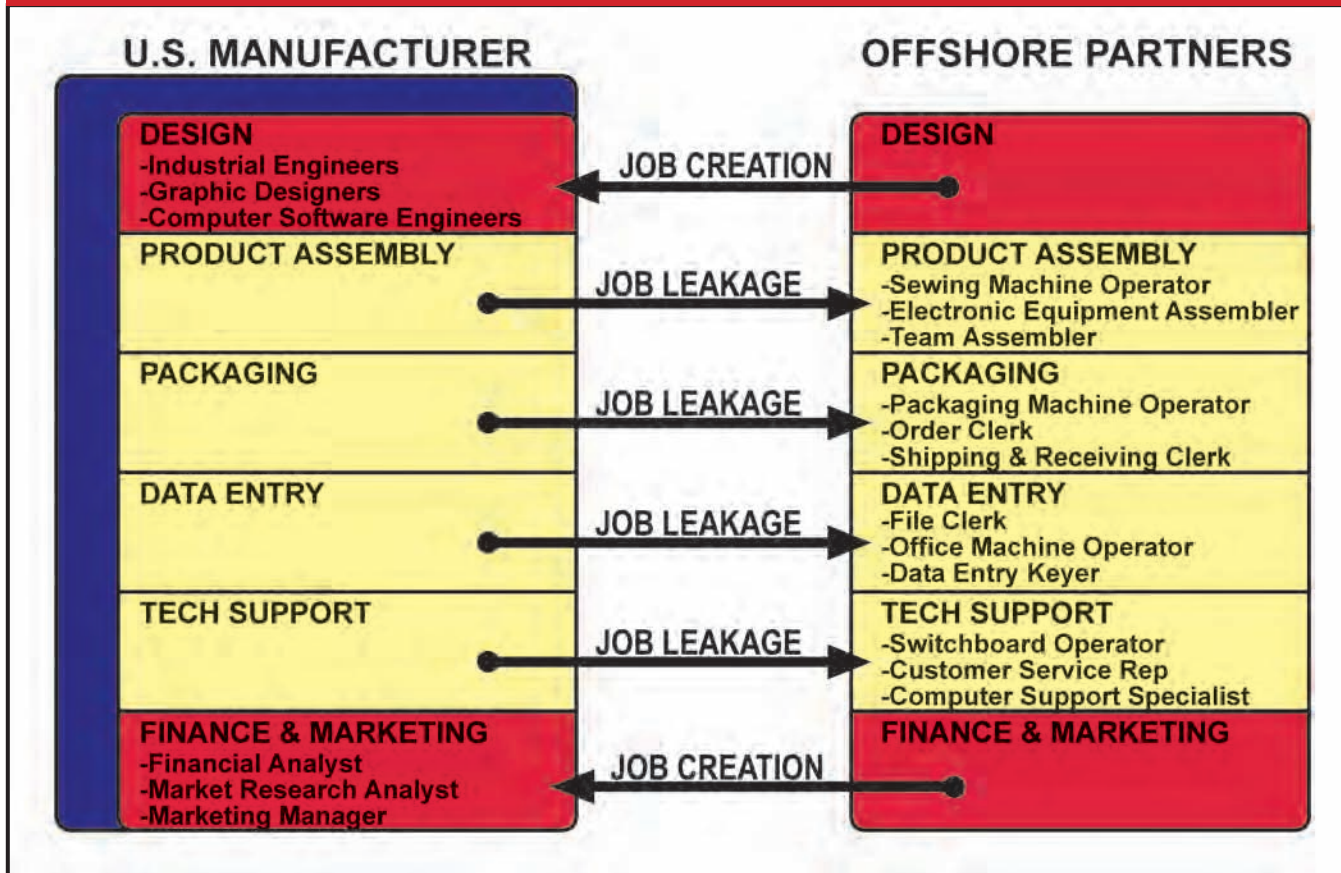
The SOC taxonomy, and the more extensive O*NET data base, provide uniformity at the occupational level. Widespread use of the SOC and O*NET taxonomies have vastly improved the ability to compare occupational characteristics, such as projections or wages, across regions and states. It has improved the ability to combine various occupational data sets created by disparate stakeholders. But occupational titles lack adequate signal strength to communicate employers' needs and expectations clearly and unambiguously to other stakeholders in workforce development. More importantly, occupational titles simply lack sufficient granularity to facilitate efficient matching of job-seekers' credentials and qualifications to actual hiring criteria for vacancies posted in the electronic labor exchange. Thus, there is added emphasis on understanding work through aggregations of skills.

Moreover, as the labor market becomes more dynamic and globally competitive, certain combinations of knowledge, skills and abilities which traditionally have been bundled together under an occupational title are being decomposed. Some unbundled occupational tasks are being offloaded to machines. Others are migrating offshore to lower wage work environments. Still others are rendered obsolete by disruptive innovations. All stakeholders in workforce development have a shared interest in developing a high resolution, commonly understood and more dynamic framework for clearly signaling what business ex-

"High Resolution Globalization"
Offshoring of Functions, Not Industries

U.S. MANUFACTURER

OFFSHORE PARTNERS

DESIGN
-Industrial Engineers
-Graphic Designers
-Computer Software Engineers

JOB CREATION ←

DESIGN

PRODUCT ASSEMBLY

JOB LEAKAGE →

PRODUCT ASSEMBLY
-Sewing Machine Operator
-Electronic Equipment Assembler
-Team Assembler

PACKAGING

JOB LEAKAGE →

PACKAGING
-Packaging Machine Operator
-Order Clerk
-Shipping & Receiving Clerk

DATA ENTRY

JOB LEAKAGE →

DATA ENTRY
-File Clerk
-Office Machine Operator
-Data Entry Keyer

TECH SUPPORT

JOB LEAKAGE →

TECH SUPPORT
-Switchboard Operator
-Customer Service Rep
-Computer Support Specialist

FINANCE & MARKETING
-Financial Analyst
-Market Research Analyst
-Marketing Manager

JOB CREATION ←

FINANCE & MARKETING

pects workers to know and be able to do.

In an increasingly dynamic, skills-driven economy, occupational titles are increasingly poor proxies to define worker capabilities and employer skill requirements. To facilitate a better match between worker skills and business needs, there must be a granular and commonly understood skill framework that, on one hand, clearly explains what workers can do and, concomitantly, what an employer needs a worker to be able to do.

To address these labor market realities, the Labor Market and Career Information Department of the Texas Workforce Commission (TWC/LMCI) began an initiative to develop a structure and data set that allows stakeholders to transcend occupational titles as the sole means to describe these increasingly complex labor market dynamics. This effort was dubbed the DWA Common Language Project.

The creation of a common language to achieve this objective requires several critical components.

1) The construct has to be transferable across multiple stakeholder groups. The language must have relevancy to employers in how

they organize work and jobs, recruit talent, assign work tasks and sustain workforce vibrancy. The educational system, at least those parts that provide occupationally-specific learning, must be able to connect or translate their existing organizing constructs into the new language (such as the student learning objectives for Career and Technology Education or the Classification of Instructional Programs for higher education). Perhaps in an ideal world these concepts would already be closely aligned, but that is not the case. There must be enough similarity to the work being done by each stakeholder so they can visualize an easy walk across the bridge of adoption.

2) The new common language should build on some existing construct that already has wide acceptance. The task is too big to start from scratch and expect that all stakeholders will abandon their existing taxonomies in favor of yet another next, new thing in the area of skills. The impressive work done by the National Skills Standards Board and the *Building Linkages* project are examples of the adoption headwinds faced by even well-designed, well-funded constructs when they are created anew in isolation of existing organizing standards and government reporting requirements.

3) The common language cannot lose sight of the objective, which is to improve the ability of stakeholders to understand and respond to labor market dynamics. As such, although the goal is to increase the granularity of the description of work, the common language must be additive back to occupations. Moreover, those occupations must be additive back to larger macroeconomic organizing principles so that broader projected changes in industry or occupational composition can be readily translated back into granular work activities. More simply, the common language must be able to answer the question of what skills are necessary to meet business demand in the context of general economic growth.

Given these underlying principles, TWC/LMCI staff weighed various alternatives. But all roads led back to the federal O*NET data base and the DWA domain in particular. The DWA domain in O*NET consists of roughly 2,300 statements that are essentially descriptions of business activities undergirded with task statements. However the DWA statements have one very important aspect that distinguishes them from task statements and that is transferability. Clearly the world of work is composed of tens of thousands of job specific task statements that are far too numerous and fluid to catalog or measure. The DWA offers a slightly higher level description of work that is performed in roughly the same way across multiple occupations. Indeed, a DWA statement cannot be included in the library if it is not performed by workers in many

different occupations.

The other advantage of building on the shoulders of O*NET is that it is closely aligned with the Standard Occupational Classification (SOC) system. The SOC gives us two distinct advantages; 1) it is mandated for all federal occupational data collection entities so it is commonly used and understood, and 2) it offers a direct relationship with industries (through a state or national industry-occupation matrix) that allows for the connection back to larger macroeconomic trends and offers a direct connection back to employers – all of whom themselves are organized in accordance to industry classification through the North American Industrial Classification System (NAICS).

It was thus agreed that the O*NET DWA library would be the point of departure for the Texas common language initiative. But this choice was not without challenges. The O*NET DWA statements left much to be desired in terms of grammatical consistency, phrasing and uniformity across all 800 plus occupations in the SOC taxonomy.

Operational Details

Moving the DWA Common Language Project Forward

The DWA approach to skills analysis is very appealing because it makes intuitive sense on many levels. But the creation and application of a skills -based language in a larger environment is entirely untested. The existing O*NET DWA domain offered a starting point but it is fraught with syntax and occupational coverage problems. As importantly, if DWAs were to become the common language for skills they had to be recognized by the private sector. Not only recognized but validated by sufficient numbers of Texas employer subject matter experts (SME) so as to lend gravitas to the effort and assure leaders in the education and workforce communities that the DWA library reflected the skill needs of private industry.

To achieve this mammoth task, TWC/LMCI issued a competitive Request for Proposals (RFP) and engaged the services of private vendor SkillsNET® Enterprises under the leadership of founder and CEO Michael Brown. SkillsNET is a nationally recognized leader in job analysis and designing human capital interoperability systems. Under contract to the TWC, SkillsNET embarked on a tireless journey to market the potential of the DWA common language to Texas employers and to engage their time and staff expertise to validate the original O*NET DWA domain.

This project did not happen overnight. There was no earmarked State or Federal grant funds specifically made available to underwrite

this initiative. Using funding provided to states by the DOL Employment and Training Administration (DOL/ETA) to support general workforce information, the project was broken up into three separate rounds of validation that spanned two years. SkillsNET started by revising and restructuring original O*NET DWA statements for 760 occupations commonly found in Texas industry staffing patterns. As a point of departure, SkillsNET cognitive scientists and industrial psychologists reviewed the original library of DWA statements in the O*NET content model for syntactical consistency, level and clarity. Inconsistently worded DWAs were rewritten in a straight forward language devised by SkillsNET. That syntax is consistent with the format approved by the Institute of Electrical and Electronics Engineers (IEEE), the International Standards Organization (ISO) and the American National Standards Institute (ANSI) for cross-industry communications. A side benefit to this standard is that the syntax also facilitates instructional delivery that is compliant with the Sharable Content Object Reference Model (SCORM) developed for the Defense Department's e-learning programs -- a standard subsequently adopted by other federal agencies. DWA statements containing multiple action verbs and/or multiple disparate objects were parsed into single verb-object statements. Unnecessarily duplicative DWA statements were eliminated.

After the initial scrubbing and restructuring of the original O*NET DWA library, it was time for an external validation process. SkillsNET staff used proprietary online technology to secure validation of, and updates for, a new DWA library from subject matter experts i.e., incumbent workers (a.k.a. subject matter experts or SMEs), and first line supervisors from Texas business establishments. By the end of the validation project, over 6,000 SMEs from almost 3,000 employers throughout Texas had provided input to the process. A table showing some sample DWA statements for selected occupations with varying education levels is included below to demonstrate the syntax and level of granularity of a typical DWA.

The first layer of the Texas DWA Common Language Project comprising a comprehensive, employer-validated library of DWA statements for the Texas occupational universe was completed in August 2010. The new library cross-references each revised and validated DWA to any of the 760 occupations (by SOC code number and SOC title) where it is required. A detailed accounting of the SkillsNET DWA valida-

tion process is provided in Appendix A of this white paper.

Sample

Detailed Work Activity Statements for Occupations with Varying Education Requirements

Occupational Title	DWA #	DWA Statement
Retail Salespersons	00932	Maintain records, reports, files, listings, or logs
Retail Salespersons	01543	Sell products or services
Retail Salespersons	01686	Check-in/Check-out customer using computer or cash register
Retail Salespersons	01706	Operate computers to enter, calculate, access, and retrieve data
Retail Salespersons	02363	Answer questions from employees, colleagues, customers, or public
Retail Salespersons	03070	Collect deposits, payments, funding, or fees from internal & external parties
Retail Salespersons	05368	Greet customers, guests, visitors, or passengers
Retail Salespersons	04134	Provide customer service
Retail Salespersons	05331	Consult with customers concerning needs
Retail Salespersons	00311	Use oral or written communication techniques
Retail Salespersons	01008	Manage inventories or supplies
Retail Salespersons	03507	Inspect work products & materials to verify quality, specifications, damage
Retail Salespersons	12527	Track deposits, payments, funding, or fees from internal & external parties
Retail Salespersons	00443	Authorize credit charges
Butchers & Meat Cutters	01188	Operate production equipment/machinery
Butchers & Meat Cutters	06435	Measure products or materials
Butchers & Meat Cutters	04890	Inspect meat or meat products
Butchers & Meat Cutters	00819	Preserve meat, poultry or fish
Butchers & Meat Cutters	09574	Weigh products or materials
Butchers & Meat Cutters	09575	Count products or materials
Butchers & Meat Cutters	01568	Slaughter animals, fish, or poultry
Butchers & Meat Cutters	01866	Use knives to prepare food or animal products
Butchers & Meat Cutters	02043	Wrap products for preservation, protection, safety, and stability
Butchers & Meat Cutters	02323	Carve fish, fowl, and other animal meats
Butchers & Meat Cutters	02332	Grind meats such as beef, pork, poultry, or fish
Butchers & Meat Cutters	04885	Cut animal meat or carcasses
Butchers & Meat Cutters	06643	Attach identification onto products or containers
Butchers & Meat Cutters	09510	Store (cold store) meat, poultry, or fish
Butchers & Meat Cutters	09564	Clean fish, animal, or meat carcasses
Actuaries	00762	Analyze social, health, or economic data
Actuaries	01330	Develop mathematical simulation models
Actuaries	05611	Evaluate significance of historical data
Actuaries	05620	Forecast phenomena based upon research data
Actuaries	04222	Explain results of statistical analyses using graphs
Actuaries	05610	Analyze the past as recorded in sources
Actuaries	00039	Analyze data to discover facts in case
Actuaries	00061	Analyze scientific research, analysis, or test data & investigative findings
Actuaries	00068	Analyze financial data
Actuaries	00280	Perform statistical analysis or modeling
Actuaries	00477	Collect statistical data
Actuaries	00497	Communicate technical or scientific information
Actuaries	00645	Develop mathematical ideas or interpretations
Actuaries	00776	Explain complex mathematical information
Actuaries	01202	Compile numerical or statistical data
Actuaries	01319	Create mathematical or statistical diagrams, charts, or tables
Actuaries	01338	Prepare technical, managerial, financial, or informational reports

PROBLEM SOLVING THROUGH DWA:
Putting the DWA Skill Statement Database to Work

There are three primary applications of the DWA database; 1) individual labor exchange, in which workers match their skills with employer hiring needs, 2) using DWAs to align and develop market responsive education and training courses and curricula, and 3) regional labor market analysis, in which skill profiles are created for one or more industries or groups of occupations and skill gaps are identified for regions or clusters. The DWA private-public partnership has made excellent progress on all three fronts, with staff at the Texas Workforce Commission LMCI department taking the lead on regional skills analysis, and SkillsNET, through the DWA Research Institute, taking the lead on education and training curricula alignment and private sector human resources tools for applicant screening and succession planning. There was joint and parallel applications by both organizations on the use of DWAs for individual labor exchange and personal job search and acquisition through skill set matching.
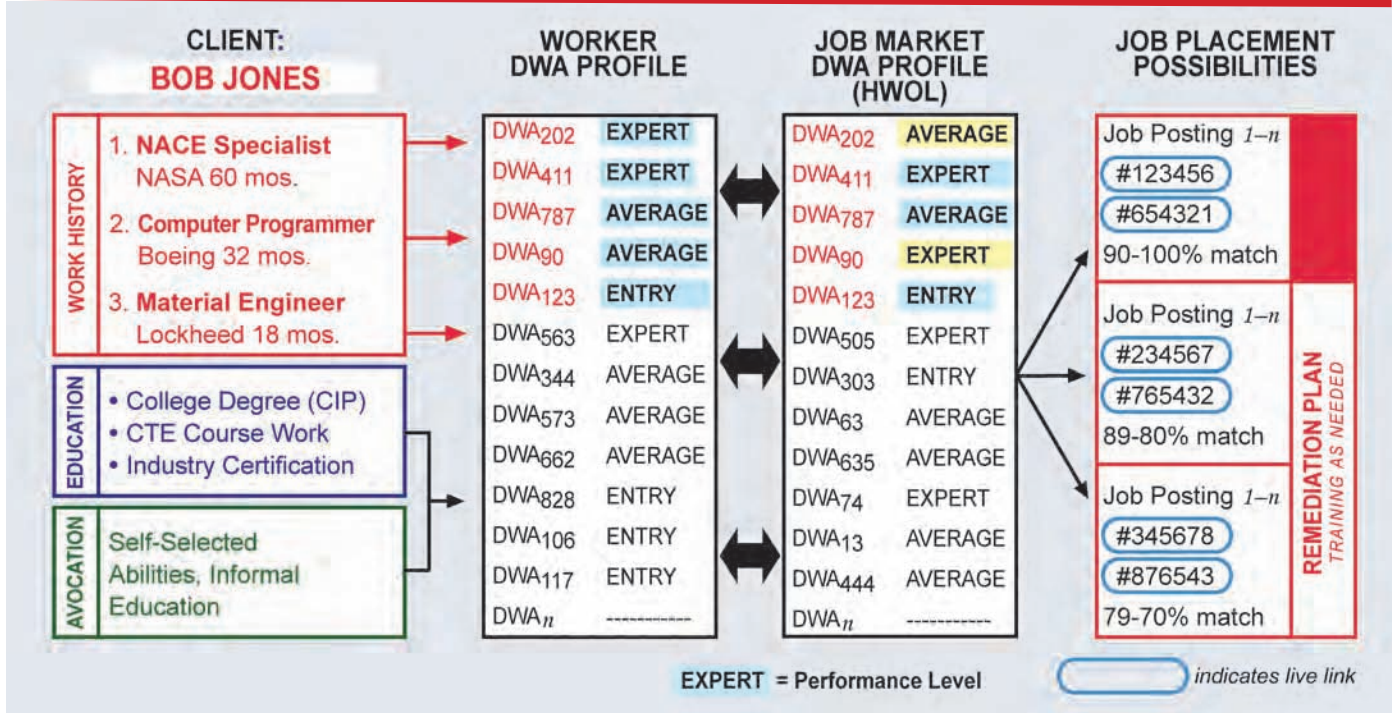
APPLICATION I:
Aligning Worker Capabilities to Job Requirements

The logical extension of the DWA skills library is to move beyond occupational title or keyword matching to a more granular approach that considers worker capabilities and how they relate to job requirements. In the labor exchange process, this translates into a dislocated worker, for example, to be portrayed as more than just her last job title but rather the entire skills compilation of her last job, her previous jobs, any formal education she has had, and any avocational skills she might have informally picked up throughout her life. The counseling community would call this the "whole person" approach. In this vision, a worker's skill profile is the compilation of all the work activities they have performed throughout their work life.

Similarly, business expects workers to be able to perform certain activities, to do them with a certain level of expertise, and with a desired level of social competence. These expectations are often obscured by overly elaborate job descriptions or elevated requirements for academic credentials that are as much employer screening devices as they are reflections of what the business wants the worker to do within their organization. Thus, rather than using a worker's previous occupational titles and academic credentials to facilitate labor exchange, the DWA process creates a profile for the worker, and a profile for the job posting or job description, using a common language that goes to the heart of the skill exchange.

These profiles are then threaded together or matched to determine

> **"To expect schools and students to guess what skills your company will need in the future is plain and simply bad business, especially in such a rapidly transforming and innovative economy"**
>
> **Peter Cappelli,** *Professor and Director of the Center for Human Resources,* Wharton School, University of Pennsylvania

Worker Capabilities To Job Requirements
DWA Labor Exchange Model

CLIENT: BOB JONES	WORKER DWA PROFILE	JOB MARKET DWA PROFILE (HWOL)	JOB PLACEMENT POSSIBILITIES
WORK HISTORY 1. **NACE Specialist** NASA 60 mos. 2. **Computer Programmer** Boeing 32 mos. 3. **Material Engineer** Lockheed 18 mos.	DWA_{202} EXPERT	DWA_{202} AVERAGE	Job Posting $1-n$ #123456 #654321 90-100% match
	DWA_{411} EXPERT	DWA_{411} EXPERT	
	DWA_{787} AVERAGE	DWA_{787} AVERAGE	
	DWA_{90} AVERAGE	DWA_{90} EXPERT	
	DWA_{123} ENTRY	DWA_{123} ENTRY	
	DWA_{563} EXPERT	DWA_{505} EXPERT	Job Posting $1-n$ #234567 #765432 89-80% match
EDUCATION • College Degree (CIP) • CTE Course Work • Industry Certification	DWA_{344} AVERAGE	DWA_{303} ENTRY	
	DWA_{573} AVERAGE	DWA_{63} AVERAGE	
	DWA_{662} AVERAGE	DWA_{635} AVERAGE	
AVOCATION Self-Selected Abilities, Informal Education	DWA_{828} ENTRY	DWA_{74} EXPERT	Job Posting $1-n$ #345678 #876543 79-70% match
	DWA_{106} ENTRY	DWA_{13} AVERAGE	
	DWA_{117} ENTRY	DWA_{444} AVERAGE	
	DWA_{n} -----------	DWA_{n} -----------	

REMEDIATION PLAN *TRAINING AS NEEDED*

EXPERT = Performance Level   indicates live link

the degree of fit and closeness of fit between worker capabilities and employer job requirements. Where a worker profile and a job profile do not align, those DWAs are highlighted as exceptions, reviewed and validated by either worker or employer that indeed a mismatch exists. If so, a remediation strategy can then be developed to remedy skill shortcomings. Because the DWA skill statements can also be imbued into training courses and educational curricula, remediating skills deficiencies becomes simply a matter of bundling a customized group of course offerings which address the skills gap of the worker, relative to a particular job.

The DWA skills library thus allows for individual or group labor exchange to occur through a more focused, granular skills matching process, reducing the likelihood for poor referrals or ineffective job search that results from the use of innumerable and poorly defined occupational lay titles proliferated across labor markets throughout the country.

> **"The planned approach of the DWA based model has the potential to completely transform the business community's manpower planning efforts. By more closely matching local talent skills to specific job requirements, hiring managers can actually see the true available resources in their area, forecast supply and demand, anticipate training / re-training needs and proactively create a more cost-effective talent management program instead of being reactive and behind the curve."**
>
> **Craig Vollmers Director,** *Human Resources UT Health,* The University of Texas Health Science Center at Houston

APPLICATION II:
Developing Market-responsive Education and Training Curricula

Postsecondary credentials, mostly in the form of college degrees, have long been recognized as being the catalysts for economic growth. With the inexorable shift in the global economy toward a demand for higher order skills, this labor market maxim is perhaps more relevant than ever, leading economist Anthony Carnevale to refer to access to postsecondary education and training as the "arbiter of opportunity in America" (Carnevale, 2010). Success in the labor market increasingly requires workers to demonstrate competencies in thinking critically, in applying new skills to ever more complex technology, as well as learning wholly new skills in short order—in short, precisely the sort of preparation provided through postsecondary education. The primary goal of creating and maintaining a Texas DWA database is to provide a more responsive system for determining core, cross-functional and specialty skills and competencies through a data-driven methodology based on a common language framework for target jobs. One significant upshot from such a system will be a more responsive and robust institutional process for updating and aligning expected postsecondary learning outcomes to current industry skill requirements through the use of a common skills language.

The system will produce modifications to or foundational elements for new curriculum; more effective and efficient credentialing products; improved industry advisory processes; greater interoperability between competency statements used in secondary (TEKS), postsecondary (WECM), industry skill standards and certifications (e.g., ASE), and employment databases (TWC/DOL); and improved placement of graduates. In addition, it is envisioned that the DWA system will lead to the development of sub-awards for common exit points (off-ramps) and improved crosswalks from military competencies to their civilian and academic counterparts to expedite the on-ramping of veterans returning to postsecondary education under the Post-9/11 GI Bill.

One such example would be the Carl Perkins Leadership activity underway at Texas State Technical College (TSTC). TSTC identified a need to "tune" its' information technology programs to reflect the changing nature of job skills. Within the arsenal of DWA tools is a process and product known as JobReady™. JobReady is an end-to-end curriculum alignment process that utilizes semantic web and artificial intelligence processes.

Job Ready incorporated a semantic analysis of select TSTC programs and course learning outcomes. The learning outcomes are aligned to the DWA common skills. The analysis includes approved WECM course core outcomes and additional TSTC local outcomes

based on more detailed actual curriculum provided by faculty. Learning outcomes are further aligned and characterized by higher order/lower order thinking and data maps from the Blooms taxonomy to guide coherent sequencing and credit articulation.

Regional employers that "expect" quality graduates from TSTC programs also participate in the JobReady process. Local employers select one or more high performing job incumbents to review, edit and finalize the list of DWAs using ActivityWare™ web-based tools. Once the employers finalize the reviews, the data are analyzed by occupational and skill statement professionals to finalize the DWA list.

Using the employer skill list, a gap alignment analysis is performed. The course-to-skills gap analysis provides the TSTC program managers three threads of information. The following offers a brief explanation of the threads:

Thread One: List of high demand job skills that align to program learning outcomes

Thread Two: List of job skills being taught that have some job demand.

Thread Three: List of high demand job skills not in alignment to the program.

TSTC program leaders and instructional designers will use the gap alignment analysis to tune current courses and issue a new version of the curriculum. This process repeats until the course meets job skills needs.

APPLICATION III:
Using DWAs in Regional Skills Gap Analysis

The 78th Texas Legislature, in Senate Bill 275, required the Governor to develop a statewide economic development plan based on competitive industry clusters. The Texas Workforce Commission led a collaborative effort to operationally define those clusters, and subsequently established cluster teams of knowledgeable industry, education, and workforce leaders. The teams met to assess the clusters and their business needs. A common finding of each cluster assessment was the need for an analysis of the state's economy that would

Making The Connection

Industry Cluster

Detailed Industries (NAICS)

Occupational Concentration (SOC)

Characteristics & Job Market Activity

Knowledge, Skills, Abilities (O*NET)

Education Programs (CIP/WECM)

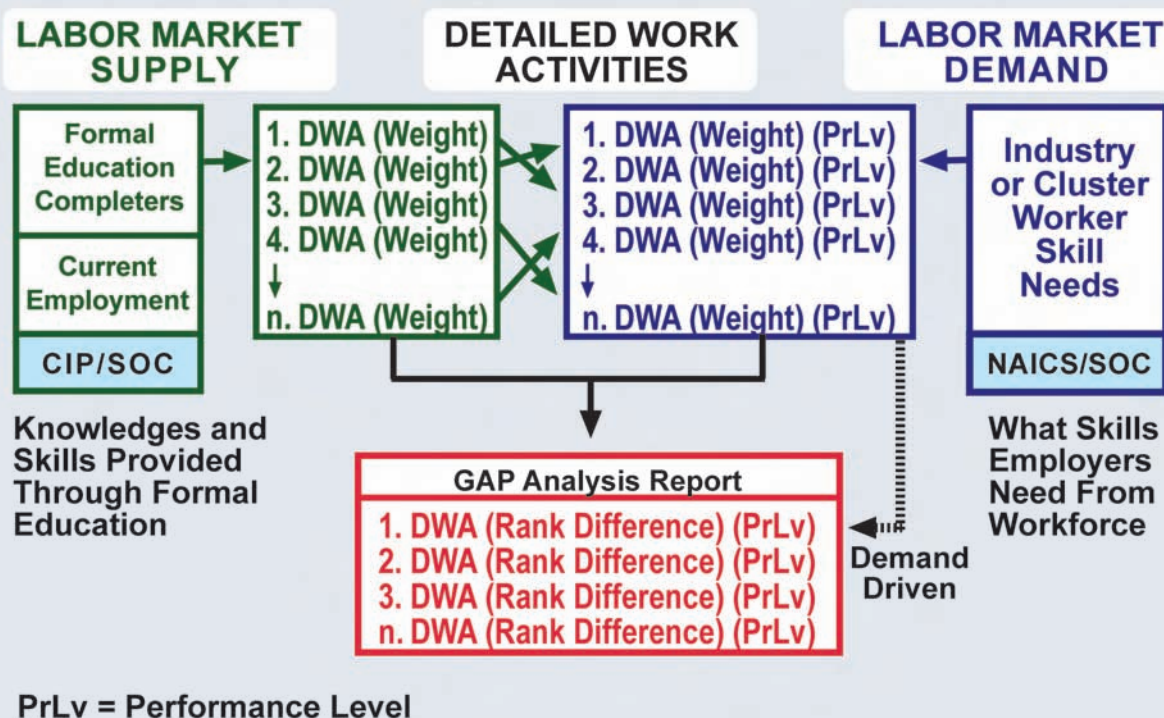Training Institutions (FICE)

Skills and Competencies (DWA)
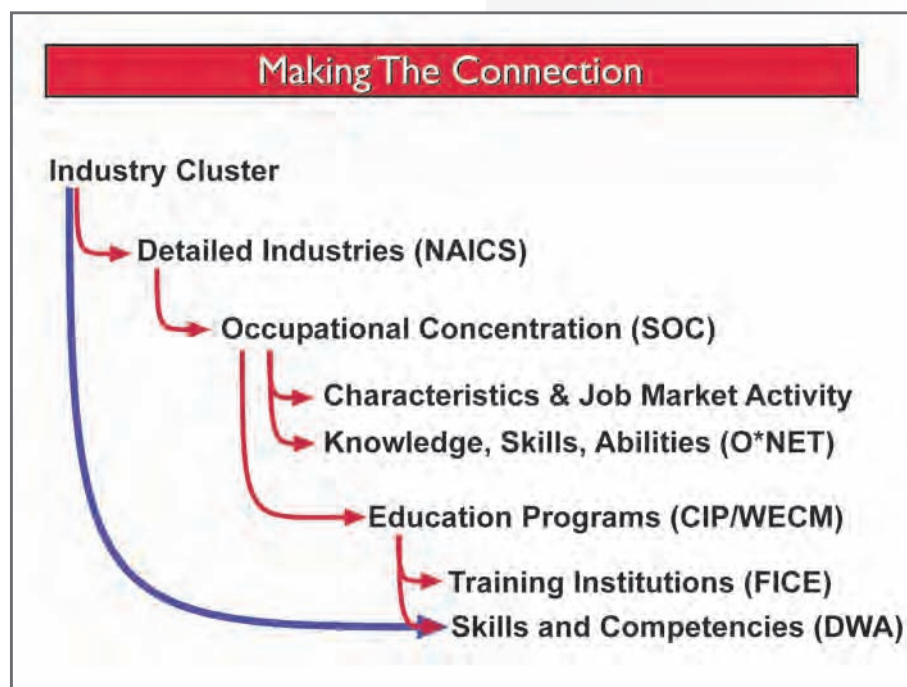
focus on employers' workforce skill needs relative to each cluster.

Imagine sitting in a meeting with the Governor's Office and being asked the question, "can you tell us the training needs and skills gaps the state should be addressing if we want to have the necessary talent available to grow the alternative energy cluster?" The same meeting, and the same question, happens routinely in local areas throughout the country where the availability of appropriately skilled labor is a competitive imperative. To answer this question, and many others directly related to it, the staff of the Labor Market and Career Information (LMCI) department of the Texas Workforce Commission created an Internet based analysis tool called the Strategic Workforce Assessment Program (SWAP).

While the goal was to identify the skills necessary to support the Governor's clusters, the existing world of labor market information is not structured in a manner that facilitates a direct connection between industry clusters and skills. There were several connections that had to be made across various taxonomies to link the two components. In making this connection, work was started simultaneously to build a common definition, language and data sets to represent the concept of

DWA- Based Regional Analysis Model

LABOR MARKET SUPPLY

| Formal Education Completers |
| Current Employment |
| CIP/SOC |

Knowledges and Skills Provided Through Formal Education

1. DWA (Weight)
2. DWA (Weight)
3. DWA (Weight)
4. DWA (Weight)
↓
n. DWA (Weight)

DETAILED WORK ACTIVITIES

1. DWA (Weight) (PrLv)
2. DWA (Weight) (PrLv)
3. DWA (Weight) (PrLv)
4. DWA (Weight) (PrLv)
↓
n. DWA (Weight) (PrLv)

LABOR MARKET DEMAND

| Industry or Cluster Worker Skill Needs |
| NAICS/SOC |

What Skills Employers Need From Workforce

GAP Analysis Report

1. DWA (Rank Difference) (PrLv)
2. DWA (Rank Difference) (PrLv)
3. DWA (Rank Difference) (PrLv)
n. DWA (Rank Difference) (PrLv)

Demand Driven

PrLv = Performance Level

skills, while also automating an ability to operationally define and connect the macroeconomic environment – in this case, the industries and occupations that comprise the state and regional economies of Texas.

As each of these efforts progressed, it was important not to divorce the macroeconomic factors driving the economy, such as energy, information technology or advanced manufacturing, from the collections of skills information. Indeed, one of the best features of the Texas SWAP program is the ability to create customized industry sectors or clusters to match Texas regional economic development efforts and be able to drill down through occupations critical to each cluster and document the most important skill sets, in the form of DWAs, for the cluster as a whole or for each pertinent industry or occupational grouping.

Picture this scenario. A SWAP customer selects one of the Governor's predefined industry clusters and wants to know the appropriate educational investments that must be made to support the skill needs for that cluster. In addition to the default industry definitions for that cluster, the customer creates a customized definition to include several additional industries uniquely critical to the region (User Defined build). SWAP returns the following reports and additional analyses;

1. Baseline employment information, including a listing of all selected industries with employment levels, projected employment and the percentage composition of the cluster.
2. A cluster-specific, employment size weighted, occupational staffing pattern for this newly defined cluster, showing the occupations and employment levels most critical to the cluster. The custom staffing pattern includes information on each occupation for wages, projections, education required, online job postings, and other key variables.
3. The ability to filter the occupational list, creating a subset of critical occupations based on occupational characteristics germane to the user, i.e. all occupations earning more than $30,000 per year, requiring an Associates or Bachelor's degree, identified as growing faster than the state average and having an employment base of at least 500 workers. SWAP returns the unique set of occupations critical to cluster.

Despite the wealth of industry and occupational information outlined in the analyses above, the critical questions still on the table are; 1) what skills do employers need relative to this cluster, and 2) what training programs are available that feed the skill needs of the cluster. SWAP provides answers to both questions. The customer can select the option to view individual occupational supply/demand reports, an aggregate list of related educational programs and the list of regional training providers that currently offer those programs.

In addition to training programs, SWAP provides a profile of spe-

cific detailed work activities (DWA) for this custom occupational group, weighted by regional employment. One analytical table of the DWA profile shows what actual skills employers require from workers in these occupations. A second DWA table shows a gap analysis between the necessary DWAs for the occupational cluster and the existence of these skills sets in the resident labor force (all occupations). A third analytical table itemizes each DWA statement and shows which training programs connect directly to teach/train individuals to master each DWA. Thus, whether the decision is to invest in programs at the macro-policy level to promote the identified cluster or to identify the training programs that could train workers with new skills at the margin, SWAP provides critical empirical information for policy makers in the education and training investment decision-making process.

The DWA Research Institute

Developing a Community of Practice

The development of an initial, employer-validated detailed work activity library represents a major accomplishment. But that momentum could be easily lost if DWA data collection and validation efforts are not continued, if the user community is not made aware of the existence and opportunity presented by these data, and open source applications and guidelines were not developed to help users achieve their objectives.

The success of the Texas DWA Common Language Project lies in three pillars of strength; a commitment to creating and growing a collaborative public – private partnership, the investment of public resources across a broad swath of agencies, and innovation and high levels of collaboration and time commitments on the part of Texas employers.

To make the Texas DWA Common Language Project a reality, piece by piece public sector funding was cobbled together that included contributions from; 1) the DOL/ETA Workforce Information grant for DWA data development and validation, 2) Workforce Investment Act Dislocated Worker funds to develop the performance level metrics, and 3) Carl Perkins Career and Technology Education funds to study and align CTE learning objectives with the new DWA skills library and to develop a data collection framework to collect Workplace Basics information for each DWA. In addition to public sector funding, SkillsNET staff contributed untold pro bono time and resources to the project, extending data collection, outreach and collaboration beyond the scope of available funding.

Establishment of the DWA Research Institute

Developing a DWA-based skills library was a critical first step to the

DWA
Research Institute
www. dwainstitute.org

DWA Common Language Project. But it was only the beginning. As described above, there were several additional public sector investments that contributed either to the core data sets or extended the application of the DWA library into the education community.

If the DWA Common Language Project is to have any long term impact, we cannot ignore two of the pillars of strength; namely the importance of the employer community to commit to helping the DWA library stay current, and the need to rely on the private side of the partnership to extend the application beyond the funded research. The genesis for the DWA Common Language Project may have started with the Texas Workforce Commission, but there needed to be an environment solely dedicated to furthering the DWA initiative. Thus was born the non-profit DWA Research Institute (www.dwainstitute.org) as a collaborative effort between the Texas Workforce Commission, as the conduit for state agency efforts, SkillsNET, as the conduit for employer and education efforts and the Texas State Technical College system as a living laboratory to test and establish best practices.

Objectives of the DWA Research Institute

Moving forward there are three major areas of focus for the Institute; 1) DWA data update and maintenance of effort, 2) "real-world' scenario-based applications of the DWA concept, and 3) additional data development. Each of these areas is discussed below in greater detail.

1) **Data update and maintenance of effort.** The initial momentum captured in the development of the first complete DWA transferable skills library was critical to the proof of concept. However, that momentum could easily wane without a mechanism to maintain and extend DWA data collection, reach out to wide range of potential stakeholders, and explore additional applications for the use of DWAs in both the public and private sectors. To maintain the currency of the effort, there must be an on-going effort to refine, examine and continue to collect DWA statements. The Institute meets this objective by routinely conducting the following data surety and currency processes:

   • Monitor real-time job postings to determine the emergence and decay of skill statements. Most if not all online job postings use lay terms to define the skills they seek to hire. The Institute translates these lay skill statements into the DWA taxonomic framework and checks the current data base to determine if it should be added.

   • Engage employers to develop regional talent pipelines that define current and emerging skills. As more employers participate in the regional DWA review process, any suggested changes are reviewed and incorporated into the DWA library, as appropriate.

   • Leverage external skill framework initiatives to compare their skills language to the DWA skill statements. One example is the

European Commission's Dictionary of Skills & Competencies (DISCO). SkillsNET is helping DISCO build its' skill statements using the same rigor that went into the development of the initial DWA library. Benchmarking the two data libraries will help keep the DWA library valid and current.

2) **Develop scenario-based applications of the data,** including uses for both individuals and organizations and applications in regional strategic planning. The DWA Research Institute was aptly named because the focus is on the constant improvement of the core DWA skills library and challenges presented in the threading and cross-matching of multiple DWA-centric data sets, e.g. matching resumes and job postings or learning objectives within a curricula to regional employment or emerging demand. However, the easiest way to demonstrate the tremendous application for DWA skills analysis is through automated online tools. An initial resume-to-job posting and career opportunity matching system, SkillsPASS™ is a minimal viable product (MVP) that was brought live on the Internet in late 2011. Patterned after the EuroPass concept of a portable skills credential, SkillsPASS allows users to upload an electronic version of their resume, curriculum vitae or comparable personal work history profile and view job postings with high skill correlations.

The SkillsPASS MVP is a fledgling effort to demonstrate the potency of the DWA skills matching process, but it still requires additional funding and development before it can meet the needs of employers, civilian job seekers, and workforce boards. Even in its' current state, SkillsPASS offers solutions to students, adults, and veterans. An audience-specific version of SkillsPASS has been created for each group to accommodate their unique job market challenges.

- Student SkillsPASS is designed for high school and college students. The student version monitors part-time, apprenticeship, and internship jobs within their region or across the state if necessary.
- Adult SkillsPASS is available to anyone that is unemployed, underemployed or someone wanting to change careers. This version monitors ALL job opportunities that match their skills profile.
- Military SkillsPASS is designed to identify and translate the unique skills veterans acquire while serving our country. Similar to the adult version, the military version monitors ALL job opportunities that match the veteran's skills profile.

3) **Additional data development.** The initial DWA library was a major success but there are several additional data development efforts that must happen to fully operationalize the power of the DWAs in education and workforce development, in individual labor exchange, and among private sector employers. As part of the vi-

sion for a DWA common language the following data development projects have either been accomplished or are in pending, ready-for-funding status:

a. **Development of Performance Level metrics** to assign the requisite status of proficiency expected by employers for each DWA as it occurs within a given occupation. While the DWA statements represent a substantial improvement toward classifying occupational skills, clearly there are multiple levels of performance or expertise associated with each DWA within each occupation. For example, an employer may need a worker that knows how to do ten unique activities. However, it may be that the job in question requires 'Expert' levels of performance and mastery for five of these activities and only 'Entry' level mastery of the other five.

   Similarly, a worker might know how to do many different activities, but has 'Expert' mastery of just a few DWAs. Thus, to further improve the ability to best connect worker abilities and employer skill needs, a Performance Level variable was assigned to each DWA within each occupation as part of the extended DWA Common Language Project. The first iteration of this deliverable was completed in February 2011. In addition to uses outlined above, performance levels have proven to be very useful in the stack ranking of DWAs within a given job description or resume, and in prioritizing skills gap analysis.

b. **Crosswalk and analysis of DWAs against public Career and Technology Education (CTE) student learning objectives.** CTE programs have the potential advantage of offering integrated academic learning objectives with occupational skills training. To ensure the occupational learning objectives are aligned with the skill needs of regional employers, many CTE programs rely on intermittent advisory council input. The DWA library offers a unique opportunity to provide that employer validation at the skill level by incorporating the feedback of thousands of employers, not just a handful of those attending local meetings. This crosswalk was completed in May 2011.

c. **Mappings of DWAs to the Classification of Instructional Program (CIP) taxonomy.** Similar to CTE programs, recent accreditation and accountability initiatives call for greater emphasis on the alignment of higher education curricula with labor market demand. As a part of the initial DWA data collection efforts, linkages were established between DWAs and technical CIP programs. These mappings allow curricula or training programs to be evaluated as to whether their embedded learning objectives address employer skill needs.

"Curriculum development is not a function of the state workforce agency or of the local workforce development boards. However, they do have an interest in the transparency of, and returns on, training services they procure on behalf of their customers. The translation of course offerings into DWA-centric learning objects and mappings to campus level offerings would be legitimate decision support for education and training partners in a comprehensive workforce development system."

Marc Anderberg, *Director,*
DWA Research Institute

The CIP to occupational DWAs maps are a good beginning but much more must be accomplished if the alignments are to have real market value. To that end, the Institute established the Realtime Market Value Index as a metric to evaluate college program alignment to changing career skill demands. The Index was designed out of necessity. Before the Index, the Institute evaluated the quality of learning outcome statements and learned that most were written in very general terms, had inconsistent syntax and were not easy to measure. Further, we learned that most colleges do not readily embrace the learning object to learning outcome framework.

The Index was established to achieve several objectives. First, the Index offers data-driven evidence on what courses are or are not in alignment with market skill demands. Secondly, the index brings new visibility for community college program alignment to four year university system programs. Finally, the Index offers a common skills language that facilitates honest exchanges between education and industry stakeholders regarding curriculum content.

Future Index analysis will focus on two important academic and industry swim lanes. The swim lanes are College to College and College to Employer transitions. Alignment of courses in and between colleges and employers is essential if America is to maintain its economic power status in the 21st Century.

d. **The monetization of DWAs.** Given the fact that a state or regional employment-weighted transferable skill profile can now be developed through DWAs, and since the Occupational Employment Statistics (OES) occupational wage program offers occupational wage data for various regions of the state (as this BLS-funded program does in all states), it seems possible to determine a relative monetary value for each DWA within a given occupation. It may be further possible to assign a wage value or wage range to a given skill, based on regional prevailing occupational employment and wage patterns. At a minimum, it seems very possible to assign a remunerative status to each DWA, i.e. some DWAs are higher value skills while others are lower value, within any given occupation or in the labor market in general. For example, "send work-related e-mail " is a DWA commonly found across many occupations and one in which many workers are likely competent. Conversely, the DWA-based skill "write computer software, programs or code" is less ubiquitous and thus likely has a higher remunerative value in the labor market. This "skills currency" will bring new meaning

and market relevance to resumes and worker skill portability.

e. **Workplace Basics: The development of measures of social competence** associated with each DWA. Occupational skills are an important part of work proficiency, but workplace basics or soft skills are always high on the employer wish list. Many states, including Texas, are increasingly aware of the importance of workplace fundamentals to the employer community. This effort attaches the top workplace basic behaviors and attitudes to each DWA, in recognition of the fact that what you do is performed in the context of both a performance expectation level and appropriate metrics of social competence. The groundwork and framework for collecting and ascribing workplace basics to each DWA has been completed as part of a collaborative project between the Texas Workforce Commission and the Texas Education Agency. However, formal data collection has yet to proceed.

f. **Delineation between DWAs that require formal education and those that can be mastered through informal or on-the-job experience.** DWAs can be used for many purposes, not the least of which is helping educational institutions align curricula with employer skill demands. But not all necessary job skills are learned through formal education. In fact, a great nmber of common job requirements are generally learned through informal methods, including on-the-job training. It is important to have a simple designation for each DWA, within each SOC occupation, as to whether the skill is primarily learned through formal education, informal methods or OJT, or whether the acquisition is dependent on the expected performance level within a given occupation. This would allow educational institutions to focus on mapping skills that are primarily acquired through formal means, rather than on lesser or more common skills. Moreover, in the labor exchange process, such a designation might focus the match algorithm on the higher order formal skills matches rather than treating ubiquitous and common skills equally. This project has not been funded; however background research has been compiled by TWC staff that shows the new Bureau of Labor Statistics educational preference designations for each occupation and DWA. We believe this characteristic can be an excellent base resource as part of a desktop audit process.

g. **Disappearing work tasks: An early warning system for skill unbundling and the potential for offshorability.** In the new global economy, some occupations and their composite work

activities have a higher possibility for being unbundled and moved offshore. Occupations that have high percentages of their job duties that can be effectively automated or offshored will likely experience declining job growth and faltering wage premiums within Texas and may not be the best long-term targets for worker training investment or recruitment. The reverse is also true, giving clues about occupations and training that have higher long-term returns in Texas. This project will build on a small, existing body of research to identify detailed work activities most likely to be offshored or technologically obsolesced and the percentage likelihood that any given job or occupation could be moved to lower cost locations or automated.

Finally, while the current DWA skills statement library is largely a Texas construct, it has tremendous applicability beyond the borders of Texas into other states equally interested. For example, other states which may be interested in aligning higher education programs with the skill needs of their local labor markets can adopt the Texas DWA library and, with some additional state-specific validation by key local employers, embrace the DWA centric match processes. Thus an additional goal of the Institute is to extend the use of detailed work activities to other states and across additional constituencies and thereby further increasing the commonality of a skills language across borders; be they national or international.
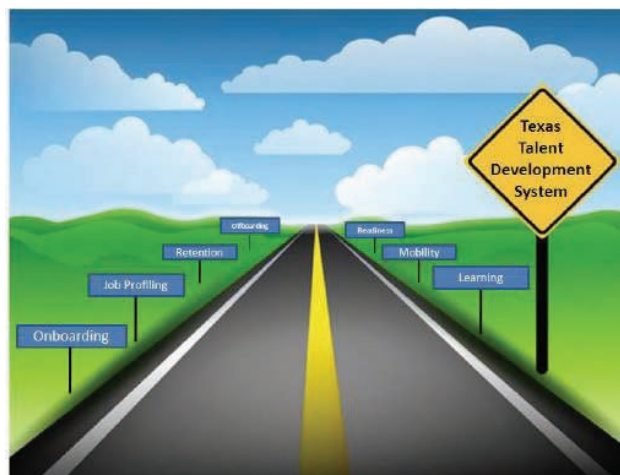
DWA Talent Development ROADMAP

Closing Thoughts

The DWA Value Proposition

In its present form, the new DWA library provides both business and education with a common language to define work and associated learning expectations. That will enable secondary and postsecondary partners to align the curriculum with, and develop course materials that are more relevant and responsive to, employers' needs. Workforce professionals also can use the new DWA library in building career development and referral strategies around what job-seekers know and can do. By depicting DWAs across all the occupations to which they apply, the new skills library facilitates more granular transferable skills analysis for more efficient reemployment of dislocated and trade affected workers than can be achieved using occupational title matching. Most important, employers can rely on the new library to guide recruiting, succession planning, in-house training or outsourcing of their human capital development.

There are many potential benefits and uses of DWAs, which include, but are not limited to, the following:

Job Seekers/Displaced Workers
- DWAs provide information about occupational work activities that can aid career exploration.
- DWAs provide a structure for describing work experiences; can be used to build a resume, and articulate work performed in previous jobs.
- The more general nature of the statements facilitates cross-occupational comparisons and helps displaced workers identify new areas of work that match their capabilities.

Organizations
- DWAs provide a bounded, standardized structure for profiling work requirements that employers can use to write job orders or position descriptions.
- DWAs can be used as a common language to define job openings and write job descriptions/orders.
- DWAs can be used to develop the common or core knowledge and skills required in occupations for potential use in performance review, etc.
- DWAs promote the use of a common language for describing the activities that occur within occupations to serve as a basis for industry sector skill standards.
- DWAs facilitate effective communication with the business community for the development of a skilled workforce.

Student/Career Counselor
- DWAs facilitate training program searches by learners to improve skills or generate learning plans.
- DWAs can be used in career guidance to explain the work activities associated with a given occupation and provide a realistic job preview.
- DWAs can be used to aid students in understanding where they can apply their school-based knowledge to a work setting.

Teachers
- DWAs help teachers with program planning and curriculum development.
- DWAs facilitate effective communication with the educational community for the development of a skilled workforce.
- The common language of the statements allows educators to use the DWAs to perform analysis of transferable skills and skill gaps.

Occupational Analysts
- DWAs provide more descriptive information to better inform the General Work Activities, while not being as specific as task statements.
- The standardized taxonomy of the DWAs can be crosswalked to other taxonomies much easier than unstructured data about occupations.
- DWAs can be used as a linkage point between other data and the O*NET Content Model.

Labor Exchanges
- DWAs could be utilized to provide a standard language for use in labor exchanges.
- The common language of the statements allows labor exchanges to use the DWAs to perform analysis of transferable skills and skill gaps.
- DWAs can be used to create personalized training and development plans based on remediating skills gaps identified between worker resumes and career goals.

THE DWA REVIEW PROCESS:
Validating Job Skill Requirements to Texas Employers' Needs

Under a grant from the Texas Workforce Commission, SkillsNET undertook an extensive review of the detailed work activities (DWA) associated with the 756 occupations (out of over 930 titles in the Standard Occupational Classification (SOC) taxonomy) which account for the vast majority of employment and anticipated openings in the Texas economy. Information on DWAs previously available through the O*NET system, which is maintained by the Department of Labor, had been compiled previously through a variety of means. Much of it had simply been moved into the O*NET through a desktop review of various occupational taxonomies (e.g., the Dictionary of Occupational Titles, the Occupational Employment Statistics (OES) dictionary, earlier incarnations of the SOC, and ancillary lay title files) when predecessor classification systems were consolidated under the new SOC at the center of the O*NET data structure. Since their merger into the O*NET, some of the occupational employment descriptors had been updated based desktop reviews and general surveys of employers by the O*NET development team. The undertaking by the Texas Workforce Commission and SkillsNET comprised the first and only systematic review of the O*NET DWA domain based directly on employer input.

Whereas prior efforts to parse job descriptions into discrete DWA components had been based on trained expert observations of workers doing their jobs and surveys largely of businesses' human resource staff, SkillsNET obtained information directly from subject matter experts (SMEs). That is, incumbent workers and their immediate supervisors were asked about what they did and what knowledge, skills, abilities, tools, technologies and resources were required for successful performance. By going directly to the SMEs, SkillsNET took observer biases, their unfamiliarity with specific jobs, and inter-coder disparities out of the equation.

SMEs were identified by their employers based on their longevity and high performance levels. Employer involvement and SME participation were entirely voluntary. Assistance in engaging employer support was obtained through endorsements of and explanations about the critical need for DWA revisions and employer-validation provided by *"champions"* affiliated with industry and professional associations (e.g. TEXO – representing construction companies, associations of general contractors, restaurateurs' associations and the Dallas County Manufacturers' Association). Contacts in the business community also were provided by local workforce boards.

- Solicitation of voluntary SME input gave employers a sense of ownership of the data at a level seldom seen when they were pressed

upon previously by public schools and colleges to participate in pro forma industry advisory boards. As one employer who asked to remain anonymous said, "This is the first time that anyone seems to be taking our input seriously."

- Moreover, involvement of the workforce boards in identifying employers and SMEs garnered more vitally important buy-in from the very intermediaries who ultimately will use the data in strategic planning, career guidance and case management. Heretofore, despite the fact that labor market information systems have been built around data sets collected from scientific samples that are geographically representative, a large number of local workforce intermediaries had looked upon data from joint "State-Fed" collection efforts with suspicion. By going precisely to their business contacts, SkillsNET obtained the "local wisdom" necessary to lay to rest much of the "not invented here" resistance to data-driven workforce development and human capital management.

To ensure that the data were reliable, SkillsNET obtained input from multiple SMEs for each job title. To date, more than 6,000 incumbent workers and their immediate supervisors have participated in the revision and validation exercise. The number continues to grow as SkillsNET left behind the automation tools used in the initial round of the Common Language Project so that SMEs could update the data any time the mix of DWAs they perform changes. SkillsNET also continues to recruit SMEs at its own expense to provide continuous improvement of the DWA library as it conducts follow-on research under subsequent grants (e.g., the DWA-to-TEKS mapping project and the DWA performance levels).

To ensure validity, the input of SMEs from multiple firms was obtained. The inputs from each SME were stripped of any firm-specific nuances and reconciled with the inputs of SMEs with the same job titles at other firms. That way, the Texas-validated library contains DWA data that are sufficiently granular to provide education and training providers with high resolution employer-identified job skill requirements to drive expected learning outcomes without overwhelming curriculum developers with idiosyncratic establishment level nuances that are best left to the firms themselves as they add the "finishing touches" to the training of new hires coming out of the education pipeline. Note here that educators expressed their appreciation for the winnowing of DWA statements into a manageable number that can and should be addressed at each juncture in a rational sequence of instructional delivery.

To engage the cooperation of employers, SkillsNET had to reduce the burdens that data collection often imposes on their precious time and resources. The processes were automated by creating electronic workbooks. Instead of starting tabula rosa (as often is the case with the focus group approach), SkillsNET pre-populated the electronic workbooks with exiting descriptors from the O*NET. Rather than re-inventing the wheel or grappling with how to phrase descriptions of what

they did in terms that others could understand, SMEs could work more efficiently in: eliminating those DWAs which they no longer have to perform; modifying those which have undergone change recently; and including DWAs recently added to their jobs.

Mounted on the SkillsNET's host computer, the workbooks could be accessed by SMEs who had been given access information and passwords. They could access their individually customized workbook at their leisure (24/7) from any remote location (thus saving them and their employers the time, expense and lost productivity incurred in traveling to attend a face-to-face focus group or industry advisory board meeting. On average, it took an incumbent worker 15 minutes to log on, learn how to use the electronic spreadsheet and complete the exercise. Supervisors and workers in somewhat more complex jobs could still complete their workbook exercises in approximately 30 minutes. Again, this is a far cry from the all-day effort involved in traveling to and participating in a focus group session. Plus SMEs could work independently and anonymously to get their frank opinions without the contamination of "group think" that usually comes about from capitulation (rightly or wrongly) to the loudest or most persistent participant at a focus group meeting.

And because the workbooks were pre-populated with DWA descriptors couched in the common vernacular of the workplace, businesses and SMEs took ownership. The exercise, to them, was not a pro forma endorsement of current curriculum offerings - as often they believed the case to be when training providers used educational jargon to set the agenda for episodic industry advisory board meetings. As another anonymous SME explained, "This is the first time I've had the sense that someone is listening to me instead of talking at me."

And to make the results coherent and useful, SkillsNET's automation tools framed the DWA statements in a consistent Skill-Object syntax. The syntax formats each DWA statement as one action verb, optional modifier, one skill object, and one contextual modifier. This format allows analysts to develop behaviorally-anchored assessments of performance and proficiencies for each DWA for high fidelity communication of related Knowledge, Skills, Abilities, Tools, and Technology Resources requirements.

Analyze engineering problems in electronic manufacturing

Action   **Object Modifier**   **Object**   **Statement Modifier**

The Skill-Object language at the heart of the DWA review and validation process does establish a common language so employers can communicate clearly and unambiguously: to educators what skills they need imparted as expected learning outcomes of training programs; and to job-seekers what criteria will be used in hiring, compensation and promotions. At the same time, the Skill-Object language provides education and training providers (as well as job-seekers and case managers) a framework for authentic and meaningful skill assessment and credentialing which communicate clearly and unambiguously what the student or adult learner knows and can do. Clarity and standardization of the common language is critical to cross-boundary signaling among employers, education and training providers, job-seekers, students and workforce intermediaries essential to managing human capital across all parts of the talent grid. High fidelity signaling will become ever more important as labor markets become more complex, more globally competitive and frequently riddled with disruptive structural changes.

APPENDIX B

Using Detailed Work Activities (DWA) as the Definitional Construct for Green Jobs

The ability to decompose any subject matter into a uniform set of DWA skill-oriented building blocks lends itself to a wide variety of unique applications. It is possible to understand the skills needed to support the Distribution and Logistics cluster, for example, by simply identifying some key dimensions, processes, technologies and market forces that are driving those industries. Similarly, it is possible to communicate the importance of the Science, Technology, Engineering and Math (STEM) disciplines to the labor market through DWAs. Many educational courses and jobs have shades or threads of STEM knowledges and workers have levels of STEM capability that can be similarly organized around the DWA concept.

One application of this process is the identification of "green jobs". The traditional approach to understanding green jobs is to classify entire industries or occupations as "green" and then survey employers in those industries to gain a sense of green job activity. However, it makes little sense to classify all bus drivers, for example, as "*green*" upon observing 1 percent of them drive busses powered by some renewable fuel. Do bus driver training programs need to be revamped because the engine of the bus they drive might use an alternative fuel source? Obviously, the answer is no.

Does that mean there are no aspects, or specific work activities, performed by bus drivers that might be materially affected by the green movement? The answer is not only yes, but each job and each occupation in the economy is subject to some degree of *"greening."* Many of the green work activities performed are in the fields of building construction, mechanical, and engineering technology as the primary area of knowledge required. These same work activities will be influenced by the use of green building materials, green construction techniques, or green production processes. In this era of sustainability, measuring the degree of "greenness" in an economy, and the degree to which a labor market is becoming more or less green over time, is a worthwhile undertaking.

Hard data about the *greening* of jobs from a skill perspective can guide curriculum revisions, facilitate informed choice in career decision-making and improve returns on the investment of taxpayer dollars in a wide array of education and training projects. We believe the superior approach to identifying, classifying and measuring "*greenness*" in a labor market is to focus on the specific knowledge, skills, abilities, tools and technology (KSAs/T&Ts) associated with the work activities which comprise an occupation.

Creating a DWA-centric Green Jobs Identification System

The Texas DWA Common Language Project gives us the potential to understand and classify many different work elements, including the extent to which the work performed within an occupation or a more specialized job can be classified as "*green*." Using the DWA processing tools, it is possible to enhance our DWA library by adding a domain for green identification. Each DWA statement across the SOC occupational spectrum can be assigned a composite green score based on the degree to which the intrinsic work elements have green objectives. In the final tally, every occupation can receive a green designation based on the degree to which the DWAs are considered green.

To assign a composite green score, each DWA can be assessed across four dimensions. In the *Green Configuration Model* diagram these four dimensions form the heart of a computational engine that can drive green DWA designation. As mentioned previously, similar models can be constructed for other subject matter areas and processed in the exact same manner. In this case, we have identified four dimensions to understand the "greenness" of an occupation. The use of latent semantic analysis techniques allows for a green rating score to be ascribed to each DWA, within each dimension. The DWA computational engine will drive that process and allow us to assign the degree to which each and every SOC occupation can be viewed as green. The four dimensions that we identified to be assessed and descriptions of each are provided in the chart below.
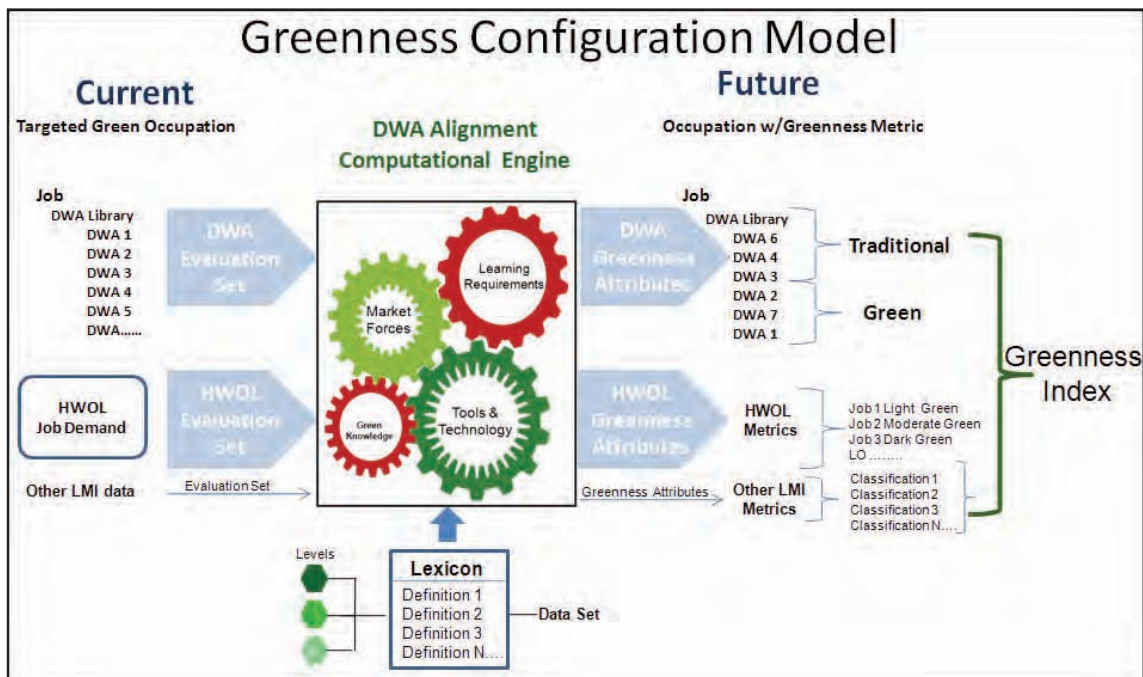
Relating High Resolution Green Data back to Occupations

Anecdotally we recognize wide variance in activities and behaviors among workers under each occupational title; this is one reason why designating an entire occupation as green or not green outside the context of the work environment is less than optimal. We conceive "*jobs*" to be subsets of occupations -- more nuanced and context- or role-specific.

In the new green economy, for example, the jobs of construction workers on a LEED-certified project are different than the jobs they will do under the same occupational titles on other projects of conventional design. To a large extent the impact a worker has on energy conservation, renewable energy production or environmental quality (i.e., "*green contribution*") depends on the context or role (i.e.; "*job*") rather than on the broader occupational classification.

By examining the work activities performed within a given job, or occupation, one can more legitimately determine the level of greenness contributed by a broader range of workers – some of whom work under occupational titles that might not ordinarily be viewed as green. These same processes can be applied to online electronic job postings and monitored over time to determine the relative level of greenness in any given region and the extent to which a regional economy is becoming more or less engaged in green work activity. *(Sample on next page)*

DIMENSION	DESCRIPTION & ILLUSTRATION
Green Knowledge	This dimension would include variables for an algorithm which would differentiate Core Knowledge (applicable to all permutations of a base occupation) from Specialized Knowledge (applicable only to certain roles or in specific contexts). On this dimension, knowledge elements would be weighed in terms of their complexity, criticality to performance and safety, and frequency. Which processes, products or services are made more efficient by new green knowledge; etc.? The larger the impact of green knowledge, the higher the weight assigned to the DWA. The higher the weighted totals across constituent DWAs, the higher the green score of an occupation.
Market Forces	Market forces shape the labor supply and demand dynamics. They determine how the workforce will be configured. They define the talent pool. Under this dimension we will determine how likely it is that jobs will be consolidated, created, shed, or made obsolete by market forces. Moreover, the general upswing in environmental consciousness will create job growth in other occupations, and their associated DWAs, not traditionally viewed as being green. Thus, similar to the O*NET construct, it is possible for some job skills to have increased demand and yet have minimal new training needs. These skills can be attributed to the greening of the economy in general but may not require additional investments in skills training.
Training Requirements	On this dimension we would identify the KSA, T&T and task targets for developing a curriculum for preparing workers to handle green DWAs wherever they are configured into base occupations or specialized jobs. What are the learning and proficiency metrics associated with each KSA or T&T? How difficult are they to master and what level and length of training is likely to be required?
Tools & Technology	On this dimension we ask if new green technology will transform or replace tasks comprising a DWA. Will a new T&T create new green tasks? How soon? Does an occupation, and any of its associated DWAs, rely on particular green tools, green materials and technologies? Answers to these questions will drive strategic decisions essential to just-in-time training delivery.