

# 21ST CENTURY COMPETENCIES

## FOR COLLEGE AND CAREER READINESS

*By Anthony P. Carnevale*

From the Civil War and until the 1970s, the United States was the world's most successful mass-production economy, the very best at producing standardized goods and services at the least cost and selling them at the lowest price. These mass-production successes required rigorous discipline and narrow skill. Final products and services were broken down into their smallest reproducible components, and rigid single-purpose machinery was built to mass-produce standardized components. A large mass of unskilled labor was used to tend the machines. A much smaller group of broadly skilled and broadly assigned white-collar and technical elites were installed at the top of large-scale organizational pyramids.



## NEW MARKET FORCES CREATE NEW DEMANDS

*Something happened in the early 1970s.* Suddenly the United States' mass-production system seemed to lose its competitive edge. People began to demand more than mass-produced standardized goods and services because often they could afford more. Family income doubled between 1946 and 1972 in the United States, and America's economic "golden age" was mirrored in the rest of the world.

As the world got richer the value of standardized commodities declined and competition shifted to new kinds of value added. The increasing competition and the demand for new kinds of value added have created more intense and complex competitive requirements. The traditional competition based on the ability to mass produce standardized goods and services and sell them at low cost has been

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gradually displaced by a competition based on a diverse mix of requirements and new kinds of value added, which includes these new competitive standards:

### **Productive Investment**

The old-time religion of cost reduction does not work in the knowledge economy because it tends to reduce investments in skilled employees, information-based technologies, and flexible organizational formats necessary to meet new performance standards. In the knowledge economy, productivity is pursued through productive investments in the synergies between technology and skill that lead to institutions that are sufficiently robust to compete in modern markets. Flexible technology and organizational formats require robust human competencies to complement and exploit their flexible capabilities.

### **Quality**

No longer insulated from serious global competition, quality is a primary component of competitive production. Quality requires lots of new skills up and down the line, ranging from technical competency to the ability to take responsibility for the final product or service irrespective of one's job description.

### **Variety**

As competition has intensified, "plain vanilla" is no longer good enough. To satisfy the growing diversity of demand in both domestic and global markets, the once standardized offerings of mass production have given way to an explosion of choices. The ability to produce variety requires workers with the creativity and problem-solving skills necessary to provide more than one-size-fits-all products or services.

### **Customization**

One-size-fits-all standardization has been superseded by customized goods and services. Customization, like variety, requires the ability to be able to problem-solve and empathize with customer wants and needs.

### **Convenience**

Busy people crave convenience. Convenience requires workers who can empathize with customer needs and use interpersonal skills, communications, and listening skills necessary for good old-fashioned customer service.

### **Consistency**

Meeting performance standards some of the time is not enough. Workers require dependability and commitment in order to meet efficiency, quality, variety, customization, convenience, speed, innovation, and social responsibility standards all the time.

### **Speed and Continuous Innovation**

There are a variety of benchmarks for improvements in speed or cycle time. The first is generating a new idea ahead of the competition. But getting ideas first is not enough. The organizational achievements come by getting new ideas off the drawing board and into the hands of the customers. Also critical is improving products or services incrementally and continuously to stay ahead of the competition.

### **Social Responsibility**

As consumers are given more and more goods and services from which to choose, the values associated with a particular brand can make a competitive difference. Consumers who become wealthier and have more choices tend to want to satisfy more than their material needs. Customers want products and services from organizations that, at least, do not violate their values and, at most, represent their values.

## **DEVELOPING BROADER AND DEEPER SKILLS**

The movement from standardized to non-standardized goods and services would not be possible without flexible computer-based technology and flexible organizational formats. Once information technology became widely available and widely distributed in organizations, new organizational structures were required to exploit new technical capabilities fully. New competitive requirements also signaled a need for more flexible and decentralized structures driven by more highly skilled and autonomous workers, coupled with the burgeoning and widely distributed capabilities of the new information technology. In addition, the new computer technology has automated repetitive tasks, aggressively leaving a growing share of non-repetitive tasks to workers. The shift from top down hierarchies to complex networks and the automation of repetitive tasks increased both the depth and scope of skill required by more autonomous and more fully engaged workers.

For a very long time, employers have asserted that jobs actually require a complex set of competencies that are not reflected in academic credentials and not nurtured through academic pedagogy. Until very recently, our ability to observe and measure these competencies and their distribution among occupations has been largely anecdotal. All that changed with the completion of the Occupational Net (O\*NET) data base, which allows us to measure the value of these competencies and at least begin a dialogue over the appropriate roles of educational institutions and employers in providing these core 21st century competencies.

The recently completed O\*NET database specifies the full set of occupational competencies required for success in particular occupations and related clusters of similar careers. O\*NET includes occupational knowledge, skills, abilities, work values, personal qualities, and work interests for more than 1,000 occupations. With the exception of occupational knowledge, very few of the O\*NET competency domains look like words one finds in a course catalogue or a K-12 content model. If we are to make students college and career ready, we will have to close the gap between academic curriculums and 21st century career competencies.

## 21ST CENTURY COGNITIVE COMPETENCIES

21st century skills are competencies required for the jobs of the future and include knowledge, skills, and abilities (KSAs). Having the appropriate skills for the job is critical if workers are to remain competitive, attract the right type of industry, and engage the right type of talent in this knowledge-based, innovative economy.

Using the O\*NET database, the Center on Education and the Workforce measured the incidence and intensity of core competencies in the economy today. The approach to this connection was twofold. First, the extent of the relatedness of occupational clusters was determined, based on the similarities of the intensity of responses from incumbents in those occupations. Second, the incidence in the national economy was determined, controlling for the size of occupations. Factor analysis was the primary data-reduction tool employed. O\*NET specifies the full set of occupational competencies required for success in particular occupations and related clusters of similar careers. Operated by the National O\*NET Consortium and funded by the U.S. Department of Labor, the database includes occupational knowledge, skills and abilities, work values, work contexts, and work interests, as well as key performances, such as tasks and activities. These competencies are multi-dimensional and the interactions between them are highly correlated. Yet, we have attempted to simplify the concepts by asserting that cognitive ability allows one to acquire knowledge, which is a foundational requirement for skills-acquisition. These terms are defined later.

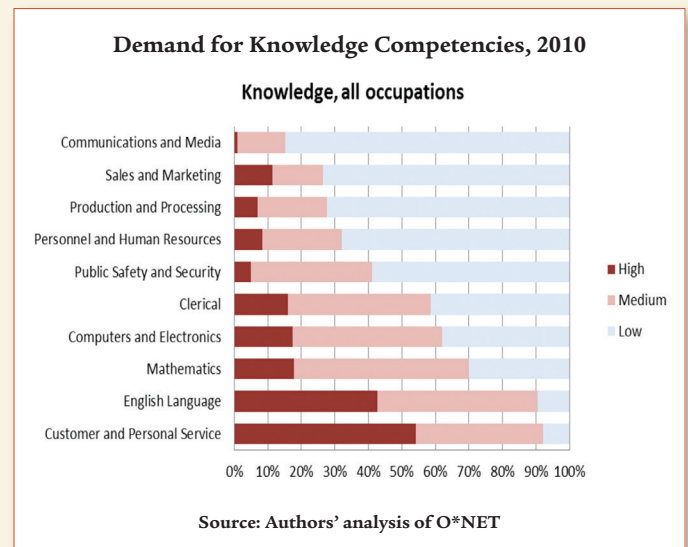
O\*NET's occupational data are anchored in a tripartite set of cognitive competencies: knowledge, skills, and abilities.

- **Knowledge** classifications are content domains familiar to educators, from math and the sciences, to the humanities, to knowledge in more applied disciplines, like accounting.

- **Skills** are competencies that promote further learning. They are divided into content, processing, and problem solving skills. Content skills are fundamental skills needed to acquire more specific skills in an occupation. These include reading comprehension, active listening, speaking, writing, math, and science. Proficiency skills are procedures that contribute to the more rapid acquisition of knowledge and skills. These include critical thinking, active learning, learning strategies, and monitoring. Problem solving skills involve the identification of complex problems and related information required to develop and evaluate options and implement solutions.
- **Abilities** are defined as enduring and developed personal attributes that influence performance at work. In the parlance of education psychology, these closely approximate "aptitudes." O\*NET divides abilities broadly into creativity, innovation, mathematical reasoning, and oral and written expression. Each of these broad abilities is subdivided into component elements. For example, innovative abilities include fluency of ideas, problem sensitivity, deductive reasoning, and inductive reasoning.

## SUMMARY AND OUTCOMES

*Knowledge Competencies are biased in favor of service occupations*



The figures above summarize the top ten knowledge-bases in the economy and the level at which they are utilized. Customer and personal services and English language are used most intensely across occupations.

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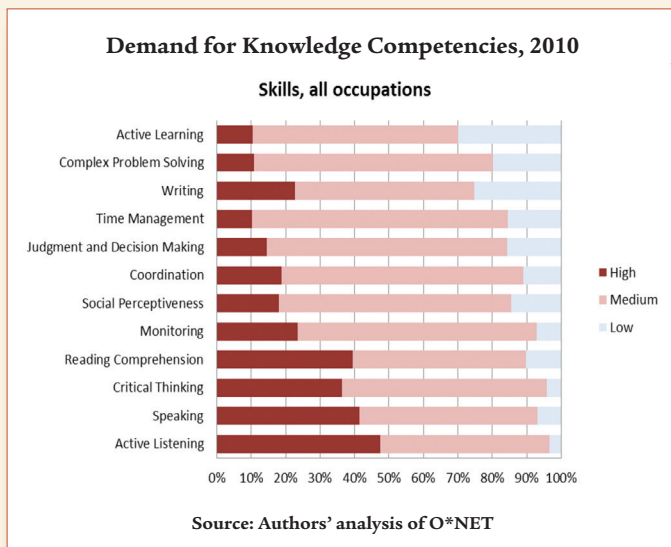
High levels of customer service and English language are required in 55% of all jobs. This is not surprising, as 80% of all jobs today are in the service sector. Jobs in industries like business services, education, health care, and office service jobs require higher levels of interpersonal and problem-solving skills because the work entails higher levels of human interaction and personalized responses to people’s wants and needs. These same behavioral skills are required in high-technology and manufacturing jobs as well, because the technology itself takes on more of the rote, manual processing tasks, allowing employees to spend more time interacting with each other in order to exploit the new flexible technologies. This allows employees to provide cutting edge value added such as quality, variety, customization, convenience, speed and innovation.

Mathematical knowledge and computers and electronics are also highly valued and transferable across occupations. Medium to high levels of mathematics and computational knowledge are required in 70% of all jobs, and medium to high computer skills are required in 62% of all jobs.

As expected, the knowledge-bases of high-wage, high-growth, high-skills occupations included more complex competencies (economics and accounting, law and government, and administration and management) than those of the general economy and excluded other competencies (such as sales and marketing, production and processing, and public safety and security).

### *Skills and Abilities are generally more transferable than Knowledge*

Skills that are highly concentrated in the economy can be found in the chart below and include, among others, active listening, complex problem solving, writing and time management.



Communications skills such as reading comprehension, critical thinking, speaking, and active listening are skills that employers highly value. Active listening is a skill that is extremely important to almost all jobs that require an employee to work in hierarchical teams or to serve customers. 48% of jobs require very high levels of active listening, with reading comprehension, speaking, and critical thinking following closely behind.

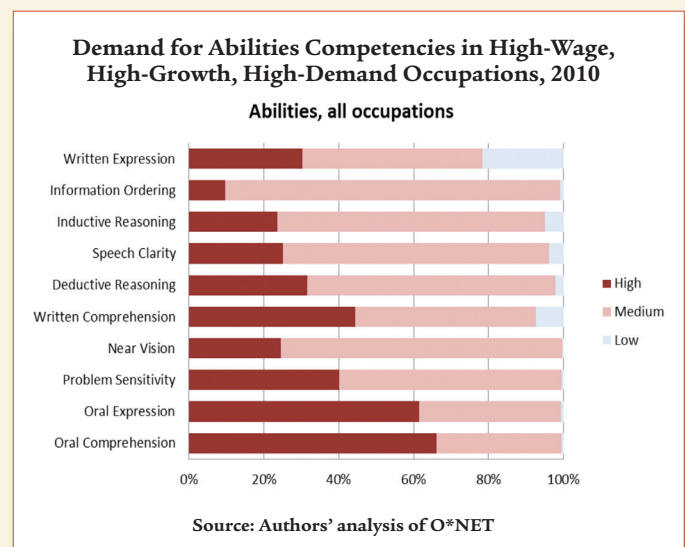
Five of the top twelve skills that are most valued in the economy are essentially communicative in nature. The ability to listen, interpret, follow instructions, and communicate instructions to other people, both orally and written, appear time and again in various jobs – even those that require relatively lower levels of education.

Skills that process information and require sophisticated cost/benefit analyses (such as critical thinking, complex problem solving, judgment, and decision making) are also highly valued. Critical thinking is a skill that is often touted by employers as a necessary requirement for success in many occupations. O\*NET data confirm this assertion, indicating its importance in close to 20% of all jobs. Moreover, 96% of all occupations consider critical thinking to be either very important or extremely important to that job.

Finally, skills that demonstrate aptitude in a social setting and demonstrate an ability to work in a team setting and to complete tasks assigned in a timely fashion are also high valued. Coordination and monitoring are especially important to production occupations, STEM fields, and healthcare. Social perceptiveness also has “caregiver” undertones and favors the traditional concentration of females into healthcare.

### *Abilities are more transferable across occupations than Knowledge*

Similar to skills, abilities are associated with the capacity to utilize knowledge learned to solve problems. Abilities are summarized as follows.





Abilities refer to capacities that are, to some extent, present in a person at early ages and developed over time. They include generic characteristics that allow individuals to acquire a skill. Oral comprehension, oral expression, written comprehension, and written expression at the highest level are valued in occupations throughout the economy. In fact, of all the abilities listed on O\*NET, these four abilities are required at their highest level in the largest proportions of occupations.

Deductive reasoning is highly demanded more than inductive reasoning, though both are valued in over 22% of all occupations. Speech clarity, together with the other verbal abilities, highlights the importance of effective communications in the transmission of information in the workplace. 21<sup>st</sup> century competencies also include non-cognitive values, interests, and personal qualities (VIP's) necessary for high performance

In addition to the cognitive competencies (knowledge, skills, and abilities), O\*NET classifies competencies tied to individual personality traits that are markers for success in individual occupations.

These key competencies are work values, work interest, and personal qualities.

- **Work values** are individual preferences for work outcomes. Important outcomes for individuals include recognition, achievement, working conditions, security, advancement, authority, social status, responsibility, and compensation.
- **Work interest** is defined as individual preferences for work environments. Interests are classified as realistic, artistic, investigative, social, enterprising, and conventional.
- **Personal qualities** are characteristics that can affect how well someone does a job. Some of these characteristics are conscientiousness, extroversion, emotionality, and agreeableness.

## A SKILLS OVERVIEW

Education reform has shifted to focus on these key competencies, particularly as they pertain to life and career skills. The move towards making people both college and career ready amounts, essentially, to finding ways to learn basic knowledge and transforming these

capabilities into *deeper learning* to create a flexible and adaptable individual with the appropriate skills to survive in the 21st century.

We are only at the very beginning of the dialogue and experimentation on exactly how we should teach these skills. What we do know, however, is that the learning curve is gentlest when these skills are introduced to students within a practical framework and appropriate context. There are some rough guidelines. Principle among them is that skill and ability are learned best when used in the context of particular knowledge domains and fields of practice. Nonetheless, we do know that skills and abilities are, to some extent, transferable across knowledge domains and fields of practice, especially when knowledge domains and fields of practice overlap in related fields of study.

Much of the hard work has been done already in relating clusters of occupations and academic preparation in the sixteen career clusters designated by the Office of Vocational and Adult Education in the U.S. Department of Education. The occupations and curriculums within each of the sixteen clusters show considerable overlap in knowledge, skills, abilities, (KSAs) interests, work values, and personality traits. The overlap among KSAs within the clusters suggests the best chance for transferability between curriculums and career pathways. The extent of transferability of KSAs, interests, work values, and personal qualities between career clusters is less powerful but quite possible in varying degrees.

The fundamental change in skill requirements for the 21st century has been due to the emergence of the new knowledge economy, which has replaced the rote skills of the assembly lines of yesteryear with flexible technologies and “high-performance work systems” that rely on more skilled and autonomous workers. In an era of flexible production and service delivery systems and more rapid economic change, workers not only need better technical preparation, they also need sufficiently robust skills to adapt to changing requirements on the job, meet employer needs, achieve ongoing career success, and realize meaning in their work and vocations.

### About the Author



Anthony P. Carnevale, Ph.D. (apc39@georgetown.edu) is Director of the Georgetown University Center on Education and the Workforce. He has served as Chair of the

Human Resources Sub-Committee of the White House Commission on Productivity under President Ronald Reagan, as Vice President for Public Leadership at the Educational Testing Service (ETS), and as Director of Human Resource and Employment Studies at the Committee for Economic Development (CED). While at ETS, he was appointed by President George W. Bush to serve on the White House Commission on Technology and Adult Education and while at CED was appointed by President Bill Clinton to chair the National Commission on Employment Policy.