The Emerging Skill Needs of A RAPIDLY CHANGING, INNOVATION-DRIVEN ECONOMY

A REPORT OF THE READY FOR THE JOB INITIATIVE

Prepared for the
New Jersey
State Employment and
Training Commission

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Background: The Ready for the Job Initiative

This report is an integral part of the *Ready for the Job* initiative, which began in 2002 to determine the skill needs of New Jersey's employers. The goal of *Ready for the Job* is to improve alignment between the workforce needs of employers and the preparation of potential and current workers by providing timely and accurate information about employer skill needs to policymakers, educators, counselors, job seekers, students, and others.

The *Ready for the Job* initiative, a joint effort of the New Jersey State Employment and Training Commission, the New Jersey Department of Labor and Workforce Development, and the New Jersey Department of Education, uses industry advisory groups, interviews and focus groups with employers, and analysis of all available data to profile the workforce and skill requirements of key industries and occupations.

Two fundamental assumptions underlying *Ready for the Job* are:

- A skilled workforce is essential to the state's economic growth, and
- In order to fully participate in the economy, the state's residents must possess the skills employers need.

Ready for the Job reports have focused on the skill and workforce requirements of key industries in the state including:

- Health Care
- Construction
- Hospitality/Tourism
- Manufacturing
- Utilities/Infrastructure
- Finance
- Information Technology
- Transportation
- Public Health/Disaster Management
- Retail
- Port Newark/Elizabeth Marine Terminal

Results and reports from the *Ready for the Job* initiative are distributed through the NJNextStop website, *www.njnextstop.org*. NJNextStop is the State of New Jersey's primary career guidance Internet portal for high school students, counselors, teachers, and parents.

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Executive Summary

Powerful economic, social, and technological forces—such as globalization and rapid technological advances—are transforming the workplace. As a result, American workers and employers must learn to navigate a new economy marked by **constant change** and a **drive toward continued innovation**. New Jersey's employers need skilled, motivated workers to remain competitive in this environment. To adapt, workers of all types must acquire more abstract cognitive and advanced social networking skills, as well as greater breadth and depth of business, technology, and job-specific technical skills.

This report identifies current and emerging workplace trends that are affecting the skill needs of New Jersey's employers. It also specifies the key skills that workers of all types will need to adapt effectively to these trends. Findings are based on interviews and focus groups with over 160 New Jersey employers, economic forecasters, and other stakeholders, as well as a review of the scholarly literature. (See Appendix for a list of individuals consulted for this study.)

Current and Emerging Workplace Trends

Heldrich Center researchers identified six broad workplace trends that are changing the skill requirements for jobs at all levels. These trends, many of which have been evolving for some time as a result of globalization, technological advances, and other developments, are:

1. **The increasing competitive advantage of firms that successfully harness knowledge and innovation.** Companies in many industries face increasing competitive pressure to harness knowledge and innovation, and to apply technology in ways that improve their overall efficiency. This trend is reshaping job responsibilities in order to improve the flow of knowledge within organizations and has, in some firms, led to the creation of new jobs dedicated to this purpose.

2. **The decentralization of business operations and management.** Many firms are moving away from top-down operations and management models toward models that emphasize high-performance work systems that place more responsibility on frontline workers. Decentralization is also increasing the use of global project networks in many industries, altering traditional employer-worker relationships through increased use of contractors, virtual employees, and other types of nontraditional workers.

3. **Expanded reliance on technology in the workplace to improve the quality and efficiency of work processes and to train workers.** The continued evolution of the Internet and other information technology resources has contributed to the widespread use of technology in nearly every type of workplace. Developments such as Web 2.0, a term used to describe the growing interactivity and user-controlled nature of the Internet, are changing the extent to which many workers interact with the World Wide Web, both at

home and on the job. This is just one example of how technology is leading to shifts in job responsibilities across all industries. Employers in many industries also report that, while technology simplifies or eliminates some job tasks, it leads to overall increases in the skills workers need as many workers are asked to perform more complex tasks that cannot be handled by technology.

4. **Increasing diversity in the workplace.** Experts anticipate that the workforce will continue to become more diverse as the percentages of older and minority workers increase. This trend will add complexity to workplace interactions, and compel frontline workers and managers alike to find new ways to relate successfully to co-workers.

5. **Increasing employer concern over security, privacy, and ethics issues.** As employers adjust to the challenges posed by terrorism, fraud, and other threats, job descriptions in many industries are expanding to include more responsibility for monitoring and/or addressing security, privacy, and ethics concerns. Some industries are also creating new jobs, such as ethics officers, to manage these issues more effectively.

6. **Business processes changing in response to shifts in regulatory environments and new patterns of regulation.** Whether regulations are added or removed, employers report that changes in regulations often lead to either long- or short-term increases in the skill level needed to perform affected jobs.

While many of these trends have existed for some time, New Jersey employers report that the pace of change and the extent to which these issues are affecting the workplace is growing rapidly. The current environment of swift, constant change requires employers and workers to continually adapt to new workplace skill and knowledge requirements in order to remain competitive.

Changing Employer Skill Needs

Today's rapidly evolving, innovation-driven economy is increasing and shifting the skill requirements for a wide range of jobs. Overall, employers expect workers to be less "task oriented" and more "goal oriented," developing not only the basic academic, workplace readiness (punctuality, appropriate attire, etc.), and job-specific technical skills needed to perform core job tasks, but also the skills needed to adapt individual and team behavior to new trends and situations. The following five categories of skills are becoming increasingly important to all types of New Jersey employers:

- **Adaptability skills**, *especially critical thinking/problem solving, managing change, lifelong learning skills, and flexible role orientation in the workplace;*

- **Information management and communication/relationship-building skills**, *especially prioritizing information, cultural understanding, the ability to communicate effectively using virtual tools, and written and verbal communication and presentation skills;*

- **Interdisciplinary skills**, *especially multiple sciences and mixtures of science and business skills;*

- **Business skills**, *especially project/ product management and entrepreneurship skills; and*

- **Math/science/engineering/ technology skills,** *especially the ability to use and understand new technologies.*

Conclusion

As employers attempt to use innovation to maintain a competitive edge in an increasingly global and technologically advanced economy, the structure and expectations of the workplace are changing rapidly. To survive in today's business environment, New Jersey's employers need workers who have the skills and motivation to assume increased responsibility for assisting companies to meet challenging new business objectives.

Study Background and Overview

This report, based on interviews and focus groups with over 160 New Jersey employers, economic forecasters, and other stakeholders, and a review of the scholarly literature, identifies trends affecting employer skill needs in New Jersey's economy. The report also identifies the key skills that workers will need to adapt to these trends.

To identify trends affecting employer skill needs in New Jersey, the Heldrich Center hosted two roundtable discussions with over 70 regional economic and technology forecasters, educators, and other key stakeholders, in the spring of 2006. The Heldrich Center complemented these discussions with a review of scholarly studies, articles, and national and state websites that provided insight into these trends and related employer skill needs.

Once these trends were identified, the Heldrich Center conducted 10 discussions with 72 representatives from 58 New Jersey employers in 11 industries to confirm and explore these trends. These discussions were also used to identify the effect that the trends are having on employer skill needs and to identify occupations that are affected by these trends. Eight occupations that are illustrative of skill and educational requirements that are changing in response to workplace trends are profiled in this report. These occupations were selected to include a variety of skill levels and to include those occupations that are expected to grow and/or experience critical skill shortages in the next three to five years.

Finally, the Heldrich Center conducted 15 interviews with representatives from 10 employers in a variety of industries to obtain more detailed profiles of the changing skill and educational requirements of the selected occupations. The Heldrich Center then used all available information to identify five specific types of skills that are increasingly important to New Jersey employers in today's rapidly changing, innovation-driven economy.

Industries Included in this Study

- Biotechnology
- Information Technology
- Advanced Manufacturing
- Advanced Materials
- Environmental Technology
- Professional Engineering and Research
- Health Care
- Telecommunications
- Energy/Utilities/Infrastructure
- Retail
- Public Health/Emergency Readiness

Occupations Profiled in this Report

- Research and Development Scientist
- Laboratory Technician
- Project Manager
- Electronics Engineer
- Telecommunications Line Installer
- Retail Store Manager
- Production Worker (Chemical Plant)
- Customer Service Representative (Insurance Industry)

Introduction: Emerging Workplace Trends and Implications for Workers

Regional economic forecasters and technology experts convened for this study agree that complexity of our global, technologically advanced economy makes it difficult to predict which technologies, industries, or ideas will dominate tomorrow's markets. However, one thing is apparent—New Jersey's workplaces are undergoing rapid and continuous changes as employers compete in an increasingly interconnected, interdisciplinary, and innovation-driven economy. While the specific direction of these changes is difficult to forecast, several broad workplace trends have been evolving that affect the skill requirements of many of today's jobs—from scientists to manufacturing production workers.

Advances in communications and transportation have created a truly global economy. While approximately one-quarter of the world's gross domestic product (GDP) was traded internationally in 1970, nearly half of all GDP was traded internationally in 2000. By 2020, this figure is expected to reach 67%.[1] Many economic theorists have postulated that the United States is entering a new era of globalization. For example, a study by the RAND Corporation found that there is a "new era" of globalization that is driven by the spread of cheap, efficient information and communication technologies and is identified by several characteristics as follows:

- Blossoming trade in intermediate as well as final goods and services,
- An expanding flow of international capital investment,
- Increasingly rapid movement of technologies and business knowledge across borders, and
- The development of a mobile, international workforce.[2]

According to New Jersey employers consulted for this study, globalization has had wide-ranging effects on their companies. New Jersey's companies now compete with firms all over the world. As more nations develop their capacity to participate aggressively in the world economy, competition in a wide range of industries is likely to increase. Employers in a variety of industries report that companies must constantly search for ways to improve productivity, efficiency, and quality of products and services. To compete effectively and to sell their products and services throughout the world, companies must also understand customer needs and meet the regulatory requirements of myriad governments around the globe.

Rapid technological advances are fueling globalization and transforming the workplace. Compared to just a decade ago, today's information technology has greater storage capacity, increased speed and reliability when processing and transmitting data, better user interfaces, wider networks, and the ability to handle a larger set of software applications.[3] These rapid changes have made it easier and more efficient to conduct business around the globe and have challenged workers to continually upgrade their skills to adjust to technological advancements. This is just one example of the way that technology has evolved in recent years in ways that are changing the nature of work in a broad range of industries.

According to technology experts, the pace of technological change is expected to grow over the next 10 to 15 years.[4] In addition, many of the new developments will be interdisciplinary in nature. A report by the RAND Corporation found that "Synergies across technologies and disciplines will generate advancements in R&D, production processes, and the nature of products and services."[5]

While globalization and rapidly advancing technology are the overarching trends affecting the economy, the Heldrich Center's research and discussions with employers, forecasters, and stakeholders revealed six workplace trends that have been evolving for some time and that have important implications for workers. These six trends are:

1. The increasing competitive advantages of firms that harness knowledge and innovation effectively;

2. The decentralization of business operations and management;

3. Expanded reliance on technology in the workplace to improve the quality and efficiency of work processes and to train workers;

4. Increasing diversity in the workplace;

5. Increasing employer concern over security, privacy, and ethics issues; and

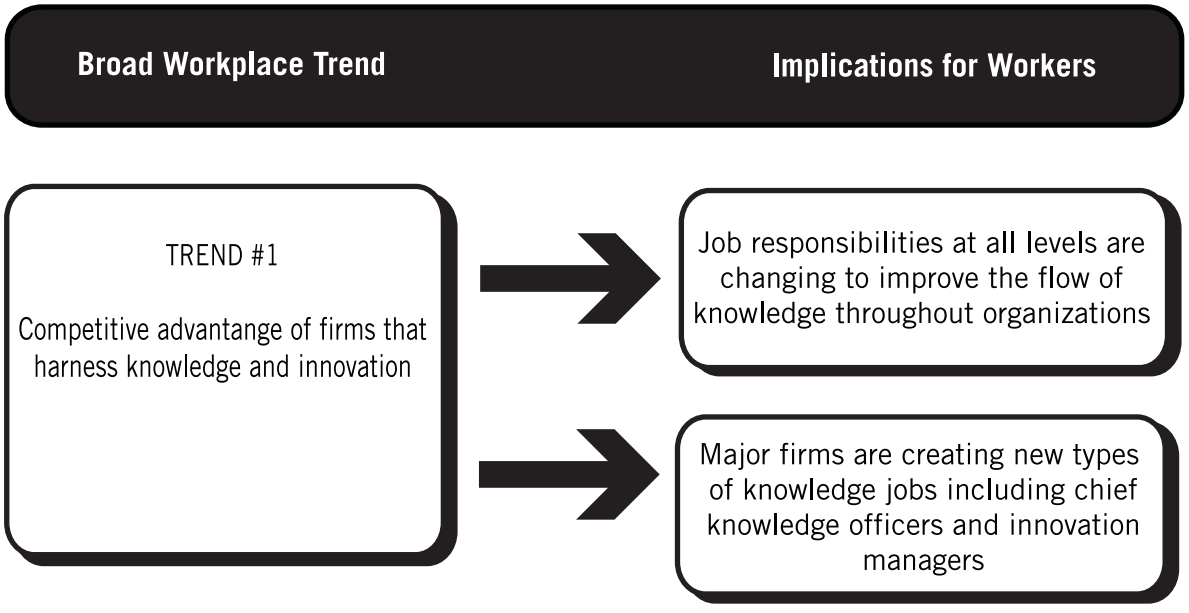
6. Business processes change in response to shifts in regulatory environments and changing patterns of regulation.

Workplace Trend #1: The Increasing Competitive Advantages of Firms that Harness Knowledge and Innovation Effectively

According to employers consulted for this study, a variety of economic trends, especially globalization and advancing technology, are forcing today's companies to innovate and capitalize on knowledge more efficiently than ever before. Employers report that they must work harder to find a competitive edge, and many have realized that this edge lies in innovation. Companies believe that those organizations that effectively manage knowledge and information and convert this knowledge and information to innovation have a distinct competitive advantage. This trend has two important implications for workers.

First, New Jersey employers report that job responsibilities at all levels are changing to expand the knowledge base and innovation capacity of their firms. Employers in a variety of industries report that nearly all workers in a firm have some responsibility for innovation. Innovation is not simply the responsibility of research and development scientists in high-tech firms, nor is it solely the purview of managers in other types of businesses. Employees, at all levels, are expected to contribute new ideas to improve products, services, and processes.

In addition, employees at all levels are expected to possess a deeper knowledge of all aspects of a company's business. According to a recent study by the RAND Corporation, knowledge is now defined by many employers as "the understanding of markets, customers, suppliers, processes, best practices, and other invisible assets of an organization."[6] Employees must not only have the technical capacity to develop and deliver new products or services, but also a deep understanding of market needs and business processes. In high-tech industries, employees in marketing, research and development, and production are expected to communicate and collaborate to ensure that new products meet consumer demand and can be efficiently produced.[7]



In the life sciences and other high-tech areas, employers are increasingly partnering with educational institutions and incubator facilities in order to expand their capacity for innovation. According to Kenneth Breslauer, Vice President for Health Science Partnerships at Rutgers, The State University of New Jersey, life sciences companies often send workers to university facilities to interact with faculty and students and to learn and use expensive, high-tech equipment. With access to international experts and high-end research technologies, universities can provide the ideas and equipment that can help innovative companies to compete effectively. According to Dr. Breslauer, companies must collaborate to compete in today's fast-changing, highly technical, global business environment.[8]

According to stakeholders, technology forecasters, and employers consulted for this study, scientists and engineers are expected to take into account business and financial concerns as they develop new innovations. Scientists and engineers working for high-tech, start-up companies are now expected to be entrepreneurs. In this role, workers must promote innovation not only through product development, but also by addressing vital product feasibility, marketing, and investor and customer relations issues. Within well-established companies, employers are no longer content to have science and engineering workers develop products based solely on their technical value. Increasingly, research and development workers must have a range of interdisciplinary skills, not only to work effectively with the newest technologies, but also to collaborate with sales, marketing, and other professionals to ensure that products being developed are marketable and profitable, as well as technologically innovative.

In addition, according to employers consulted for this study, employees are expected to efficiently share information and knowledge within the company. For example, managers are expected to identify and disseminate critical knowledge to all workers in the company. Employers also expect entry- and mid-level workers to actively seek and share critical information with colleagues. For example, several New Jersey companies interviewed for this study, including an aircraft equipment manufacturer, require workers to become cross trained in a variety of areas and to share important knowledge across job lines. (See Example 1.)

EXAMPLE 1
New Jersey Employer Profile:
Expanding the Knowledge Base and Innovation Capacity of Firms

A company that manufactures aircraft equipment now trains its workers on all aspects of production before allowing them to learn specialized skills. In addition, production workers, specialized fabricators and molders, and design engineers share knowledge and expertise on the shop floor and in special learning sessions that are designed to allow workers to not only learn new skills, but also to impart what they know to others.

Source: Employer Association of New Jersey, 2006, accessed April 4, 2006 at: http://www.eanj.org/future/FOWProject.asp?SortBy=Company.

EXAMPLE 2
New Job Snapshot:
New Knowledge-Based Jobs

A compliance learning organization in New Jersey that provides computer-based training solutions for regulated businesses created a new position for chief innovation officer to lead and coordinate the company's research and development activities for creating new products. The position requires a Master's degree in education (the firm's specialty area), as well as extensive experience in business development, process improvement, and quality management.

Source: Employer interview, March 16, 2006.

According to national studies, some employers are also creating new knowledge-based jobs, such as chief knowledge officers and innovation managers. Separate from information technology and human resources, knowledge and innovation officers are responsible for managing intellectual capital and promoting knowledge sharing in an organization.[9] While evidence of new positions dedicated solely to knowledge sharing and innovation promotion in New Jersey firms is limited, at least one company included in this study has created a new position. A New Jersey company that delivers regulatory compliance training has established a chief innovation officer position to increase innovation in its product development. (See Example 2.)

According to New Jersey employers consulted for this study and other sources, the pressure to harness knowledge and innovation has increased the importance of three types of skills:

Interdisciplinary Knowledge and Skills

As a result of employers' more expansive definition of knowledge, employees must possess technical skills and a broad knowledge of other business processes.[10] In high-tech industries, in particular, workers at all levels are increasingly expected to have not only a specialty skills set, but also additional skills that will allow them to communicate effectively with workers in other business areas. For example, sales workers in the pharmaceutical industry must have a solid understanding of industry-relevant science and research methods to communicate effectively with research and development workers.

Many employers and stakeholders consulted for this study report rising demand for scientists and engineers with business skills. In high-tech industries, employers specifically note that individuals who possess both a Ph.D. in a science and engineering field and an M.B.A. are particularly valuable. Business degrees, and the skills a business education imparts, are especially valuable for scientists and engineers who work for start-up companies in high-tech areas.

Finally, employers report that many scientists and engineers need a high level of skill and knowledge in more than one technical discipline to understand and apply new technologies and new types of scientific knowledge, as well as to contribute to the development of new innovations. For example, according to employers and educators interviewed for this study, scientists require in-depth knowledge of biology, computer science, physics, and other subjects to engage in bioinformatics, a growing field within the

life sciences that allows scientists to categorize and analyze complex biological data. (See Example 3.)

Information Management and Communication Skills

Workers at all levels must have the skills to gather, prioritize, and analyze key knowledge about customers, markets, and product development gained through their day-to-day work. Employees must also be able to convey the knowledge gained to the appropriate people in the organization. To do this effectively, workers need strong verbal, written, and presentation skills that will allow them to share knowledge with co-workers efficiently and effectively.

EXAMPLE 3
Changing Job Skills Snapshot:
Research and Development (R&D) Scientist

Increasingly, science and engineering workers, such as R&D scientists, must have **interdisciplinary skills**. Employers seek workers with strong core skills and relevant college degrees in at least one science, math, or engineering area (many emerging technology-based industries, including those dealing with nanotechnology, now require secondary skills in other technical disciplines, as well). These workers also require strong business, technology, and communication skills to help new and existing companies innovate effectively and efficiently. According to stakeholders consulted for this study, there is a critical need for R&D scientists with strong interdisciplinary science and business/entrepreneurial skills to start new technology companies.

Source: Employer and stakeholder focus groups and interviews, 2006.

Since most efforts to improve knowledge sharing and innovation at firms involve employees working together to communicate and collaborate, workers in jobs ranging from production to advanced managerial and science-related positions need strong teamwork, negotiation, networking, and persuasion skills. Managers must have strong group facilitation skills to communicate key knowledge to large groups of employees, as well as to solicit information from workers.

Adaptability Skills

According to employers consulted for this study, if firms are to harness knowledge and innovation capacity effectively, workers must be able to identify and adapt quickly to new situations. Specific skills that help workers to adapt include problem-solving and critical thinking skills. These skills help workers to identify new opportunities to contribute to the successful development of products and services that meet customer needs within a competitive business environment. In addition, workers must be able to identify and independently correct (or report, if needed) problems that cause inefficiency and affect the firm's ability to innovate effectively. For example, retail employers expect sales workers to independently make adjustments to merchandise displays based on how well or poorly they are attracting customers to purchase the products.

As mentioned in a 2006 special issue of *Business Week* focusing on "the innovation economy," firms, and the workers within them, must have the skills needed to **manage and support change** in business processes in order to compete

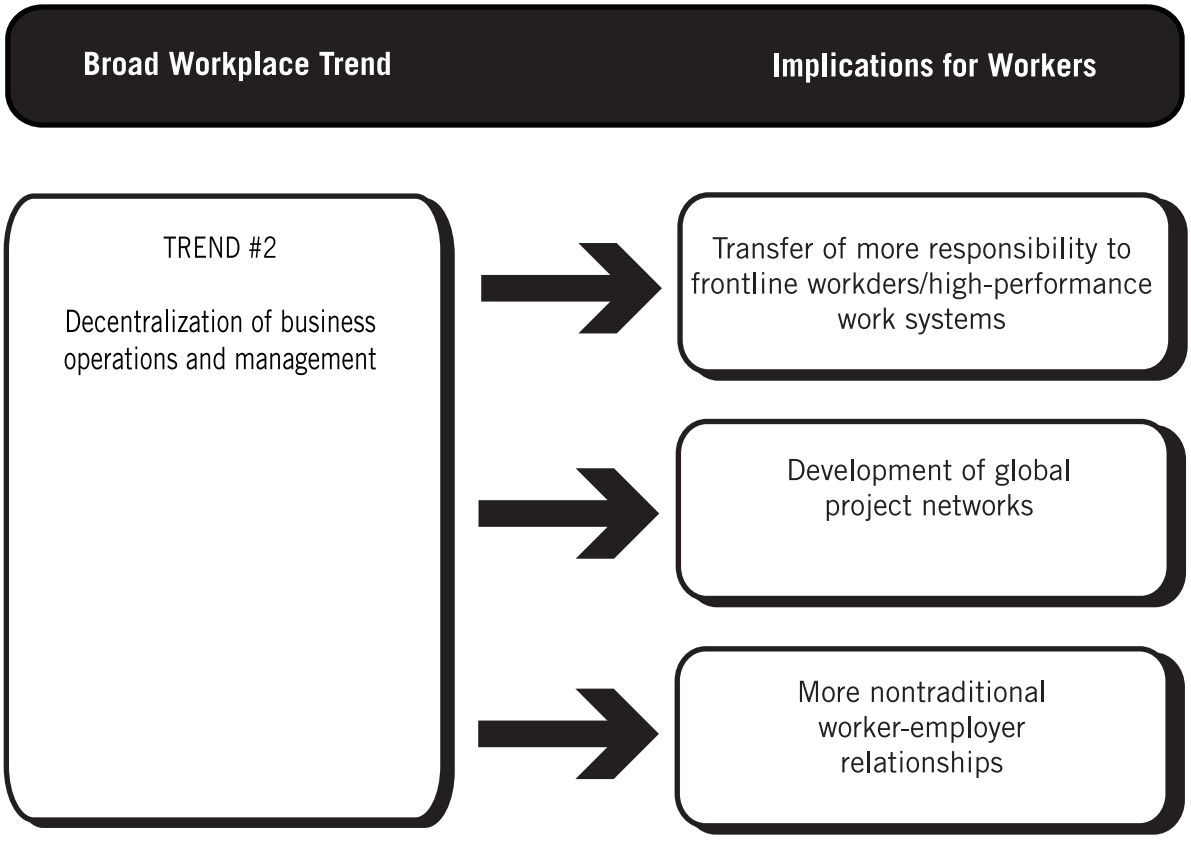
and innovate effectively.[11] Employers report that firms often need to adjust job responsibilities and work processes to respond in a timely fashion to new business, technology, or other trends. For example, managers at a New Jersey pharmaceutical manufacturer have been challenged to adjust business processes and work schedules to allow production workers to take advantage of a computer-based training system being introduced company-wide without compromising quality or efficiency. (See Example 10 on page 26.)

Workplace Trend #2: The Decentralization of Business Operations and Management

In response to increased competition fueled by globalization, rapid advances in information technology, and widespread deregulation in many industries, firms are becoming less vertically integrated, specializing in areas of expertise rather than trying to control all phases of production.[12] To cut costs, employers report that firms in many industries are outsourcing a growing variety of functions to other firms. For example, a financial services firm may outsource its mailing operations to another U.S.-based firm as a way to concentrate its activities on the core services it provides and to achieve cost efficiencies.

A related, but separate, trend is off shoring, which refers to the movement of jobs to overseas locations. This movement may occur within core jobs at a company, such as when a U.S.-based company establishes an overseas location, or within non-core jobs, which may be outsourced to a foreign firm. Off shoring has long been associated with industries such as manufacturing, but employers agree that off shoring and outsourcing now occur in many traditional "knowledge economy" industries, such as financial services, customer service, and computer programming. For example, employers consulted for this study report that many U.S. companies are outsourcing and off shoring call center and computer programming services to locations including India and Russia.

As businesses decentralize their operations, they are also moving away from hierarchical management systems in favor of more decentralized models of handling employees.[13] The trend toward



decentralization in both business structure and management has three important implications for workers.

Transfer of More Responsibility to Frontline Workers/High-Performance Work Systems

Many firms are turning to high-performance work systems to improve quality and efficiency in a highly competitive, decentralized business environment.[14] These systems are sets of formal or informal practices designed to move more authority and problem-solving responsibility from managers to frontline workers.[15] According to employers consulted for this study, New Jersey firms are increasingly using self-directed work teams and performance improvement systems, which represent two common variations of high-performance work systems.

Some companies have created self-directed teams, typically consisting of employees from a variety of functional areas. Companies assign these teams with responsibility for specific projects or business processes. With their emphasis on employee collaboration, the teams reduce the need for a hierarchical supervisory structure. For example, workers at a New Jersey communications firm work on self-directed teams of peers from a variety of departments to develop and eventually perfect and market new products.

Some companies, particularly those in manufacturing, have implemented performance improvement systems. With such systems, companies involve all employees (including frontline workers) in a concerted effort to increase the quality of goods and services. Employees are expected to contribute ideas, identify inefficiencies, or track performance. For example, a New Jersey drug manufacturer recently implemented a lean manufacturing process that requires its workers to identify areas of waste and inefficiency. (See Example 4.)

According to New Jersey employers consulted for this study and other sources, high-performance work systems can only be effective if employees have adaptability, information management and communication, and business skills.

Adaptability Skills

High-performance work systems require workers to have flexible role orientation skills that can allow them to take on more

EXAMPLE 4
New Jersey Employer Profile:
High-Performance Work Systems

A New Jersey drug manufacturer recently received a grant from the State of New Jersey to upgrade the skills of its workers in support of the implementation of a new lean manufacturing process. From production workers to scientists, all employees are being trained to identify and eliminate waste in the drug manufacturing process. The company defines waste as anything that does not add value to the product. While the company has been implementing lean manufacturing in some form since the 1980s, officials report that the focus has changed from minimizing inventories to support just-in-time manufacturing to "value stream mapping," which identifies the activities needed to achieve a product goal and identifies ways to improve efficiency.

Source: Employer interview, 2006.

responsibility for advancing a firm's goals than may have been included in a formal job description. Employers report that workers must be able to move from a standardized, task-oriented perception of their jobs to one that is more broadly focused on improving departmental and firm-level outcomes through an evolving variety of independent and team-oriented actions. For example, in a small Internet company, workers often serve multiple roles ranging from programmer to clerical worker to budget analyst in order to help the company reach its goals. In addition, in utility companies, linepersons are now expected to perform more customer service functions to help improve the company's performance.

Since high-performance work systems often require workers to assume new and/or expanded job responsibilities, workers at all levels must be committed to applying lifelong learning skills to seek needed training, guidance, and assistance to perform well in new job roles. While companies may provide some in-house training to help employees transition to new systems, especially when these systems are of the formal variety (e.g., lean manufacturing processes), often workers are expected to learn new skills independently. For example, workers at a New Jersey cell laboratory who were asked to work with a new flowchart program were provided some training, but were expected to build additional expertise in working with the program on their own. (See Example 5.)

High-performance work systems place more responsibility on frontline workers to identify and address areas of potential waste or inefficiency. As a result, workers must employ critical thinking and problem-solving skills on an ongoing basis to be successful.

EXAMPLE 5
Changing Job Skills Snapshot:
Laboratory Technician

Laboratory technicians at a New Jersey cell repository recently had to assume new job roles to help the company comply with ISO certification requirements. To help the company become ISO certified, these workers had to create flowcharts that mapped their existing job tasks and policies governing their area of work. To create flowcharts that were comprehensive of company operations, these workers had to work in teams with other employees to gather the existing information, as well as to learn new technology skills to operate new flowchart software effectively.

Source: Employer interview, May 17, 2006.

Information Management and Communication/Relationship-Building Skills

Employers report that workers of all ranks must have strong teamwork, negotiation, networking, and persuasion skills to work well with others within most high-performance work systems, especially those involving self-directed teams. In these systems, workers must collaborate with little oversight from managers to produce effective solutions that improve work processes. For example, workers at a New Jersey software consulting firm needed superior teamwork skills to manage the development of software programs with workers from a variety of social and cultural backgrounds and widely varying levels of experience.

Frontline employees need to gather, prioritize, and analyze data and information encountered on the job that may affect firm performance. For

example, employers report that adult education teachers are often expected to act as "practitioner-researchers," collecting and analyzing data on student performance, often using computer-based software. In the life sciences, many biologists are now required to have skills in bioinformatics, a discipline that allows scientists to categorize and analyze complex biological data using computer programs and statistics.

Workers at all levels also need verbal, written, and presentation skills to convey new knowledge gained independently or in groups to managers and other key staff. For example, one technology employer notes how difficult it is to find technical and scientific workers who can design and deliver presentations of their work to executives and other non-technical staff.

Business Skills

Since high-performance work systems require frontline workers to assume more responsibility for firm-level outcomes, these workers are increasingly expected to have basic business skills, including an understanding of **business finance, product management and marketing, and project management skills.** For example, workers in many New Jersey technology development firms must have an understanding of the fundamentals of marketing and business finance to ensure efficiency.

Development of Global Project Networks

In 2001, a survey commissioned by WorldCom estimated that 61% of workers in large firms (500+ workers) worked on virtual teams. The typical team had six members, met once per week, and used email, audioconferencing, and the Internet to manage goals.[16] A 2006 survey sponsored by Verizon and Microsoft found that global collaboration enabled by communication technologies is a primary driver of firm performance across industries. According to the survey, businesses rated collaboration as a larger factor in business success than a company's aggressiveness at marketing and the competitive business climate.[17]

According to employers, many of New Jersey's high-tech employers rely on global networks of workers to manage complex projects. For example, a New Jersey engineering firm requires workers from several countries to collaborate on product development. (See Example 6.) Workers involved in global networks must manage people and processes using technology and handle communication difficulties related to language differences and understanding new cultural norms and workplace practices.

EXAMPLE 6
New Jersey Employer Profile:
Global Project Networks

At a small engineering firm with operations in New Jersey, the Philippines, and China, American team members must work effectively with their counterparts at other locations to develop new products. Challenges for the company include effectively managing workers in other countries who have different cultural and workplace norms and finding project managers with the foreign language skills necessary to facilitate team communication.

Source: Employer focus group, May 25, 2006.

According to New Jersey employers consulted for this study, workers must possess the following skills in order to adapt to and manage global project networks:

Information Management and Communication/Relationship-Building Skills

With any type of activity that requires intensive collaboration, especially among workers who use virtual tools such as email to communicate, workers need the skills to prioritize information effectively and analyze its significance to the project network's goals. For example, emails sent to all project network members may contain information that is more applicable to one member than to others. Employees must be able to identify the information that is crucial to them, while ignoring the information that is not pertinent.

Employers report that workers who participate in global project networks are expected to have the skills to understand common workplace norms and behaviors of the cultures represented on their teams. While most world cultures have adapted to American business styles, workers from these areas cannot be expected to carry the full burden of ensuring clear communication among team members. Increasingly, American workers at all levels who participate in global project networks are being asked to learn the subtle social cues that may indicate a communication problem that could adversely affect the team's efficiency or productivity. For example, one employer notes that their workers need to understand the differing communication styles of two European cultures in order to manage business meetings effectively. (See Example 7.)

EXAMPLE 7
Changing Job Skills Snapshot:
Project Manager

Several New Jersey firms that employ global project networks note that project managers at their firms must now employ sophisticated technology, people management, and communication skills to ensure that projects run smoothly. These project managers often work virtually and are also expected to travel internationally. At home and abroad, these workers must be skilled not only in basic project management skills, but also in facilitating communication among people from different cultural and language backgrounds. For example, one international electronics employer notes that a project manager at his company needed to facilitate a productive debate between American, Dutch, and German scientists, all of whom had vastly different verbal and nonverbal communication styles that tended to produce culturally based misunderstandings among some team members. The project manager in this case required the cultural understanding and communication skills to minimize misunderstandings and keep the project moving forward.

Source: Multiple employer and stakeholder focus groups, 2006.

Many companies also seek managers, especially those who will lead global teams, who have the foreign language skills to improve communication with critical team members. Employers and stakeholders consulted for this study consistently cite Spanish and Chinese dialects, especially Cantonese and Mandarin, as being the most highly desired language skills. Managers must

also have strong group facilitation skills to manage global networks effectively. For example, one employer that develops high-tech equipment notes that managers must sometimes use Chinese to clarify communication problems that arise among global team members in the United States and China.

Workers involved in global project networks must also have superior communication, presentation, and teamwork skills, including an awareness of the impact of nonverbal communication and more casual forms of written communication, such as email, to avoid misunderstandings and a loss of productivity among team members. Workers whose first language is not English must also be able to communicate effectively with team members. Several high-tech employers note that many of their technical workers are from other countries and have needed to develop stronger English language and general communication skills to perform their jobs effectively.

Business Skills

According to employers, the most commonly needed skill to participate effectively in a global project network is project management. The highly diverse and decentralized nature of global project teams necessitates that team members, especially those in leadership positions, need especially strong skills in this area. For example, employers report that workers on global project teams must be skilled at developing detailed project plans, assigning roles and responsibilities, maintaining clear communication among team members, tracking progress, and ensuring project milestones are accomplished on time and on budget. (See Example 7.)

Technology Skills

Given the geographic dispersion of team members in a global network, all team members must have excellent technology skills, especially with regard to virtual communication technologies. This includes the ability to effectively operate Internet-based conferencing and collaboration software, email, audio-conference equipment, and similar virtual communication tools.

Advances in Internet technology are making the World Wide Web easier to use for a number of purposes, including global project networks. Technology experts use the term Web 2.0 to describe the recent trend in Internet software development toward leveraging collective intelligence through websites that enable and encourage user input and interaction.[18] One common example of Web 2.0 technology is MySpace, where users develop their own web pages, post documents, and interact with other users. In the context of a global project network, non-technical workers may be expected to use Internet-based software to create project web pages that, similar to MySpace pages, allow users to share project documents and interact in a virtual environment. New software based on Web 2.0 technology also makes it easier for workers to access more types of data and information through the Internet, so global project team members must rely more heavily on Internet technology to conduct some types of research, according to employers.

More Nontraditional Worker-Employer Relationships

Employers report that the decentralization of business operations and increased competition are slowly leading to more nontraditional relationships among workers and employers. Some New Jersey employers included in this study report hiring more part-time workers and independent contractors, especially within high-tech businesses. High-tech employers also report hiring more virtual workers and allowing more workers to telecommute. Some estimates state that up to 25% of the U.S. workforce in 2003 was considered "nonstandard," including self-employed and part-time workers.[19]

Change in the nonstandard workforce has been slow over the past 20 years, but some analysts anticipate future growth.[20] Much of this growth is apparent in high-tech industries. For example, in June 2006, almost half of the nearly 6,000 New Jersey-based jobs posted on Dice.com, a leading high-tech job board, were either part-time or contractual work.[21] Several employers consulted for this study note that they had observed a sharp increase in the use of contractual workers in some New Jersey industries, especially telecommunications. Other high-tech firms consulted for this study, including a computer applications firm in northern New Jersey, also report an increase in hiring "virtual" workers, many of whom work from their homes and deliver products to the company electronically. (See Example 8.)

Given the increasing capability of communication technology, some researchers predict a coming rise in "e-lancers"—businesses of one or a few people connected across electronic networks to deliver services and products to a global marketplace.[22] Once again, employers at a number of high-tech businesses who were interviewed for this study note that their company, and others in their industry, are increasingly more likely to hire such workers on a contractual basis.

According to New Jersey employers consulted for this study and other sources, workers need specific skills in order to adapt effectively to these less traditional employer/employee relationships, including:

EXAMPLE 8
New Jersey Employer Profile:
Nontraditional Worker/ Employer Relationships

A firm that creates computer applications for the U.S. military reports hiring a larger number of "virtual" engineers in recent years. These workers perform engineering tasks in a remote location (usually another state) and deliver their products to the company digitally. Similar to those who manage global project networks, managers at the company must be skilled at communicating effectively with these virtual engineers and managing their progress using email, video and audio conferencing tools, and other virtual communication tools. The company also reports that managers have to be more flexible in designing schedules for these virtual workers, who are often seeking more freedom in their job role than traditional employees.

Source: Employer focus group, May 17, 2006.

Adaptability Skills

Especially in the case of contractors and other contingent employees, workers must have superior change management skills to adapt to constant shifts in their work assignments, employers, and pay rates. Whether working as a part-time employee or as a consultant, employers report that many nontraditional workers must apply lifelong learning skills to seek new knowledge and job skills that will help them to stay competitive with more traditional workers and maintain or improve job assignments. For example, since many nontraditional workers (with the exception of full-time employed telecommuters) do not receive traditional employer benefits, they must also independently develop the career management skills needed to secure adequate health care coverage, establish retirement accounts, and procure other fringe benefits. Most contractors and e-lancers must also file taxes independently.

For virtual workers and consultants, effective time management is also an essential skill. For example, several high-tech employers consulted for this study report that workers must be able to produce deliverables efficiently without a supervisor physically present.

While larger firms use technology tools to monitor employee productivity virtually, many smaller firms do not possess such sophisticated tools. To perform effectively, employees or e-lancers who work remotely must be able to effectively balance the demands of professional and personal life.

Information Management and Communication/Relationship-Building Skills

Many nontraditional employees, especially contractors and part-time workers seeking additional employment, must build strong written and verbal communication and presentation skills to market themselves to potential new employers. Similarly, these workers must have superior negotiation and networking skills to succeed. For example, e-lancers need to find ways to convey their written and verbal talents and must understand how to negotiate appropriate compensation for their work.

Technology Skills

Many types of nontraditional workers, especially consultants and e-lancers, need excellent technology skills. Regardless of industry, these workers need to be able to operate and maintain a home computer with email, Internet access, and often the ability to host virtual meetings. In high-tech industries, workers are also expected to have skills in the latest industry technologies. For example, most workers at a New Jersey-based telecommunications firm are expected to have varying levels of knowledge and skill in Voice-Over-Internet Protocol technology, depending on their position. (See Example 9.)

EXAMPLE 9
Changing Job Skills Snapshot:
Electronics Engineer (Consultant)

Several high-tech companies note that more engineers in New Jersey are being hired as consultants, especially within the communications industry. These workers must independently seek training to keep current on the latest technologies in their industry, especially Voice-Over-Internet Protocol, and must have the business and communication skills to market their talents to potential employers. In addition, these workers must excel at time management and must independently deal with their own taxes and secure their own health care and other benefits.

Source: Multiple employer focus groups, 2006.

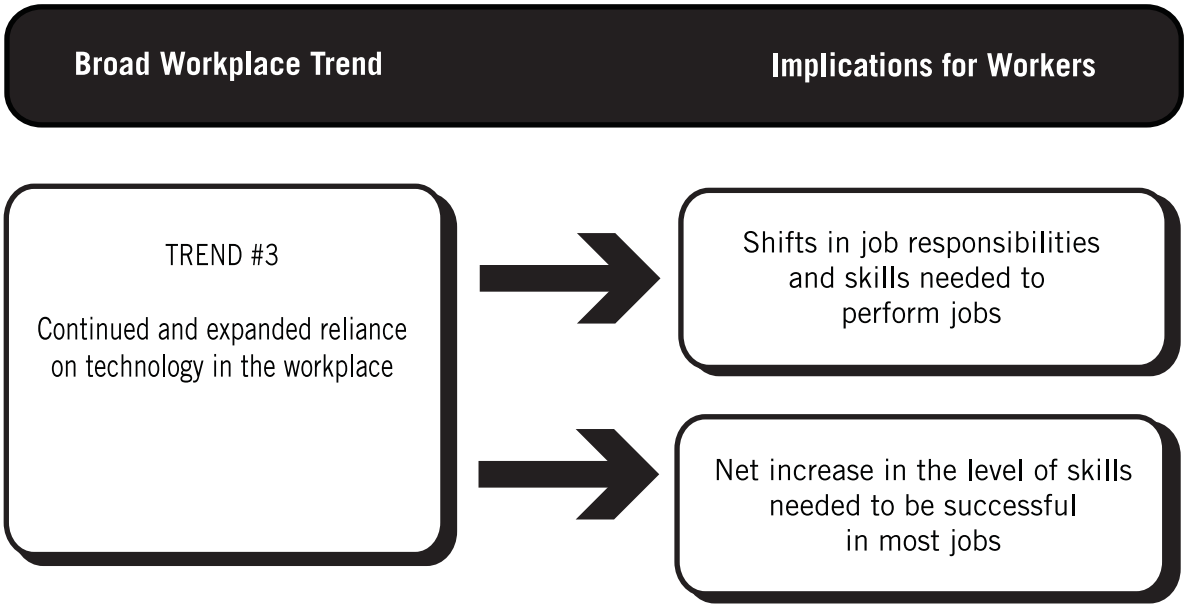
Workplace Trend #3: Expanded Reliance on Technology in the Workplace to Improve the Quality and Efficiency of Work Processes and to Train Workers

Economic forecasters and employers consulted for this study agree that nearly all jobs, regardless of industry, are affected by technology to some degree. Employers in high-tech industries require many highly skilled workers to develop, repair, install, and use new technologies as companies continually introduce new innovations to improve the quality of products and services and to make work processes more efficient.[23] However, other industries are heavy users of technology, especially information technologies that enable communication and data transmission, analysis, and storage. According to the RAND Corporation, by 2001, the finance industry had made the greatest investments in technology, followed closely by the transportation, communications, and utilities industries.[24]

According to stakeholders and employers consulted for this study, the health care industry is also a heavy user of a range of technologies.

As noted earlier in this report, many technology experts have used the term Web 2.0 to describe broad changes in Internet technology that have made it easier for non-technical users to access and generate content on the World Wide Web. While the exact meaning of Web 2.0 is still a subject of debate, experts agree that new types of Internet software are enabling more users, including workers, to use the Internet for targeted research, marketing, and communication.

Companies are also relying more heavily on technology to deliver training to workers.[25] As reported by the American Society of Training and Development, between 2003 and 2004, the use of technology to deliver training increased from 23% to 27% among small companies surveyed and from 35% to 38% among Fortune 500 companies surveyed.[26]



This increased reliance on technology has two important implications for workers.

First, technology used on the job to improve the efficiency of business processes is causing **shifts in the job responsibilities** of many workers. In many cases, the shift in job responsibilities comes as a result of needing to learn the skills to effectively use a new technology, such as a new database program or a new piece of manufacturing equipment.

However, technology often replaces job functions and, in some cases, entire jobs. As end-user technologies (e.g., scanners) become easier to use, some jobs require fewer skills and responsibilities. More often, however, employers report that they add new, more complex responsibilities to job descriptions to replace those made easier by technology.[27] These new responsibilities may be technology related. For example, in the retail industry, employers report that low-skill job tasks such as affixing price labels, which are now accomplished through technology, have been replaced by higher-level tasks such as increased customer service and product sales and marketing display.

The increasing use of technology to deliver training to workers also contributes to shifts in job responsibilities. Several employers consulted for this study use some form of computer-based learning system. Workers and managers are expected to schedule time during the workday to use the system for ongoing staff development. For example, a drug manufacturer is now training all of its workers through distance learning. (See Example 10.)

In the biotechnology industry, much new technology is developed and tested at universities, according to Kenneth Breslauer, Vice President of Health Sciences Partnerships at Rutgers University. As a result, workers must travel to off-site locations and interact with students and professors within an academic setting as they learn about and use newly developed technologies. For example, according to Breslauer, a small New Jersey company routinely sends workers to an incubator facility at Rutgers to train on and use nuclear magnetic resonance machines that the company cannot afford to build and use in-house.

Second, employers report that the introduction of new technology, whether for training purposes or to help workers perform their jobs, generally increases the level of skill and education required to succeed on the job. Some new

EXAMPLE 10
New Jersey Employer Profile:
Expanded Reliance on Technology in the Workplace

A drug manufacturer recently introduced a company-wide distance learning initiative to train workers—from frontline production workers to managers. The employer reports that production workers were especially challenged by the need to apply technology and independent learning skills in the new learning environment. Many of these workers have little to no experience with computers. However, the new technology assumes a certain amount of basic computer skills, as well as the ability to learn and generalize knowledge learned through a computer program to apply on the job.

Source: Employer interview, May 5, 2006.

technologies, such as relational databases, require complex new skills to operate effectively.[28] Even in cases where job responsibilities are made simpler by technology, New Jersey employers consulted for this study expect workers to have the fundamental skills that the technology replaces in order to identify equipment malfunctions and to perform effectively when the technology breaks down.

According to New Jersey employers consulted for this study and other sources, workers need to possess a number of key skills in order to effectively adapt to the increased reliance on technology in the workplace.

Math/Science/Engineering/ Technology Skills

Frontline workers may not need as high of a level of skill to operate new technologies on the job as many technology products have developed more intuitive user interfaces. However, workers who develop, test, repair, or install technology must stay current on the details of how new, sometimes complex, technologies operate. This may require not only technology-specific skills, but also broader skills in math, science, and/or engineering.

Often, worker interactions with technology on a day-to-day basis are limited to certain common user functions, such as monitoring a computer display in a chemical plant to track fluid levels or other diagnostics. However, many employers, especially in high-tech industries, need workers to have the systems analysis skills to understand the underlying principles behind the technology they operate in order to identify equipment malfunctions and troubleshoot problems when the technology fails to operate correctly. Employers consulted for this study report that older workers tend to have a better understanding of these principles and how the larger system works, but lack high-level technology skills to adapt to new interfaces. Younger workers have stronger technology-based skills, but lack the wider systems understanding. Ideally, employers need workers who possess both sets of skills.

While many technical jobs require workers to be familiar with particular types of equipment, software, or other types of technology, workers from every industry and at nearly all levels of employment, must use computers to complete job tasks. A growing number of workers also have access to the Internet and are required to communicate with other workers, conduct research, and create content using Internet-based technology.

Adaptability Skills

Due to the rapid advances in technology, especially the information technology used in many workplaces, workers must constantly adapt to new technologies being introduced on the job. Lifelong learning and change management skills are especially important for this purpose. For example, several telecommunications employers stress the need for line installers and other workers to have skills in Voice-Over-Internet Protocol and other new technologies. (See Example 11.)

EXAMPLE 11
Changing Job Skills Snapshot:
Telecommunications Line Installers

At New Jersey telecommunications firms, line installers, as well as nearly all workers in the company, need to be familiar with the latest telecommunications products, including Voice-Over-Internet Protocol. Since this technology is more complex than some previous technologies, workers need more advanced technology skills to understand and install it effectively. Several employers report that too few workers are prepared with skills in current and emerging industry technologies.

Source: Employer focus group, May 17, 2006.

Workplace Trend #4: Increasing Diversity in the Workplace

New Jersey's workplaces are becoming more diverse, and this trend is likely to continue. The New Jersey Department of Labor and Workforce Development predicts that the percentage of women in the workforce is expected to stay constant at 47%, and the percentages of older workers and workers from other ethnic backgrounds is expected to increase dramatically in the next several years.[29]

Between 2004 and 2014, the number of older workers in New Jersey's civilian labor force, especially those over 64, is expected to increase at a much faster rate than the number of younger workers.[30] The number of workers aged 65 and over is expected to increase by 56% from 2004 to 2014. (See Table 1.) The number of workers between the ages of 35 and 44 is expected to decrease while the number of workers in all other age groups is expected to increase at a moderate rate. During the same period, the growth of workers from minority backgrounds will vastly outpace the growth of White, non-Hispanic workers in the state's civilian labor force.[31] (See Table 2.)

Table 1
Projections of New Jersey Labor Force, by Age Group

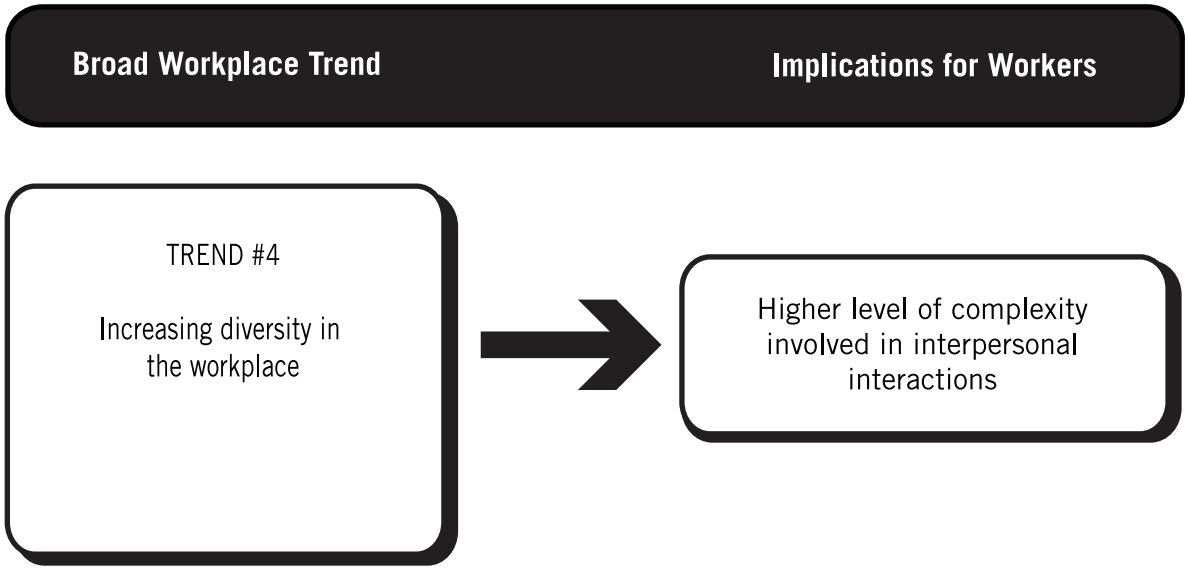
Age Group	Estimated Number of Workers, 2004	Projected Number of Workers, 2014	Percent Change, 2004-2014
16-24	584,200	649,100	11%
25-34	863,300	939,700	9%
35-44	1,134,600	948,300	-16%
45-64	1,658,300	1,919,500	16%
65+	147,600	230,600	56%

Source: Authors' calculations based on New Jersey Department of Labor and Workforce Development, Population and Labor Force Projections, 1990-2025.

Table 2
Projections of New Jersey Labor Force, by Race

Age Group	Estimated Number of Workers, 2004	Projected Number of Workers, 2014	Percent Change, 2004-2014
White	3,460,100	3,566,200	3%
Black	583,300	635,000	9%
Other	308,700	432,400	40%
Multiracial	35,900	53,500	49%
Hispanic	627,300	825,300	32%
White, Not of Hispanic Origin	2,882,900	2,808,900	-3%

Source: Authors' calculations based on New Jersey Department of Labor and Workforce Development, Population and Labor Force Projections, 1990-2025.



According to several New Jersey employers included in this study, these trends may be even more pronounced in high-tech industries as employers report that a large percentage of the science and engineering workforce is foreign-born.

According to New Jersey employers included in this study, age, race, and gender diversity can make workplace interactions more complex, especially in an environment where workers must work in teams more than ever before. People from different cultural or generational backgrounds may encounter more challenges communicating with one another than with people from similar backgrounds.

However, employers report that when communication is successful, there are many benefits to having a diverse workforce. To ensure success, employees—from production workers to engineers—must develop the skills needed to understand and communicate with colleagues and supervisors who have different cultural backgrounds and communication styles. For example, a technology employer notes that some managers have faced challenges adapting to the needs of older, experienced workers. (See Example 12.)

EXAMPLE 12
New Jersey Employer Profile:
Handling Diversity in the Workplace

The CEO of a small technology firm was interested in hiring older workers because of their ability to add value to the company through their maturity, diverse skill sets, experience, and willingness to mentor younger workers. However, the company has been challenged to create flexible work arrangements for older workers, many of whom are not interested in working a standard work week or who may travel for large parts of the year.

In addition, managers have to develop innovative approaches to addressing communication-related challenges that have arisen due to generational gaps between younger and older workers. Workers have to adapt their communication styles to adjust to a workplace that includes a wider range of ages than in the past.

Source: Employer focus group, May 19, 2006.

According to New Jersey employers consulted for this study and other sources, workers will need a number of important skills in order to adapt to the increased diversity of the workforce.

Communication/Relationship-Building Skills

Employers report that workers need strong written and verbal communication, cultural understanding, teamwork, negotiation, and presentation skills to ensure smooth interaction with a more diverse set of co-workers. Workers whose first language is not English also need strong English-as-a-Second-Language skills. For example, a software manufacturer notes that a number of communication difficulties were alleviated as workers learned to understand the cultural norms and expressions of workers from other cultural backgrounds.

Adaptability Skills

To handle the diverse needs of workers who come from a variety of backgrounds and personal circumstances, managers, in particular, need to manage change effectively, including being able to introduce personalized scheduling and benefit packages for workers with special needs or preferences.

For example, some retail employers are constructing special incentives that include flexible scheduling to attract older workers. (See Example 13.) Overall, managers must be able to meet the needs of individual workers while communicating with the larger employee base regarding revised or amended company policies. Workers at all levels need lifelong learning skills to learn new communication skills that may be needed to work within a more diverse setting.

EXAMPLE 13
Changing Job Skills Snapshot:
Retail Store Manager

At a large New Jersey retail pharmacy chain, store managers who are recruiting older workers to high-demand positions, such as pharmacists, must develop new scheduling policies and procedures to accommodate skilled older workers who are willing to work, but who prefer alternative work schedules. Many of these workers choose to live outside New Jersey for large parts of the year. To accommodate their needs, store managers must construct personalized schedules and work with the corporate office to arrange for regular transfers to chain locations in other states.

Source: Employer focus group, June 27, 2006.

Workplace Trend #5: Increasing Employer Concern Over Security, Privacy, and Ethics Issues

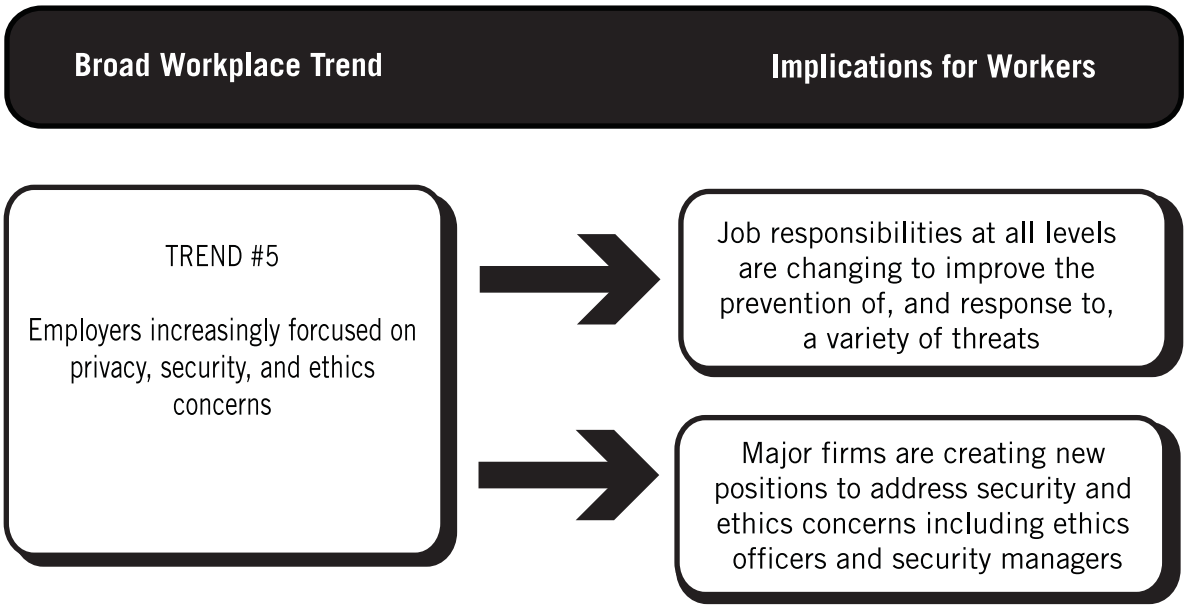
In recent years, new threats to the safety and privacy of workers, employers, customers, and the public have emerged that are affecting the business world. According to many employers, the September 11th terrorist attacks, corporate scandals such as the one perpetrated by Enron, and the loss of large amounts of personal customer data by several large organizations, has served as a "wake-up call" for business and government alike.

Employers report that these threats, and others like them, are affecting the priorities and business practices of many workplaces in New Jersey. Some industries, such as the chemical manufacturing sector and the financial industry, are responding to new state and federal regulations that mandate them to change their processes. However, many more industries are independently making changes to deal with new, real, or perceived threats. According to employers and other sources, the emergence of new threats has caused many employers to increase their focus on ethics, security, and privacy in the workplace.

Advances in technology and its pervasiveness in the American workplace play a large role in many types of security, privacy, and ethics-related threats, according to employers. Hackers have found ways to steal confidential information or disable key systems using computer programs, while terrorists use the Internet and other technologies to communicate, and many ethics scandals leave long trails of email evidence for skilled technical investigators to uncover.

This trend has two important implications for workers.

First, job responsibilities at all levels of employment are changing. As discussed in Workplace Trend #2, New Jersey employers report that they are increasingly likely to hold workers at all



levels accountable for identifying, monitoring, and addressing security, privacy, and ethics concerns. For example, a New Jersey pharmaceutical firm is training all of its workers in environmental and safety standards. (See Example 14.) In addition, according to a 2006 survey by PriceWaterhouseCoopers, 9 out of 10 medical device companies surveyed nationwide had applied an industry-wide ethics code to all workers, regardless of rank.[32]

Because technology is involved in many types of threats today, employers expect workers at many levels to have more advanced technology skills, as well as fraud detection and investigation skills to uncover many types of computer-based threats. For example, financial services industry employers report needing a range of workers who can identify irregularities in computer records and systems that might indicate compromise or fraud.

EXAMPLE 14
New Jersey Employer Profile:
Handling Security, Privacy, and Ethics Concerns in the Workplace

A large pharmaceutical firm implemented a global training initiative to train all workers in safety and environmental standards. The program supports a "best practices" initiative that formally disseminates information on safety and security practices throughout the firm. The same company also created a corporate-level position for an individual to manage this program and to ensure that the company remains in compliance with safety and environmental standards.

Source: Employer interview, June 20, 2006.

Second, major firms in the region are creating specialized positions to oversee training and monitoring of security and ethics issues.[33] Especially in the finance, chemical, transportation and storage, manufacturing, and other vulnerable industries, employers are developing positions that have sole responsibility for ensuring that security, privacy, or ethics issues are dealt with effectively. The field of cyber security, which requires professions with computer science and investigation skills, is a growing field of specialized work that has emerged as employers search for ways to fend off computer-based threats. For example, at Port Newark/Elizabeth, cyber security workers analyze computer-based databases and other information to pre-screen ships approaching the Port.

According to New Jersey employers consulted for this study and other sources, workers need new skills to adapt to this increased focus on security, privacy, and ethics:

Adaptability Skills

As new threats and challenges emerge, workers at all levels need strong monitoring, critical thinking, and problem-solving skills to identify potential security, privacy, or other threats and to take appropriate action to minimize problems for the company or the public at large. Workers, especially managers, need monitoring skills to remain aware of new regulations related to various threats and to identify best practices for preventing or handling breaches of security, privacy, or ethics, especially when regulations for how to do this do not exist. Since companies must often change their business processes and policies quickly in

response to new threats, workers from frontline employees to managers must be able to manage change effectively.

Math/Science/Engineering/ Technology Skills

Since many companies use technology—including cameras, electronic databases, scanners, and other tools—to identify and manage security, privacy, and other threats, workers at all levels increasingly need technology skills, as well as monitoring and observation skills to operate such equipment correctly and identify malfunctions early. For example, chemical production plant workers must use technology to identify potential safety and security threats in their workplaces. (See Example 15.) Systems analysis skills are necessary in many information technology positions to troubleshoot technology-related problems quickly.

Since cyber security, the use of technology to monitor and prevent security threats, is such a growing and competitive field, workers who develop such tools also need the required math, science, and engineering skills to develop and test new technologies quickly and effectively.

EXAMPLE 15
Changing Job Skills Snapshot:
Chemical Plant Production Worker

According to several New Jersey employers, chemical plant production workers must be skilled at conducting security vulnerability assessments, mapping hazards in the workplace, verifying the identity of plant visitors and workers, and carrying out company-specific emergency awareness protocols, among other duties. Employers report that production workers now need specific attitudes and skills including:

- Monitoring and observation skills to identify potentially hazardous/dangerous materials or persons at their work sites;
- Critical thinking and enhanced communication skills to improve the relationship between their companies and the larger community;
- Other adaptability skills, such as risk and change management skills, to determine priorities in a shifting security environment; and
- Technology-based record-keeping and reporting skills to track security-related events, persons, and activities.

Source: Multiple employer interviews, May 2006.

Workplace Trend #6: Business Processes Change in Response to Shifts in Regulatory Environments and Changing Patterns of Regulation

Today's businesses must deal with the wide-ranging impact of both domestic and international regulatory environments. Whether regulations affecting an industry are added, changed, or reduced/eliminated, employers included in this study agree on the result: managers must adjust their business processes to accommodate the new environment. In the age of globalization, with firms having offices and customers in many different countries, employers report that businesses must often adjust to not one regulatory environment, but several. There are two ways in which regulatory environments are changing and affecting businesses.

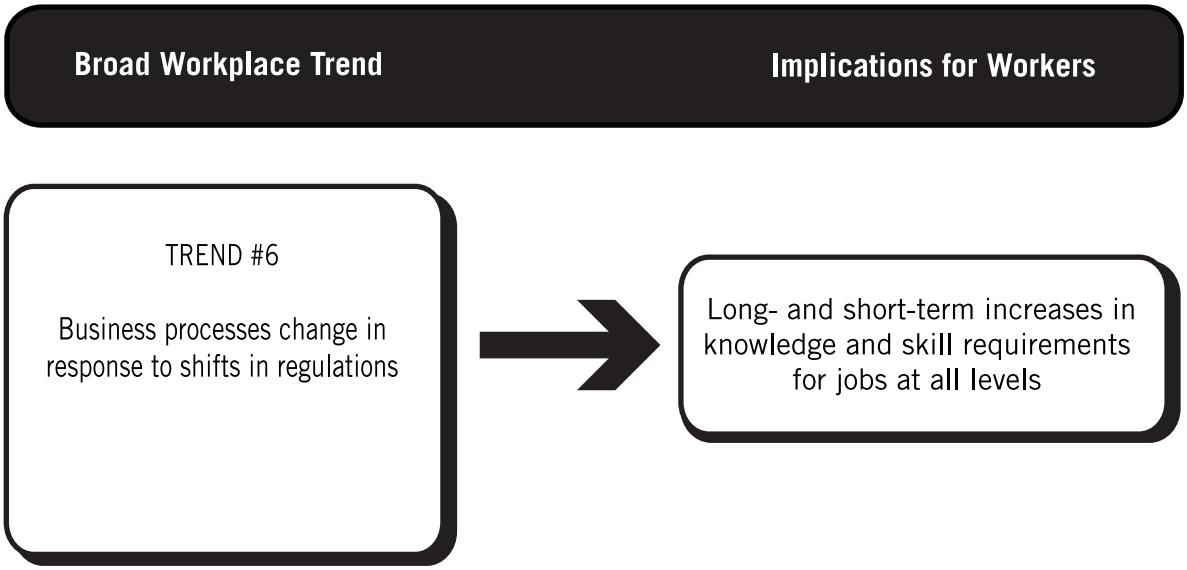
Deregulation

Many countries, including the United States, are reducing government oversight and restrictions in certain industries to promote global competition and increase market efficiency. In the United States, industries including communications and financial services have undergone massive deregulation efforts in recent years that have led to major shifts in business processes and the level of competition within the industry.

New Regulations

New regulations are also introduced on an ongoing basis both domestically and internationally. According to employers, not only are the regulations themselves often complex, but the enforcement of certain international regulations can vary from country to country. For example, a European Union regulation banning toxic substances in electronic equipment is enforced differently in particular European countries, according to employers interviewed for this study.

As industry-related regulations are added or removed, firms must adjust their business processes to accommodate the change.



Whether regulations are added or removed, employers report that the skill and knowledge requirements for jobs at all levels of the organization tend to increase. Deregulation, as one employer states, is "like moving from the zoo to the jungle."[34] Often, employers are given more freedom to operate in new ways and competition increases sharply. As a result, workers at all levels must acquire new skills and knowledge sets to keep the company competitive. New regulations, whether domestic or international, are often complex and can influence business processes in profound ways. For example, a medical equipment manufacturer had to make multiple changes to its production processes to adjust to a new international regulation that was enforced differently in different European countries. (See Example 16.)

Depending on the regulation, there may be a net increase in the skills required of workers in the long term. However, the job responsibilities and knowledge base of workers at all levels tends to increase sharply as the company adjusts to the new laws.

EXAMPLE 16
New Jersey Employer Profile:
Business Processes Change in Response to Shifts in Regulatory Environments

A medical equipment company had to change its production processes to adapt to a new international regulation that is enforced differently in each customer's country. As a result, managers needed to create complex new policies for ensuring that products met destination requirements. Frontline production workers need enhanced critical thinking and observation skills to identify and remove prohibited materials from production lines.

Source: Employer focus group, May 25, 2006.

According to New Jersey employers consulted for this study and other sources, employees need several key skills to adapt effectively to this trend.

Adaptability Skills

Since changes in regulations often cause major changes in business processes that affect employees at all levels of an organization, workers need to be able to manage change effectively and to apply lifelong learning skills to acquire the new skills needed to adapt to the changed environment. For example, managers must determine which jobs and tasks will require changes to adjust to the new regulatory situation. Critical thinking and problem-solving skills are also important to allow workers to identify current tasks in their purview that may be subject to a new regulation or to the removal of regulations.

Business Skills

Especially in the case of deregulation, which intends to increase competition within industries and remove barriers to doing different types of business activities, managers and frontline workers must apply better marketing, sales, project and product management, and business finance skills to help the firm prosper in the new environment. For example, according to employers, customer service representatives in the insurance industry must now aggressively sell other types of financial products to help their firms stay competitive in a deregulated environment. (See Example 17.)

Information Management Communication/Relationship-Building Skills

The sudden changes that shifts in regulatory environments bring about require that workers, especially managers, have superior written, verbal, and presentation skills to ensure that critical information about changes in business processes is filtered effectively and efficiently throughout the company. Managers, as well as other workers, must also have the reading comprehension and information prioritization and analysis skills to understand how notices about regulatory shifts may affect their job areas.

EXAMPLE 17
Changing Job Skills Snapshot:
Customer Service Insurance Representative

Employers in New Jersey's financial services/ insurance industry report that following the passage of the Graham-Leach-Bliley Act in 1999, which deregulated the finance industry, customer service insurance agents had to learn additional knowledge and skills to effectively sell new financial products to insurance customers. No longer limited to selling just insurance, these workers must understand a complex array of banking and security products to be effective at their jobs.

Source: Employer focus group, February 24, 2006.

Conclusion: The Changing Skills Needs of Employers

Workplace trends driven by globalization, rapid advances in technology, shifting regulatory environments, diversification of the workforce, and emerging security, privacy, and ethics-related threats are changing the skill needs of employers. Skills related to managing relationships, information, and business processes to promote innovation are in the highest demand to help businesses to compete effectively in a rapidly changing global business environment.

Overall, employers included in this study agree that workers **at all job levels** increasingly require the following skill sets, which are necessary to effectively manage relationships, information, and business processes to promote innovation and adapt effectively to emerging workplace trends:

1. Adaptability skills,
2. Information management and communication/relationship-building skills,
3. Interdisciplinary skills,
4. Business skills, and
5. Math/science/engineering/technology skills.

Priority Skill # 1: Adaptability Skills

Employers need workers who can independently find ways to adapt quickly to changing business processes and innovate effectively. Critical thinking and problem-solving skills, managing change, and applying lifelong learning skills are some of the most important skills workers need to adapt to rapid changes in the workplace. All workers must also adopt what some researchers call "flexible role orientation" in the workplace, the skill needed to transition successfully into new job roles and responsibilities. In addition, part-time and independent workers must have especially strong career and time management skills.

High-Priority Adaptability Skills

- Critical thinking and problem solving
- Monitoring
- Flexible role orientation
- Manage organizational change
- Lifelong learning
- Time management
- Career management

Priority Skill # 2: Information Management and Communication/ Relationship-Building Skills

In today's information-rich work environments, workers must have the skills to gather, prioritize, analyze, and present information effectively using a variety of media. Employers stress that these skills—as well as cultural sensitivity and understanding, verbal and written communication skills, and presentation skills—are especially important. Workers

also need the teamwork, group facilitation, networking, and other communication skills to manage relationships well and to improve the flow of knowledge throughout the organization and to key stakeholders. Managers and advanced sales positions may require foreign language skills.

High-Priority Information Management and Communication Skills

- Gather, prioritize, and analyze data and information
- Convey knowledge gained through analysis
- Cultural understanding/awareness
- Public speaking/presentation
- Writing (especially brief, professional summaries)
- Teamwork
- Negotiation
- Persuasion
- Networking
- English language/English-as-a-Second-Language
- Foreign language (especially Chinese, Spanish for managers)
- Group facilitation (especially managers)

Priority Skill # 3: Interdisciplinary Skills

While most technical jobs still require strong skills in a target discipline, many employers increasingly seek workers who also have strong skills in other technical and business disciplines. For example, experts agree that there is a strong need for scientists and engineers who have the entrepreneurial and interdisciplinary technical skills needed to create start-up companies that will bring new technologies to the market.

High-Priority Interdisciplinary Skills

- Multiple technical disciplines (e.g., two or more sciences, science and engineering)
- A mix of one or several technical skills and advanced business and/or communication skills

Priority Skill # 4: Business Skills

Employers are especially focused on finding workers who have strong project management skills as well as the marketing skills needed to ensure successful commercialization of innovative products and services. Other important business skills include entrepreneurial, basic business finance, sales, and management skills, especially the ability to manage virtual workers.

High-Priority Business Skills

- Project management
- Product management/marketing
- Sales/customer service
- Basic business finance
- Management skills, especially in a virtual environment

Priority Skill # 5: Math/Science/ Engineering/Technology Skills

Workers at all levels in high-tech firms are expected to have some level of technical knowledge in the company's target discipline. In other industries, most workers also need to be able to learn new technologies and to have fairly advanced technology skills. In addition, workers must increasingly have the ability to effectively use distance learning and other computer-based technology training.

High-Priority Math/Science/ Engineering/Technology Skills

- Advanced knowledge in a single math/ science/engineering discipline
- Basic knowledge in a technical discipline
- Mechanical and other hands-on technical skills
- Understand and apply new technologies, including distance learning tools

Endnotes

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Appendix: Employers, Economic and Technology Forecasters, and Other Stakeholders Consulted for this Study

As part of this study, the Heldrich Center hosted interviews and roundtable discussions with 161 forecasters, New Jersey-based employers, and other stakeholders.

To understand broad economic and industry trends, the Heldrich Center convened two discussions with a total of 74 economic and technology forecasters and other stakeholders, including a large number of educators and industry-related organizations. These groups took place in January and February of 2006.

From February 2006 through July 2006, the Heldrich Center hosted focused discussions with 72 representatives from 58 New Jersey-based employers spanning 11 industries to confirm and explore the trends identified by forecasters, stakeholders, and the scholarly literature. These discussions were also used to identify the effect that the trends are having on employer skill needs and to identify occupations that are affected by these trends. A total of 10 group discussions were conducted for the following employer groups, some of which represent multiple industries:

- Multiple high-tech industry employers (two groups held)
- Health care (two groups held)
- Finance
- Transportation
- Utilities (two groups held)
- Retail
- Domestic Preparedness

Finally, the Heldrich Center conducted follow-up interviews with 15 employer representatives from a variety of industries between April 2006 and June 2006. These interviews were used to obtain more detailed skill and educational profiles of occupations affected by emerging workplace trends.

The following individuals participated in the discussions and interviews conducted for this study:

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