

The goal of this information technology (IT) workforce skills assessment is to gather information to help New York State (NYS) better meet the training and development needs of its IT professionals, and to identify future needs for IT skills. The project included two voluntary on line surveys. The first was directed to IT employees and the second to Chief Information Officers (CIOs) in state agencies. The two surveys together produced a comprehensive current profile of self-reported demographics, skill proficiencies, and training needs of the current state IT workforce, as well as a comprehensive set of agency level IT forecasts for the next three years. This report, prepared by the Center for Technology in Government (CTG), is the first step in a longer term effort. In the next phase, the State CIO Council Human Resources Committee and its subgroups will use these results to generate recommendations for next steps and action plans that enhance professional development and skill proficiency for the entire IT workforce. In addition, CTG will produce agency level reports to be provided to participating agency CIOs for similar future planning.

The data show that New York has a strong foundation for moving into the future. The IT workforce has strong and pervasive management skills, and strong proficiency in fundamental IT topics. IT employees are well-educated and very experienced in state government and in the missions of agencies. The workforce is stable and highly motivated for training in both traditional and new areas. On average, employees reported a need for some level of training (from basic to advanced) in 42 of the 126 skills in the survey. Many commented that frequent and varied training is necessary because the field changes continually and because its components are so interdependent. The retirement picture is mixed. Non-managerial IT professionals indicate they may retire in only modest numbers in the near future, but a growing wave of impending retirements, especially after 2009 and among management staff is a concern. As a counterpoint to this picture, most employees are interested in working for the State part time after retirement.

Strong proficiency exists in foundational IT technical areas such as system design and development, programming, and technical support services which are all important for current and future IT effectiveness. Equally important, however, the study showed a substantial gap between the current proficiency profile of the IT workforce and the skill needs forecasted for growth in the near future. Infrastructure (including security), web computing, and work associated with information content appear to present major challenges. Most agency CIOs forecast growing need for skills in these competency areas, but current proficiency levels are low in all three. Fortunately, strong convergence is evident across employees, CIOs, and state IT leaders on the types of skills that are necessary to achieve and sustain an effective IT enterprise across state government in the future. These skills were identified by comparing low current proficiency ratings, high future need, high employee training demand, and strategic importance. These skills represent the most fruitful areas for investments in workforce skill development.

Training professionals can use the data from this study to construct comprehensive programs and coherent curricula that address the needs of workers in a variety of job specialties and in core competencies that pertain to all IT professionals. In addition, similarities in key needs across all types of agencies present opportunities for partnerships and economies of scale in training and professional development investments.

Finally, the study results suggest areas for future investigation and leadership attention. These pertain to three topics: workforce development, training program design, and organizational and enterprise IT planning.

Workforce profile

The demographic data collected through the surveys highlight areas of strength in the NYS workforce as well as some concerns with respect to future workforce development.

The State IT workforce is well-educated and very experienced. More than 90 percent have some college education and much of that education is concentrated in technical fields (more than one-third hold degrees in computer science, information science, or management information systems). In addition, about 16 percent of IT professionals hold current certifications. The workforce is also very experienced in both state government and agency missions, with long tenures in state service, mostly concentrated in one or two agencies.

Retirements among non-managerial IT professionals may be modest in number for the next three years, although nearly a quarter of IT managers and about one-third of the CIOs expect to retire within that time period. Retirement projections increase substantially for all three groups after 2009. The overall workforce profile indicates a substantial proportion will be eligible to retire in the next three years (especially among managers and executives) although the proportion of non-managerial IT professionals who actually plan to retire is rather modest (about 11 percent) between 2006 and 2009. The pace of retirement intentions for non-managerial IT professionals between 2006 and 2012 ranges from 1.7 percent planning to retire in 2006 to 3.9

percent in 2012, by which time more than 22 percent of today's IT workers expect to have retired. Three-quarters of IT professionals and managers reported an interest in continuing to work for the State part-time after retirement.

Current skill proficiencies

The skill proficiency data is based on self-assessments by New York State IT employees. They reported their personal level of proficiency on 126 skills associated with IT work in state government.

Higher overall proficiency ratings are concentrated in management, system design and development, technical support, and legacy technologies. Among the top 25 skills, ten are general management skills such as written and oral communication and supervisory skills.

Lower overall proficiency ratings are associated with networking, web-based services, security, and information analysis and use. No skills in these areas appeared in the top 25.

As a broad pattern, younger employees have somewhat higher proficiency ratings in newer technical skills, while older workers have higher proficiency ratings in management and legacy technologies.

The most striking differences in proficiency rating patterns are associated with job specialties. Within each specialty area, (such as programming, data administration, or IT management) high proficiency ratings exist in a number of skills appropriate to the specialty.

Training demand

In addition to reporting their personal levels of proficiency, employees also reported their need for training in each skill.

On average, IT employees said they need some level of training in 42 skills. The level needed ranged from basic to advanced and generally employees chose the level that is one step above their current proficiency. Many commented that they need ongoing training in their particular specialties plus general familiarity with a variety of other areas in order to keep up with constant changes in technology, to understand the broader context of their assignments, and to do a good job of contributing their particular expertise to larger efforts that combine skills and technologies from several specialty areas.

Overall, the greatest demand for training occurs among management skills, followed by skills associated with the web and with security functions. Strong demand is also present for skills associated with system design and development and networking. Lesser demand is present for information analysis skills followed by operations support and mainframe-oriented technologies. Among the top 25 skills for training demand, eleven are general management skills, eight pertain to security functions and infrastructure, and six are associated with the web.

Competency areas

Broad competency areas were constructed to organize the full set of 126 skills into logical clusters. Collectively, these competency areas encompass the entire IT function of state government.

Seven competencies provide an organizing framework for skills development. The competency areas encompass a full range of capabilities for both IT professionals and IT organizations. Collectively, they represent a competency framework that is useful for considering both agency effectiveness and individual proficiency across the full spectrum of IT activities. While no single person or agency could be expected to be expert in every specific skill, IT employees and IT organizations should generally possess some level of familiarity or proficiency in each of the seven broader competency areas.

Higher proficiency ratings are evident in the competency areas we call management, systems and databases, technical support services, and legacy technologies.

Lower proficiency ratings are evident in the competency areas of infrastructure, web computing, and management and use of information as an asset.

Training demand is higher in management, web computing and infrastructure competencies, and lower in systems and databases, management and use of information as an asset, technical support services, and

legacy technologies.

Three-year IT forecasts

CIOs assigned a forecast to each of the 126 skills for three years into the future.

Most growth is forecast for infrastructure and web computing skills. The majority of CIOs chose a growth forecast for more skills in the infrastructure and web computing competency areas than in the others (eleven and nine skills respectively). The majority also chose growth forecasts for three management skills, four system and database skills and four skills in the competency area of management and use of information as an asset. No skills in technical support services or legacy technologies received a majority growth forecast.

Some differences are evident across agencies with different numbers of IT staff, but at least half of the CIOs in agencies with small, medium, and large staff chose a growth forecast for the same fourteen skills, with most emphasis on the infrastructure and web computing competency areas. These 14 skills include website design and development, website management, system security applications, and identity management and directory services, as well as systems integration, project management, and records management.

Gap analysis

The data from both surveys was combined with information from the State's strategic statement of enterprise architecture principles in order to triangulate on the greatest differences between needed skills and existing proficiency.

At the statewide level, the skills that represent strong convergence among low proficiency ratings, high training demand, forecasted growth, and strategic importance fall almost entirely in the competency areas of infrastructure, web computing, and management and use of information as an asset. Two management skills, business continuity planning and IT risk assessment, also emerged. No appreciable gap was evident for the competency areas with higher proficiency ratings such as systems and databases, technical support services, or legacy technologies.

When the gap analysis was performed for individual job specialties, the same strong competency-based patterns were evident, although each specialty included a somewhat different set of additional skills relevant to its work content.

Workforce development considerations

Training demand is strongly motivated by current work responsibilities and desire for more challenging work. Nearly all employees reported that training is needed to improve their ability to do their existing work. Similarly, more than four out of five said that training would prepare them for more demanding work and a greater variety of assignments.

Both employees and CIOs prefer off-site classroom programs. Overwhelmingly, both employees and CIOs prefer off-site classroom programs for learning all types of skills. Many comments suggested that this is the only method that assures a student will be able to devote uninterrupted time and attention to learning. However, open-ended comments included a variety of suggestions for combining training methods into complementary sets of approaches.

According to employee comments, many approaches (and combinations of approaches) to improving skill proficiency are possible and desirable. These include on- and off-site classes, mentoring, reference books, e-learning, and hands-on practice. Comments suggested that results can be improved by sequencing or combining multiple learning methods, better matching the timing of training with the need and opportunity to use new knowledge, better targeting of training intensity to needed levels of expertise, explicitly allocating work hours to professional development, and valuing learning more highly in the management culture of agencies.

CIOs favor professional certification for a number of skill types. Three-quarters of the CIOs reported that professional certifications would or might be helpful in accomplishing their agencies' missions over the next three years. They were most positive about certifications in project management, information systems security, network security, and databases. Currently, only 1-2 percent of employees hold certifications in these areas.

Future considerations

Given the importance and nature of workforce development, the report is the first step in a longer term effort. In the next phase, the State CIO Council Human Resources Committee and its subgroups will use these results to help generate recommendations for next steps and action plans that enhance professional development and skill proficiency for the entire IT workforce. The study results suggest several areas for future investigation and leadership attention.

Skill proficiency affects many aspects of IT workforce development. These aspects include assessing the relationship between job advancement and technical proficiency as well as the roles education and skills assessments could play in recruitment. Other topics include the usefulness of a skills orientation to IT succession planning and better understanding of the relationships among training, employee satisfaction, and retention.

Training and other professional development programs would benefit from further evaluation. Future considerations for the design of learning opportunities include determining the effectiveness of formal education compared to skill-oriented training, as well as understanding the effectiveness of various methods and combinations of methods for achieving different competency goals. Another consideration is the possibility of identifying core competencies and ideal specialization profiles to help set priorities for future skill investments. In addition, consideration could be given to policies and methods for coordinated purchasing of professional development programs.

An important relationship exists between skills and the effectiveness of the IT enterprise. Future exploration in this area might include better understanding of how organizational culture and policies affect proficiency levels, consideration of current and needed skills in the process of selecting agency and statewide IT standards, and explicitly incorporating skills considerations into organizational strategies for moving to higher levels of IT effectiveness.
