

Overview

CIOs were asked to assign a forecast to each of the 126 skills for three years into the future. 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 different size agencies, but at least half of the CIOs in agencies at all three size levels chose a growth forecast for fourteen skills, with most emphasis on infrastructure and web computing. These fourteen 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.

Assessing the skill forecasts

The agency CIO survey provided agency-specific forecasts of the need for specific IT skills over the next three years. CIOs assigned a forecast to each of the 126 skills based on their knowledge of their agency operations and strategies. CIOs selected their forecasts from the following choices:

- **In use and growing** – currently in use and expect use to increase over the next three years
- **Steady state** – currently in use and expect use to remain stable over the next three years
- **In use, but declining** – currently in use, but expect use to decline over the next three years
- **Possible adoption** – planning to explore or currently exploring for possible adoption in the next three years
- **None expected** – not currently in use and not expected to be used over the next three years
- **Don't know** – do not know if this skill or technology will be used within the next three years

As with proficiency ratings and training demand, there is no one best way to assess the forecast data. Different agencies are in different phases of skill adoption and use based on their missions, size, and previous history. Therefore, we looked at the three-year forecasts in several ways.

Forecast patterns

One way to look at the data is to assess the number and kind of skills that fall into each forecast type. Viewed in this way, the following rough patterns emerge:

- **In use and growing forecast** – applied predominantly to skills associated with networks, security, the web, and information analysis and management.
- **Steady state forecast** – applied predominantly to foundational skills in both technical and management areas
- **Possible adoption forecast** – applied predominantly to emerging technologies associated with modern infrastructures and analytical tools
- **In use, but declining forecast** – applied predominantly to legacy technologies and specific types of web computing tools
- **None forecast** – applied predominantly to legacy technologies

Table 12 below illustrates how the forecasts are distributed across competency areas for forecasts other than growth. It shows the top five skills selected by CIOs for each forecast as measured by the number of CIOs who selected a particular forecast for a particular skill.

Table 12. Top five forecasts (other than growth) by competency area

Three-year IT Skills Forecast

Competency Area	Steady state(percent of CIOs choosing forecast)	Possible adoption(percent of CIOs choosing forecast)	In use, but declining(percent of CIOs choosing forecast)	None expected(percent of CIOs choosing forecast)
Management	<ul style="list-style-type: none"> Internal controls (57%) Managing agency staff (55%) 			
Infrastructure	<ul style="list-style-type: none"> Hardware maintenance & support (71%) Principles of operating systems (63%) 	<ul style="list-style-type: none"> Voice over IP (56%) Public Key Infrastructure (PKI) (53%) Biometrics (61%) Video imaging (38%) Linux operating systems (38%) 		<ul style="list-style-type: none"> Mac OS/ OS X operating systems (85%)
Web computing			<ul style="list-style-type: none"> Microsoft Access (35%) Visual Basic (22%) 	<ul style="list-style-type: none"> Borland JBuilder (80%)
Systems and databases				
Technical support services	<ul style="list-style-type: none"> Support for desktop applications (64%) 			
Management and use of information as an asset				
Legacy technologies			<ul style="list-style-type: none"> COBOL (39%) Mainframe operations (26%) PowerBuilder (22%) 	<ul style="list-style-type: none"> Fortran (95%) Unisys mainframe (80%) IBM mainframe (64%)

To further illustrate these patterns, Tables E7 – E11 in Appendix E show the top ten skills in each forecast type and highlight the competency area associated with each skill.

This study is particularly concerned with gathering information that prepares New York for the future; therefore CIO growth forecasts for skills are especially relevant. Table 13 lists the skills in each competency area where at

least 50 percent of the CIOs chose the growth forecast. The table shows that substantial growth is expected in five of the seven competency areas, with the greatest number of technical skills needed over the next three years falling in the infrastructure and web computing competencies.

Table 13. Skills with growth forecast by competency area

Competency Area	In use and growing (percent of CIOs choosing forecast)
Management	<ul style="list-style-type: none"> • Project management (66%) • Change management (53%) • Business continuity planning (50%)
Infrastructure	<ul style="list-style-type: none"> • System security applications (82%) • Identity management & directory services (70%) • Encryption (68%) • Disaster recovery & planning (67%) • Web/IP (66%) • Intrusion detection (63%) • Mobile computing (60%) • Network architecture & design principles (54%) • Windows operating system (52%) • Wireless technologies (51%) • Firewalls (51%)
Web computing	<ul style="list-style-type: none"> • Website design & development (82%) • Website management (72%) • DHTML/ HTML/ XHTML (63%) • JavaScript (61%) • Java (61%) • XML/XSL (57%) • Website accessibility (54%) • Web servers (54%) • Website search & administration (53%)
Systems and databases	<ul style="list-style-type: none"> • Systems architecture (56%) • Systems integration (56%) • Oracle (53%) • Testing & evaluation (50%)
Technical support services	
Management and use of information as an asset	<ul style="list-style-type: none"> • Records management (56%) • Workflow management (55%) • Content management (51%) • Data warehousing (51%)
Legacy technologies	

Growth forecasts by agencies with small, medium, and large IT staffs

When we examine the growth forecasts by IT staff size, some clear themes emerge. CIOs with large IT staffs were more likely to forecast growth for IT management skills, especially those associated with more complex IT operations such as IT project portfolio management and IT risk assessment. CIOs with medium and large IT staffs shared strong growth forecasts for web computing and systems and database skills, as well as for skills that comprise management and use of information as an asset. CIOs of small agencies were more likely to forecast growth in infrastructure skills, as were CIOs of medium agencies. Table 14 below highlights these similarities and differences in the growth forecasts across the three agency size groups. (Similar data for the other forecast types can be found in Tables E12 –E14 in Appendix E.

Table 14. Similarities and differences in growth forecast across agency size groups

Competency Area	In use and growing (50% or more of CIOs in all three agency size groups chose this forecast)	Differences among in use and growing forecasts (50% or more of CIOs in the listed size groups chose this forecast)
Management	<ul style="list-style-type: none"> • Project management 	<ul style="list-style-type: none"> • Change management (medium, large) • IT project portfolio management (medium, large) • Business continuity planning (medium, large) • IT asset management (medium, large) • Financial management (medium) • Organizational awareness & business knowledge (medium) • Leadership (large) • IT strategic planning (large) • Managing consultant staff (large) • IT risk assessment & management (large) • Capacity management (large) • Contract management & vendor relationships (large) • IT procurement (large) • Planning & evaluation (large)
Infrastructure	<ul style="list-style-type: none"> • System security applications • Identity management & directory services • Encryption • Web/IP • Mobile computing • Disaster recovery planning • Intrusion detection 	<ul style="list-style-type: none"> • Network architecture & design principles (small, medium) • Firewalls (small, medium) • Windows operating systems (small, medium) • Windows network operating systems (small, medium) • Wireless technologies (small, medium) • Network configuration (small, medium) • Backup & recovery (small, medium) • Technology training activities (small, medium) • Open systems server administration (medium) • Unified messaging services (medium) • Linux operating systems (medium) • Video imaging (medium) • Cellular technologies (medium) • Broadband technologies (large) • Wide Area Networks (WAN) (large)

Web computing	<ul style="list-style-type: none"> Website design & development Website Management DHTML/ HTML / XHTML 	<ul style="list-style-type: none"> Web servers (small, medium) Website accessibility (medium, large) Website search administration (medium, large) Website privacy (medium, large) Java (medium, large) JavaScript (medium, large) XML/ XSL (medium, large) UNIX (large) Unified Modeling Language (UML) (large)
Systems and databases	<ul style="list-style-type: none"> Systems integration 	<ul style="list-style-type: none"> Object-oriented analysis & design principles (medium, large) Technical documentation (medium, large) Oracle (medium, large) Systems architecture (medium, large) Systems life cycle planning principles (medium, large) Testing & evaluation (medium, large) Database design & development standards (medium, large) Business process analysis (large) Quality assurance (large) Joint Application Development (JAD)/ prototyping (large) CASE tools (large) Requirements analysis (large)
Technical support services		<ul style="list-style-type: none"> Call center activities (large) Help desk activities (medium)
Management and use of information as an asset	<ul style="list-style-type: none"> Records management 	<ul style="list-style-type: none"> Data warehousing (medium, large) Content management (medium, large) Collaboration software (medium, large) Workflow management (medium, large)
Legacy technologies		

Statewide forecast highlights

Three-year IT Skills Forecast

The growth forecast is an important indication of where agencies are headed over the next three years. Both the overall growth forecast and in the agency size forecast highlighted three competency areas (Table 15): infrastructure, web computing, and management and use of information as an asset.

Table 15. Statewide forecast picture

Growth forecast appears most often in these competency areas
<ul style="list-style-type: none">• Infrastructure• Web computing• Management and use of information as an asset