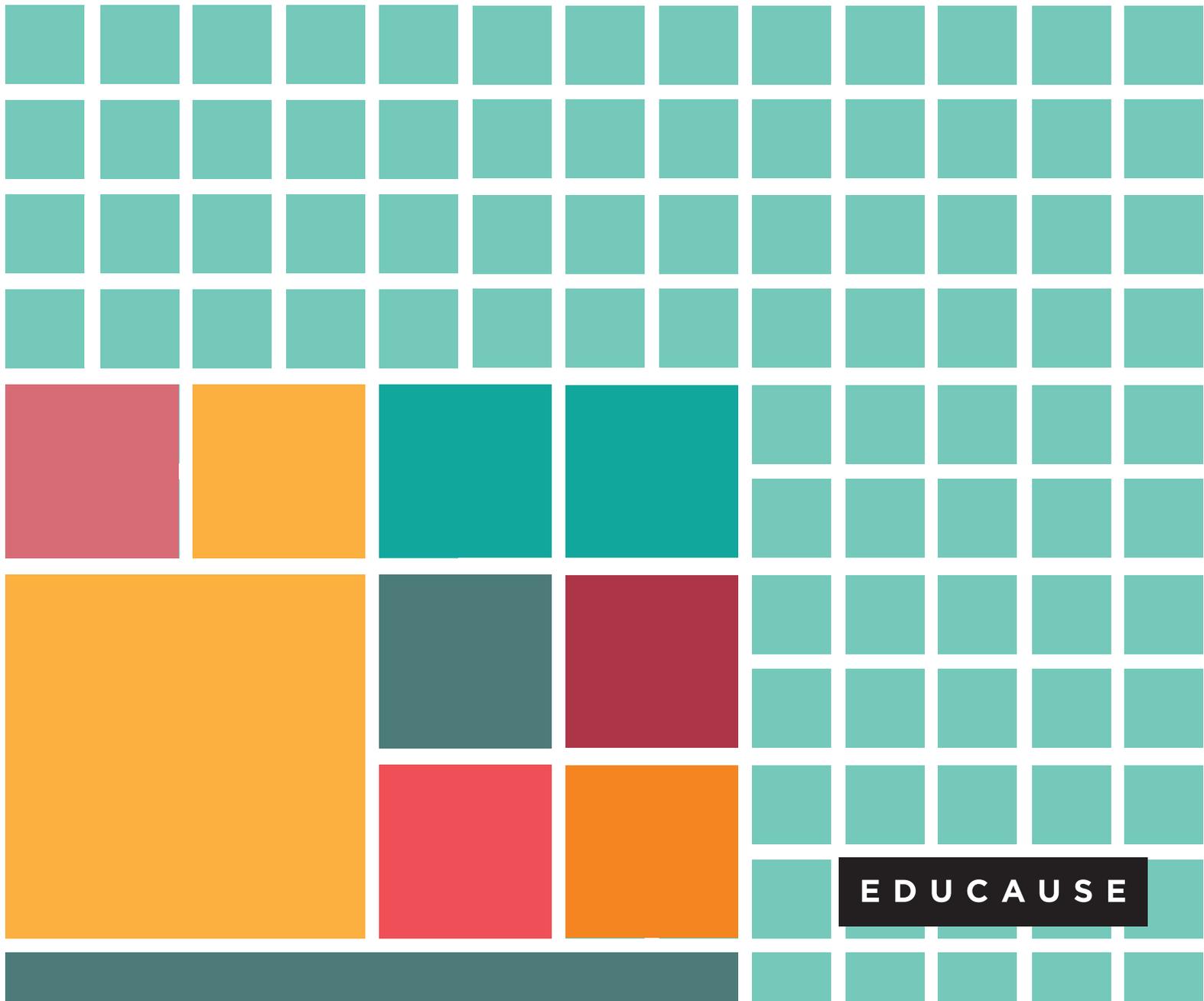


# The Higher Education IT Workforce Landscape, 2016



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## Overview

Institutions of higher education are well known for their long-term stability. Information technology (IT), on the other hand, is well known for rapid change. IT in higher education, by its very nature, is pulled in opposite directions. Who makes up the workforce in this conflicted environment? How can institutions of higher education retain an IT workforce and provide professional development to grow that workforce? What is the career path for those in the higher education IT workforce, and how can institutions of higher education develop staff into leadership roles?

This is the third comprehensive research study on the IT workforce in higher education from the EDUCAUSE Center for Analysis and Research (ECAR). These studies describe the state of the higher education IT workforce across all management levels (CIOs, managers, and staff): demographics, career paths within the IT workforce, factors that affect salary, professional development activities, and factors that impact employee retention.

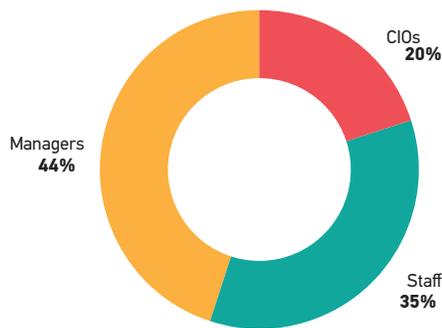
## Key Findings

- **The higher education IT workforce is remarkably stable**, with employees staying with institutions more than twice as long as the national average for the U.S. workforce across industries.
- **Nearly half of the IT workforce are considering pursuing employment opportunities outside their current institution within the coming year**, a dramatic increase from the previous workforce study published two years ago.
- **Diversity of ethnicity in the higher education IT workforce remains below national figures but is on the rise**, especially in staff positions. The higher education IT workforce is also older than the national average for the U.S. workforce.
- **Institutional loyalty is a double-edged sword for those on an upward career path in higher education IT**. The longer an individual has been at the same institution, the greater the likelihood of becoming a manager. Those desiring a CIO position, however, have a better chance of success if they move to another institution. Managers and CIOs tend to come from within higher education IT rather than from outside.
- **There is not a significant salary gap between men and women who hold CIO and management positions in the current study**. In fact, the median salaries for women in both positions are slightly *higher* than those of their male counterparts. However, for some types of staff positions, the median salaries for men remain significantly higher than those for women.
- **The factors that determine salary vary in both kind and number, depending on the management level of the IT employee**. For CIOs, years in higher education, type of experience, and the type of institution where one works are the most important factors. Salaries for managers and staff are similarly shaped by age, experience, and the area of their current position, but ethnicity is a key factor for managers, while education level is important for staff.
- **The number of positions eliminated from central IT units over the previous year has decreased dramatically from the previous workforce study**. While most IT units have not added positions, this is nevertheless significant evidence of the stabilization of central IT units.

- **Managers and CIOs are able to fill open and needed positions but are unable to create new positions.** This finding not only reflects a degree of workforce stabilization but also suggests the limitations of higher education institutions to respond to the hiring needs of rapidly evolving IT units.
- **CIOs and IT managers continue to rate human resources (HR) departments more favorably for hiring and retention collaboration than for meeting specialized IT needs.** CIOs tend to evaluate the cooperation of HR departments more favorably than do managers.
- **A discrepancy persists between the levels of importance attached to skills required for success in IT and the reported levels of proficiency in those skills.** The largest gaps show up for soft skills such as communication and negotiation abilities; the smallest gaps are for managerial and practical skills.
- **Professional development activities that are encouraged by a supervisor are perceived by staff to have value.** Professional development is important for keeping staff at their institution. Supervisors therefore have the power to facilitate the retention of staff.
- **Quality of life is the most important factor keeping IT employees at their current institution.** While salary and benefits are important, employees' personal lives are more important to them than their tangible compensation.

## Introduction

The EDUCAUSE Center for Analysis and Research (ECAR) has produced 28 publications on IT workforce in higher education since 2002. These include two comprehensive research studies, the first on IT leadership in 2010–11 and the second on the economic climate facing higher education in 2013–14.<sup>1</sup> This is the third such comprehensive ECAR research report on the IT workforce. The second report in this series, published in 2014, was one of the first studies anywhere to focus not only on CIOs but also on non-CIO managers (hereafter referred to as *managers*) and nonmanagerial staff (*staff*). This report retains that inclusivity, focusing on the entire higher education IT workforce and issues that affect those in positions at all levels. Figure 1 displays the distribution of responses to our survey, by management level (n = 1,188).



**Figure 1. Management level of respondents to the workforce survey**

This investigation focused on the following questions:

- What is the makeup of the IT workforce?
- What is the educational and professional background of members of the IT workforce?
- What are the current salary ranges and determinants of salaries, by management level, within the IT workforce?
- What is the current state of hiring in higher education IT?
- What is the current relationship between IT and human resources (HR) in higher education?
- What are the strategic activities and roles of CIOs and IT managers?
- What skills are most important in the IT workforce?

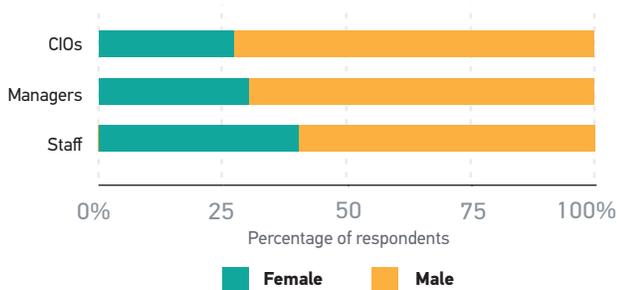
- What professional development activities are members of the IT workforce engaging in, and what are CIOs and managers encouraging their staff to engage in?

To answer these questions, ECAR conducted a survey of the EDUCAUSE membership of higher education IT leaders and professionals. See the Methodology section near the end of this report for details about the sample and response rate.

## The Makeup of Today's IT Workforce

The breakdown of respondents to this survey differed somewhat from that of the previous workforce study. The percentage of staff among respondents to this survey is identical to that from the 2014 report: a steady 35%. The percentage of managers participating has decreased from 51% to 44% but remains the largest group. The percentage of CIOs or equivalent positions has increased by almost half, from 14% of respondents to 20%.

The percentage of women in the IT workforce varies by management level (figure 2). Unfortunately, here we see stark evidence of the glass ceiling: Women make up 40% of the IT staff, but just 30% of the managers, and only 27% of the CIOs. The percentage of women CIOs has changed little from past studies, though the percentage of women managers is down from 38% in 2010 and 33% in 2013. The percentage of women staff has rebounded slightly from 37% in 2013, though it has not quite returned to the 2010 levels of 43%. These figures compare unfavorably with U.S. Department of Labor statistics, which show that 47% of the U.S. workforce consisted of women in 2014.<sup>2</sup> On the other hand, these figures compare quite favorably with a 2013 study by the American Association of University Women (AAUW) showing that women make up 26% of the U.S. workforce in computing.<sup>3</sup>



**Figure 2. Percentage of men and women in each management level**

Women make up **40%** of the IT staff, but just **30%** of the managers, and only **27%** of the CIOs.

The workforce in higher education has a reputation for being fairly stable. Employees in the IT workforce have been at their current institution for a median of 10 years and in their current position for 3 years. Compared with the U.S. workforce in general, these numbers are exceptional: The U.S. Bureau of Labor Statistics reported in 2014 that the median amount of time that wage and salary workers had been with their current employer was 4.6 years.<sup>4</sup>

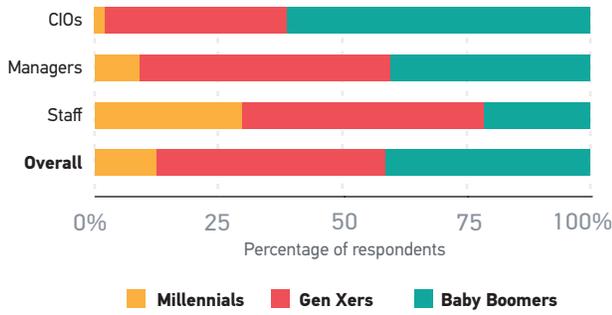
The IT workforce in higher education is also older than the national average, perhaps as a result of employees’ remaining at their institutions and within higher education.<sup>5</sup> The median age of the higher education IT workforce overall is 48, compared with the 2014 national workforce median of 42.<sup>6</sup> As one might expect, this median age varies by management level (see table 1). The median age of CIOs remains stable from 52 in 2013, though the decline in maximum age from 73 to 69 may be evidence of retirements. The age of managers is largely stable from 2013, though the median has dropped by two years, approaching the 2010 value. The age range of staff is nearly identical with that in 2013, but the median is five years younger.

**Table 1. Age ranges of IT professionals**

Management level	Minimum age	Median age	Maximum age
CIOs	32	53	69
Managers	24	48	73
Staff	22	43	70

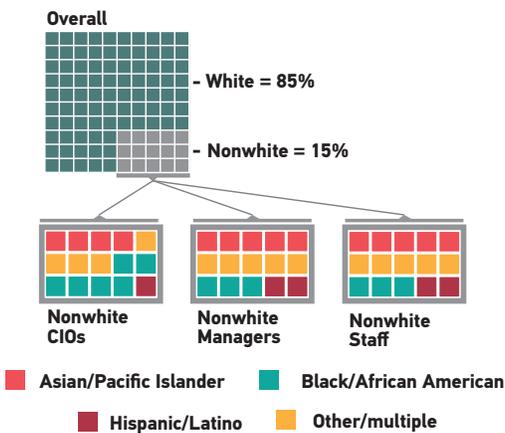
In past workforce reports, age was categorized by decade (25–34, 35–44, etc.). In this report, we take a different approach and categorize age by “generation,” using the Pew Research Center’s definition<sup>7</sup>: In 2015, Millennials were 18–34, Gen Xers were 35–50, Baby Boomers were 51–69, and the Silent Generation were 70–87. While any categorization of ages is arbitrary, these generations map well onto our previous categorization, as well as having the advantage of being more intuitive.

Generation corresponds strongly with management level (figure 3). The majority of CIOs are Baby Boomers (62%), and Millennials occupy very few positions as managers or CIOs. This is, of course, mostly a factor of age: The longer one has been in the workforce and within an institution, the greater the opportunity to work one’s way up the ladder. The makeup of the IT workforce in higher education, however, is unlike the U.S. labor force, either overall or at any of the management levels. Pew reports that in 2015 the U.S. labor force comprised 29% Baby Boomers and 34% each of Gen Xers and Millennials.<sup>8</sup> Our respondents included only five members of the Silent Generation (less than 1% of the total sample); these respondents were omitted from analyses involving generations.



**Figure 3. Generational distribution in each management level**

This survey continues to show the diversification of the IT workforce that was evident in the 2014 report (figure 4). Diversity in the IT workforce seems to be leveling off in management roles while continuing to increase slowly but steadily among staff. The percentage of nonwhite CIOs rose from 4% in 2010 to 13% in 2013 and 15% in 2015. The percentage of nonwhite managers rose from 8% in 2010 to 13% in 2013 and 15% in 2015. Nonwhite staff rose from 10% to 12% to 15%. Nevertheless, the IT workforce in higher education remains predominantly white (85% for each management level). This contrasts unfavorably with U.S. Bureau of Labor Statistics figures, which show that 34% of the U.S. workforce was nonwhite in 2015.<sup>9</sup> Figure 4 shows the breakdown by ethnicity for each management level.



**Figure 4. Breakdown of ethnicity in each management level**

## The IT Professional Pipeline

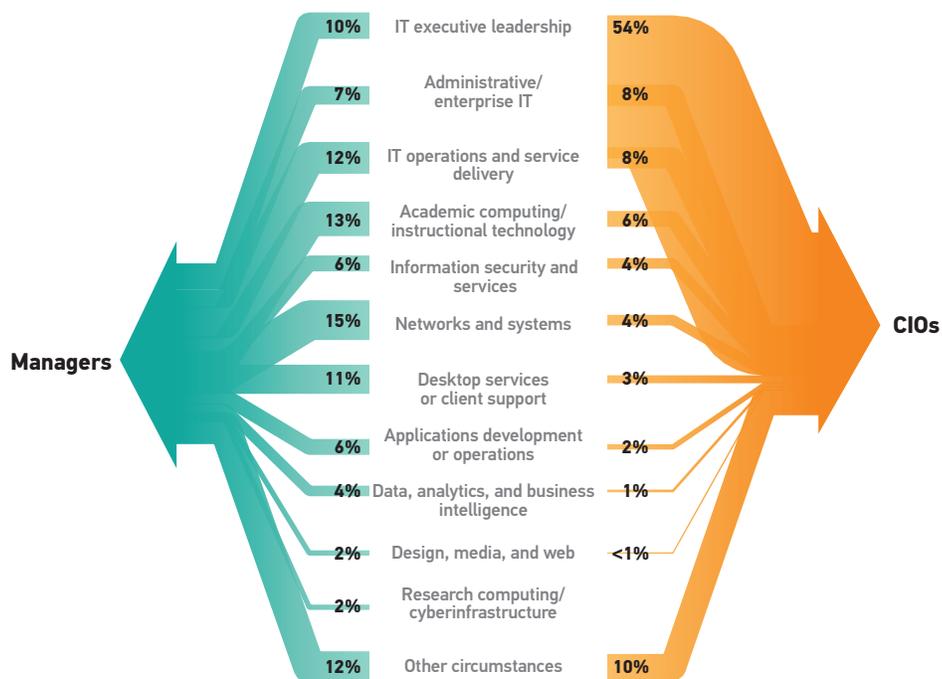
As the Baby Boomers of the CIO population approach retirement age, it becomes more important than ever to ask how institutions—and the field of higher education as a whole—can “grow” CIOs and other senior IT leaders.

Given the length of time that IT professionals have been at their current institution, it is not surprising that 82% of CIOs come from within higher education and that 52% of those CIOs were promoted from within their current institution. Similarly, 82% of current IT managers come from within higher education, and 82% of those managers were promoted from within. It seems clear that institutions of higher education “grow their own” as employees work their way up through the organization over a long tenure at the institution.

It takes more than having been at an institution a long time, however, to be promoted into a leadership position. What experience and qualifications do higher education IT leaders have? Managers are likely to have been promoted from a position in networks and systems, academic computing, IT service delivery, or desktop services/client support. Each of those four areas represents about 13% of the previous positions held by managers. Managers also come from IT staff or other IT management positions but rarely from institutional leadership positions: The likelihood of being a manager is reduced by about one-third if an individual’s previous position was in institutional leadership. In other words, the data suggest that if one has been in an IT executive leadership position previously, moving to a manager position may very well be a step backward.

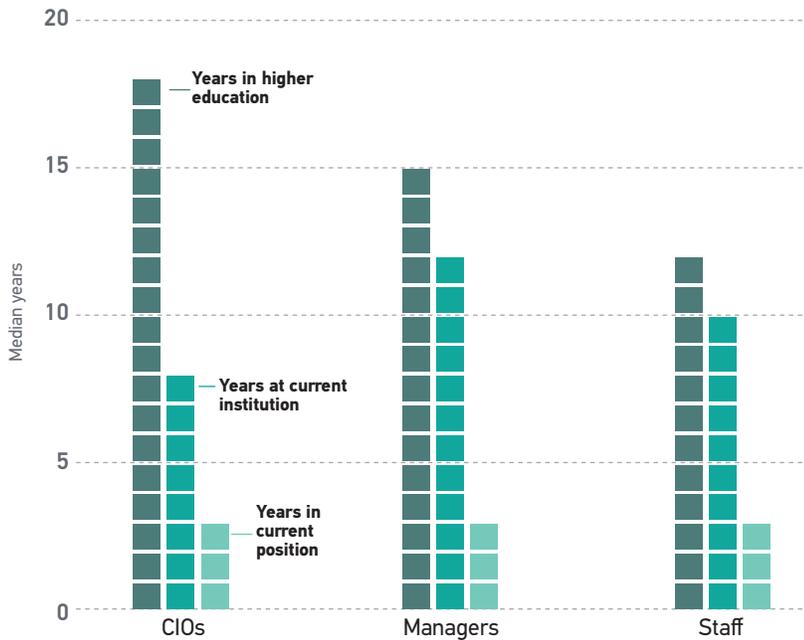
The majority of IT managers (68%) worked their way up from within their current institution: Managers are 30% more likely to have emerged from their own institution than to have come from another institution. This changes with the jump to CIO: CIOs are 150% more likely to have been hired from outside the institution. However, CIOs who come from other institutions tend to come from non-CIO leadership positions at those institutions. Individuals in IT executive leadership positions (chief technology officer, chief information security officer, deputy information officer, etc.) are 600% more likely to have their next job be CIO (figure 5). In short, individual institutions of higher education grow their own IT managers and leaders, but CIOs are grown collectively across all of higher education.

Individual institutions of higher education grow their own IT managers and leaders, but CIOs are grown collectively across all of higher education.



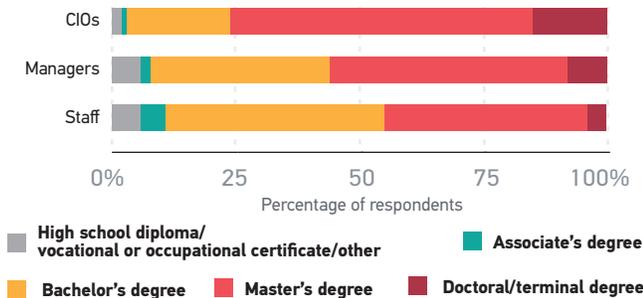
**Figure 5. Previous positions of CIOs and managers**

CIOs tend to be older and to have been in higher education longer than managers and staff (figure 6). But, as stated above, CIOs have been at their current institution for less time than managers and staff. CIOs at doctoral institutions are comparatively stable, however, with a median of 11 years at the institution, compared to 6 years at nondoctoral institutions. Being a manager is significantly and positively related to the number of years employed at one’s current institution, controlling for other factors such as age, current position, and years in higher education. As with CIOs, the tenure of managers is longest at doctoral institutions—a median of 14 years. Staff tend to be younger than either CIOs or managers and to have been in higher education for less time. The median tenure of staff at an institution is 9.5–10 years, regardless of institution type.



**Figure 6. Median number of years of experience in higher education IT**

It should come as no surprise that among college and university IT professionals, higher education is itself valued and serves as a ticket to both employment and advancement (figure 7). In terms of education, holding at least a bachelor’s degree is common across all three types of positions. Advanced degrees are valued by those in CIO and managerial positions: 75% of CIOs have at least a master’s degree, and over half of managers have a master’s degree (48%) or higher (8%). The value of higher education for IT staff is also evident, as 9 out of 10 IT staff members hold at least a bachelor’s degree.

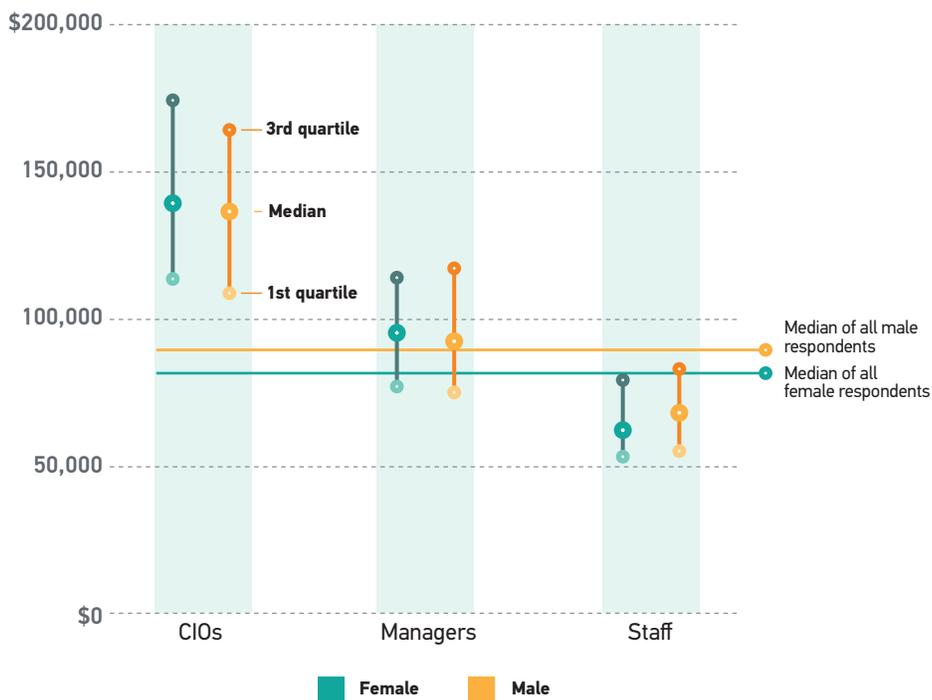


**Figure 7. Highest education level of CIOs, managers, and staff**

When we move beyond these bivariate relationships and consider the impact of all of these factors together, we find that very few variables actually statistically “predict” whether one is a manager or a CIO. Furthermore, the variables that do predict one’s position also vary by position type. On the one hand, managers tend to be men who have not emerged from previous leadership positions or design/media areas of IT; they also tend to have been at their current institution for a long time but have only recently moved into their current position. On the other hand, those who are currently CIOs tend to be older, to have formerly held leadership positions, to come from administrative computing, and to have worked in higher education for a long time; but they have not worked at their current institution for very long. Because holding a bachelor’s degree or higher is so common among higher education IT managers and CIOs, education level is not a significant predictor of management level. None of these findings suggest that career roadblocks or paths to promotion are determined by these factors exclusively; they simply illustrate the significant tendencies or probabilities that we observe among our current survey respondents.

## Salaries

Median salaries and salary range for each of the three management levels are shown in figure 8. The median salary for all survey respondents across all position types is \$87,000.



**Figure 8. Median salaries by gender and management level**

Our salary data suggest that gender-based inequality for CIO and managerial positions is no longer an issue. The median salaries of female managers and CIOs are slightly higher than those of their male counterparts; these differences are substantively, though not statistically, significant and suggest that gender equity among IT leaders in higher education is a reality. Indeed, the maximum and minimum salaries for female CIOs are also higher than for male CIOs, a finding consistent with recent College and University Professional Association for Human Resources (CUPA-HR) data.<sup>10</sup> Unfortunately, inequality in salaries between men and women persists among staff, though only in some job categories. Among the 12 IT job areas identified in the workforce survey, women earn significantly less than men in only three: academic computing/instructional technology; networks and systems; and data, analytics, and business intelligence.

In the 2014 workforce report, the greatest factor affecting salary was institution type. Institution type continues to have a major impact on salary, but it is not as significant a factor as in the past. IT professionals at all levels—CIOs, managers, and staff—are paid higher salaries at doctoral institutions, and even higher yet at private doctorals; master’s institutions are not far behind.

The factors that actually influence one’s salary vary in both kind and number: the type of institution, the type of position held, the experience brought to the position, and the education level and negotiation skills of the employee. Further still, structural factors such as age, ethnicity, and gender may also influence compensation. Finally, different combinations of these factors may apply to different levels and positions (simplified here into the categories of CIO, manager, and staff). See table 2 for a detailed breakdown of these factors and their effects on salaries.

**Table 2. Significant determinants of salary**

Factor	CIOs	Managers	Staff
<b>Current position</b>		<ul style="list-style-type: none"> <li>IT executive leadership</li> <li>(Desktop services or client support)</li> </ul>	<ul style="list-style-type: none"> <li>IT executive leadership</li> <li>(Design, media, and web)</li> <li>(Academic computing/instructional technology)</li> <li>(Desktop services or client support)</li> </ul>
<b>Managerial responsibility</b>	<ul style="list-style-type: none"> <li>Number of direct reports</li> </ul>	<ul style="list-style-type: none"> <li>Number of direct reports</li> </ul>	
<b>Experience</b>	<ul style="list-style-type: none"> <li>Additional years in higher education prior to current position</li> </ul>	<ul style="list-style-type: none"> <li>Additional years in higher education prior to current position</li> </ul>	<ul style="list-style-type: none"> <li>Additional years in higher education prior to current position</li> </ul>
<b>Institution type</b>	<ul style="list-style-type: none"> <li>DR private</li> <li>DR public</li> <li>(Community college)</li> </ul>	<ul style="list-style-type: none"> <li>DR private</li> </ul>	<ul style="list-style-type: none"> <li>DR private</li> <li>DR public</li> </ul>
<b>Generation</b>		<ul style="list-style-type: none"> <li>Silent Generation</li> <li>Baby Boomer</li> <li>Generation X</li> </ul>	<ul style="list-style-type: none"> <li>Baby Boomer</li> <li>Generation X</li> </ul>
<b>Ethnicity</b>		<ul style="list-style-type: none"> <li>American Indian/Native American/Alaska Native</li> <li>Asian/Pacific Islander</li> <li>White/Caucasian</li> </ul>	
<b>Education level</b>			<ul style="list-style-type: none"> <li>PhD</li> <li>Master’s degree</li> <li>Bachelor’s degree</li> </ul>
<b>Sex</b>			<ul style="list-style-type: none"> <li>Male</li> </ul>

Note: Factors in parentheses are negatively related to salary.

For CIOs, only five variables predict salary significantly. Each additional person reporting to the CIO results in a modest increase in salary. CIOs also enjoy an increase for each additional year employed in higher education prior to their current position. Institution type, however, has the largest impact on CIO salary. CIOs at both public and private doctoral institutions see a large bump in their pay grade, while CIOs at community colleges earn much less.

The significant factors that shape managers' salaries are considerably more complex than those determining CIOs' salaries. First, the well-known positive relationship between age and salary level is borne out here: Moving from Gen Xers to Baby Boomers to the Silent Generation, we observe respective increases in salary of approximately \$10,000.<sup>11</sup> Second, salaries increase for every year managers have worked in higher education previous to their current position. Third, managers receive a modest increase in salary for every individual who reports directly to them. Fourth, managerial job categories have an impact on salary: Managers who hold positions on their institution's executive leadership team earn higher salaries, while those who manage desktop services/client support earn less. Fifth, private doctoral institutions pay managers more than their peers at other types of institution. Sixth, only for managers does ethnicity play a role in determining salary level, with self-identified American Indians/Native Americans, Asian/Pacific Islanders, and whites/Caucasians earning higher salaries than other groups.

For regular IT staff, the significant factors that predict salary levels are as diverse as those for managers, with some important areas of overlap. Being a Gen Xer or a Baby Boomer earns IT staff members more money.<sup>12</sup> Staff who hold IT executive leadership positions receive a large bump in pay over the average staff salary. However, staff who work in design, media, and web; academic computing/instructional technology; and desktop services or client support earn a lot less than their peers in other higher education IT areas. IT staff at public doctoral institutions earn more than their peers at other types of institutions. And the number of additional years employed in higher education translates into an increase in pay as well. Holding an undergraduate or graduate degree leads to slightly more earning power. Finally, as noted above, female staff members earn on average less than their male staff counterparts.

When it comes to the factors that predict salaries in higher education IT, it's important to be specific about whose salary we mean. CIOs have a fairly similar set of roles and duties, which constrains the number of factors that really matter. Managers, while similar to CIOs in some respects, engage in a broader set of roles and duties; in fact, managers are very similar to staff in terms of the variables that predict salary. Not everything counts in determining salary, but what does count, counts differently to different groups.

## The State of Hiring in Higher Education IT

CIOs were asked how many full-time positions had been added to central IT in the past year (not including replacement hires). Over half (57%) of the responses to this question were zero, and 90% of the non-zero responses were five positions or fewer. However, CIOs in a few institutions reported that 30 positions or more had been added in the past year. In contrast to these hiring numbers, only 6% of CIOs reported that positions had been eliminated from central IT in the past year, a dramatic decrease from 23% in 2013. Larger central IT units were significantly more likely to have eliminated positions in the past year. At the same time, when positions were added, they also tended to be within larger central IT units—all of the additions of 10 or more positions were in central IT units of 100 people or more. All in all, these findings provide further evidence that institutions of higher education are feeling the effects of the economic recovery in the United States; as fewer positions are eliminated and more hires made, the size of central IT units appears to be stabilizing.

Managers and CIOs were asked about the state of hiring in IT (figure 9). As we observed in 2013, more than half agreed that they had been unable to create desired IT positions. On the other hand, more than 60% responded that hiring for open IT positions had not been suspended. In other words, although managers and CIOs were able to refill *open and needed* positions, they were unable to create *new* positions that would meet the demands placed on IT. This incongruity suggests that IT needs may exceed the pace at which higher education institutions, with their bureaucratic nature, can respond to demands for change in the IT workforce. At the same time, it may mean that IT, in conjunction with HR departments, needs to think creatively about how to retrain and repurpose existing talent, or rethink how to make their case for hiring.

Although managers and CIOs were able to refill open and needed positions, they were unable to create new positions that would meet the demands placed on IT.

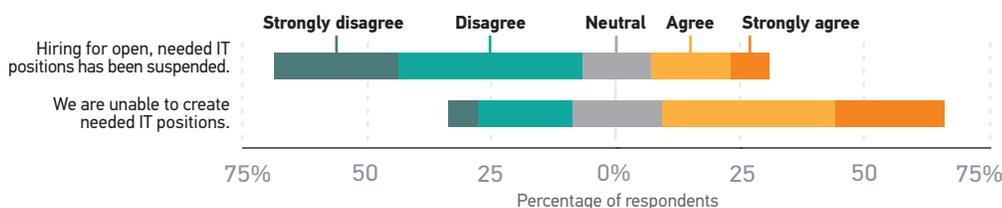
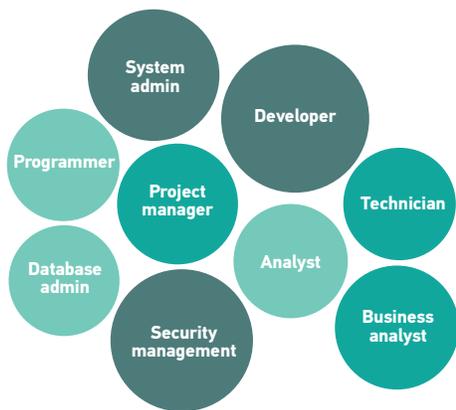


Figure 9. The state of hiring in IT

The good news for managers and CIOs is that hiring freezes are less likely than they were a few years ago. The bad news is that certain skill sets are still in short supply. Those positions that most need filling (developer, security management, and system administrator) are the most highly technical (figure 10).



**Figure 10. Positions/skill sets in short supply**

CIOs were asked whether there were plans for central IT to reorganize within the following year and, if so, the extent of the planned reorganization. Responses to this question were split, with half of all CIOs reporting plans to reorganize central IT. If such plans existed, CIOs were also asked to describe the planned reorganization and the reasons for it. Table 3 summarizes the most common responses.

**Table 3. Most common reasons for reorganization in IT**

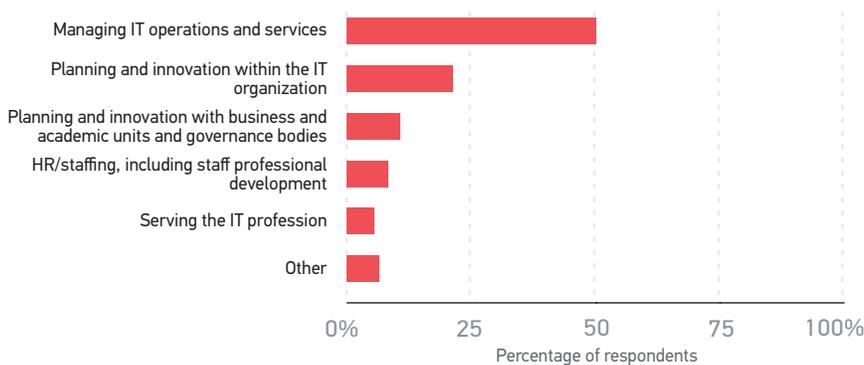
Reasons for the reorganization	Yes, and the reorganization will probably be minor	Yes, and the reorganization will probably be moderate
Aligning positions with functional roles or changing reporting lines to focus on efficiency and streamline processes	44%	62%
Eliminating or repurposing positions, changing organizational structure, reorganizing to promote job growth	29%	14%
Changing of leadership	13%	16%
Creating news jobs, new areas	13%	8%

Those IT units that saw positions eliminated during the previous year were more likely to have experienced a reorganization of some magnitude. The findings discussed earlier in this section present evidence of the stabilization of central IT units as fewer positions are eliminated and more hires made, but this finding seems to run counter to that. Recall, however, that 50% of institutions had plans to reorganize central IT, and a minority of those included eliminating positions. Most of the reasons given by CIOs for a reorganization involve changing the scope or function of positions: aligning positions with institutional functions, focusing on new areas, etc. These are arguably natural changes for an IT unit in any type of organization; as tools and technology change, the services that IT units offer must also change.

## Strategic Activities and Roles of CIOs and Managers

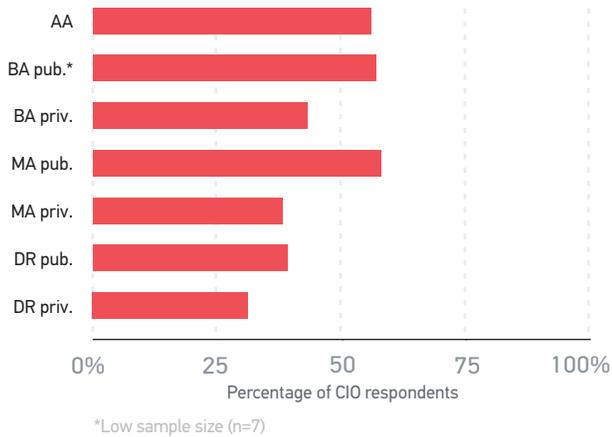
CIOs and IT managers have the opportunity to influence and shape the strategic direction of their departments, units, and institutions. Although half of managers' and CIOs' time (50%) is spent managing IT operations and services (a 10% increase from 2013), the next largest chunk (30%) of their time is spent engaged in planning and innovation activities, either within the IT organization or with business and academic units and governance bodies (see figure 11). When it comes to planning and innovation *within* the IT organization, managers spend significantly more time on that task than do CIOs (23% versus 19%). CIOs are significantly more engaged in planning and innovation with *external* groups than are managers (17% versus 10%). This is due in part to the fact that 42% of our CIO respondents serve as members of the president's or chancellor's cabinet. While this figure is down from the 49% found in 2013, those CIOs on the cabinet have considerable influence. CIOs who serve on the cabinet are significantly more likely to:

- Discuss the IT implications of institutional decisions with executives (82% versus 49%)
- Shape institutional administrative directions (80% versus 43%)
- Shape institutional academic directions (48% versus 21%)



**Figure 11. Percentage of time CIOs and managers spend on various activities**

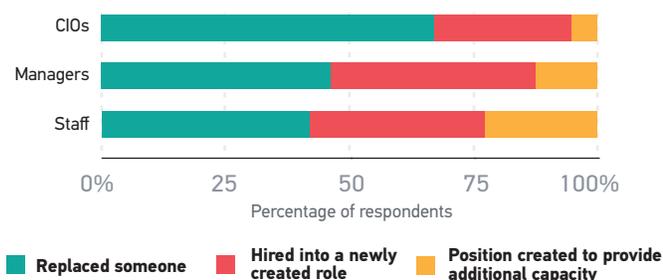
Whether a CIO serves on the president’s or chancellor’s cabinet weakly depends on the type of institution (see figure 12). Community colleges and public BA and MA institutions have roughly the same percentage of CIOs who hold a cabinet position. Indeed, CIOs at an AA or public MA institution are about one-third more likely to be on the cabinet than not. CIOs at other types of institutions, however, are no more likely to be on the cabinet.<sup>13</sup> Although the percentage of CIOs holding cabinet positions tends to be lower among private institutions, these differences are not statistically significant.



**Figure 12. Percentage of CIO respondents who are members of president’s cabinet, by institution type**

## The Skills Needed in Today's Higher Education IT Workforce

Further evidence of economic recovery, as well as an indication of the evolution of technology and IT service delivery, comes from the finding that 59% of staff and 55% of managers were hired into a newly created role or a position created to provide additional capacity—figures similar to those in the 2014 workforce report (figure 13). While this would seem to contradict the finding, stated earlier, that 57% of CIOs reported no full-time positions added to central IT in the past year, these “newly created” roles may have been created more than a year previously. This suggests a steady expansion of IT in higher education that tracks with and reflects a healthy economy.<sup>14</sup>



**Figure 13. Reasons IT professionals were hired**

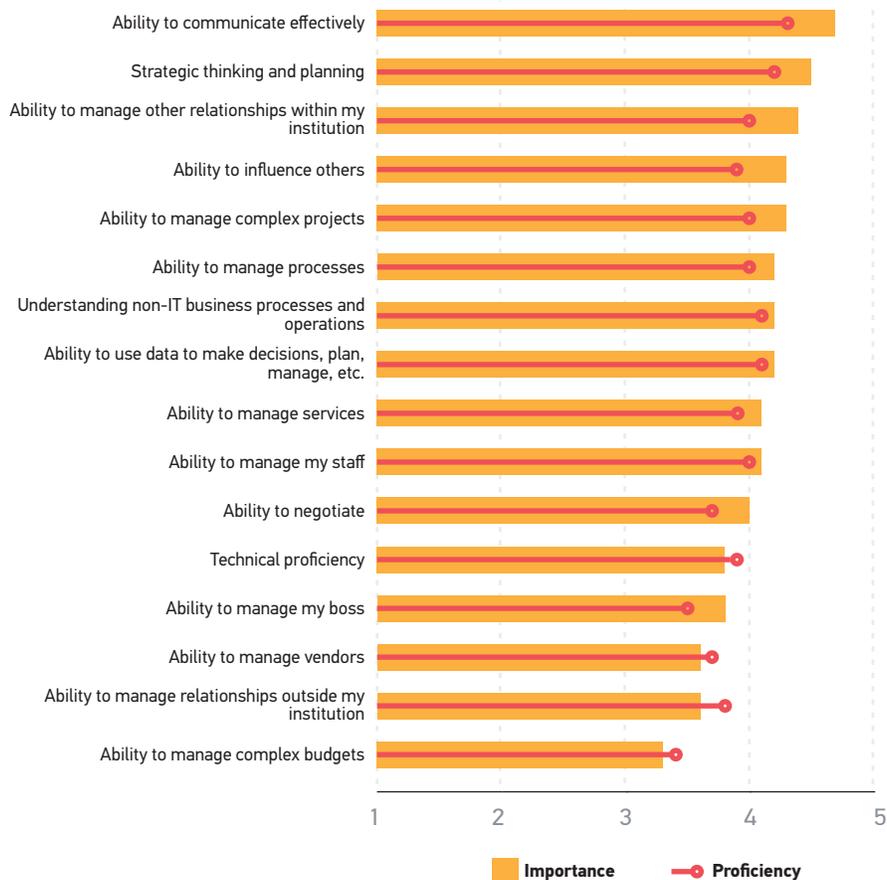
Somewhat more surprisingly, 28% of CIOs were hired into a newly created role. This is actually *up* from 23% in 2013. The EDUCAUSE Core Data Service reports that 67% of institutions reported having a CIO position in 2015, which was itself up from 59% in 2011.<sup>15</sup> The 2014 workforce report suggests that this may reflect the increasing importance of the CIO role in higher education; clearly this trend continues to be strong. Unlike in the 2014 report, however, there is no clear relationship between institution type and newly created CIO positions. Indeed, percentages for the types of institutions creating new CIO roles are fairly consistent, with 22% of new CIO positions occurring at community colleges at the low end and 32% occurring at public master’s institutions at the upper end.

Survey respondents were asked to rate the importance of a number of skills required for success in their current IT position. These skills fall into three groups: soft skills, managerial skills, and practical skills. Both the ranking and the emphasis on certain types of skills map closely to the type of position held, though the skills required of those with management responsibilities (CIOs and

managers) are more similar to each other than either is to the skills required of staff. Soft skills dominate the top 5 skills for all management levels, with the ability to communicate effectively ranking first across the board. The ability to manage staff and other relationships within the institution was, perhaps unsurprisingly, ranked highly by those with management responsibilities. Only staff ranked technical skills (e.g., technical proficiency and the ability to manage complex projects) near the top. Interestingly, technical proficiency was at or near the bottom of the rankings for CIOs and managers, which supports the recent finding that “a nontechnical background can often better prepare individuals to be IT leaders because the role is more about relationships, planning, and budgeting than just about the technology.”<sup>16</sup> While specific technical competencies may not be as important to a CIO’s success as the leadership qualities mentioned above, technical acumen is what differentiates IT leaders from all other institutional leaders. A CIO is expected to have a sound understanding of how technology works, an appreciation for technology’s present and future value to the institution, and the ability to communicate how technology aligns with the institution’s goals.

Respondents were also asked to assess their proficiency in the set of skills shown in figure 14, skills required for success in their current IT position. Two major patterns reveal themselves in this proficiency data. First, CIOs and managers rate almost all of their skills significantly higher than staff rate themselves. The only skill for which staff rate themselves higher than CIOs and managers do is their level of technical proficiency. Second, all management levels self-rate their soft skills (such as the ability to communicate effectively, strategic thinking and planning, and understanding non-IT business processes and operations) most highly. Two practical skills (the abilities to manage processes and complex projects) are also among those that IT managers and CIOs claim. Managerial skills dominate the lower half of the skills rankings.

An examination of the gap between the importance of skills (where 1 = not at all important, and 5 = extremely important) and proficiency (where 1 = very low, and 5 = very high) in those same skills reveals another interesting pair of findings (figure 14). First, the importance of skills significantly exceeds the proficiency levels reported for 75% of the items; the only skills for which proficiency significantly exceeds importance are the ability to manage relationships outside one’s institution, the ability to manage complex budgets, the ability to manage vendors, and technical proficiency. Second, the greatest gaps between importance and proficiency exist for soft skills (abilities to communicate effectively, to influence others, and to manage other relationships within one’s institution). The smallest gaps are mostly for managerial and practical skills.



**Figure 14. Mean proficiency and mean importance of various skills for success**

Finally, respondents were asked to rate the extent to which certain skills (or the lack thereof) and other factors are obstacles to their effectiveness in their current IT position (table 4). Gaps in skills were rated very low on the list across all management levels. The factors that were rated highly—again, across all management levels—were those concerning a lack of resources: primarily staff, but also financial. There is evidence of economic recovery in higher education in other areas, but it’s clear that many institutions are still feeling the effects of budgets that have shrunk over the past several years.

**Table 4. Obstacles to effectiveness**

Factor	CIO	Manager	Staff
Insufficient IT staff resources (in general)	3.55	3.37	3.35
Insufficient financial resources	3.41	3.25	3.26
Too many priorities and goals	3.39	3.33	3.34
Insufficient staff resources (in my specific function)	3.36	3.24	3.15
Insufficient staff resources in business units I support	3.23	3.08	3.01
Institutional leadership's lack of understanding of IT	3.06	3.14	3.13
Difficulty retaining good staff	2.94	2.83	3.12
Institutional leadership's lack of interest in IT	2.78	2.89	2.90
Lack of cooperation among colleagues outside IT	2.69	2.80	2.89
Lack of clear, consistent goals for IT overall	2.65	3.06	3.24
Insufficient support from human resources	2.47	2.72	2.71
Insufficient authority	2.46	2.83	3.04
Lack of clear, consistent goals for me or my specific area of IT	2.45	2.80	3.09
Excessive work hours	2.21	2.19	2.01
Lack of cooperation among colleagues in IT	2.18	2.72	2.90
Overly broad job responsibilities	2.17	2.78	3.00
Gaps in my communication skills	1.83	1.88	1.96
Gaps in my management skills	1.81	2.18	2.36
Gaps in my skills in managing services, processes, change, projects, and the like	1.79	2.07	2.27
Gaps in my technical skills	1.67	1.96	2.22
Poor fit between me and the institutional culture	1.62	1.78	1.99

*Note:* Means listed in the CIO, Manager, and Staff columns are derived from a scale of 1 (not an obstacle) to 5 (critical obstacle). Different shadings illustrate how the top 5 factors track across each management level.

## Professional Development and Retention

Hiring and retention of the IT workforce has been in the top half of EDUCAUSE's Top 10 IT Issues since 2012. Even though IT professionals remain at higher education institutions for a remarkably long time (compared with other sectors), ensuring staffing capacity and retention remains critical despite the fact that IT budgets and hiring appear to have stabilized in recent years. The IT field changes rapidly; new skills are constantly needed. To bring these new skills into the organization, IT management can either develop existing staff or hire new staff. Recruiting and hiring new staff is expensive: One meta-analysis of studies on the costs of employee turnover found that the median cost of hiring and training a new employee is 21% of an employee's annual salary and that the greater the level of specialized training a job requires, the higher the proportional cost.<sup>17</sup> And of course many IT positions require quite specialized training. Keeping existing employees' skills sharp and relevant can be significantly less expensive and disruptive to the organization. Professional development is a cornerstone of good IT workforce management.

### Professional Development

Respondents were asked what professional development activities they had participated in at least once in the past two years. A list of professional activities and the percentage of CIOs, managers, and staff who engaged in each appears in table 5.

Continuity in the professional activities engaged in across management levels is remarkable, with managers and staff tracking very closely together. The top 4 activities are identical for CIOs, managers, and staff (though in a different order for CIOs), reflecting professional activities common to and valued in higher education. Professional development is the name of the game here, both in terms of learning new skills (reading, attending conferences) and developing a professional reputation (attending conferences, networking, obtaining advice from a mentor).

**Table 5. Engagement in professional activities**

Activity	CIO	Manager	Staff
Read about current higher education news/developments	98%	88%	80%
Read about current IT news/developments	98%	95%	90%
Attended a conference focused on higher education IT	91%	74%	55%
Engaged in informal peer networking	88%	78%	68%
Delivered a presentation at or outside my institution	79%	61%	48%
Engaged in formal peer networking (as part of an organized group, consortium, etc. )	72%	62%	43%
Obtained advice from a mentor	67%	65%	49%
Attended a general IT conference without a particular focus on higher education	59%	47%	36%
Completed a “stretch” assignment outside my role or outside my annual goals	50%	48%	39%
Attended a non-IT conference	49%	34%	28%
Created or contributed to a blog or online discussion group	46%	46%	44%
Participated in formal management development programs	44%	49%	22%
Taught IT seminars, classes, or courses (for credit or professional development)	37%	30%	25%
Earned a competency-based certification (e.g., a badge or other credential)	28%	35%	27%
Taken a MOOC	25%	20%	21%
Authored or coauthored a professional article, book, or book chapter	25%	14%	8%
Taken formal technical training classes	21%	39%	45%
Earned a certification (e.g., PMP, ITIL)	10%	22%	18%

*Note:* Different shadings illustrate how the top 5 activities track across each management level.

Respondents were then asked which activities contributed most to their professional growth and development (table 6). Here we observe greater differentiation across professional groups, and a realignment indicating that managers are tracking now more closely (perhaps aspirationally) with CIOs. The top 3 items for both managers and CIOs are related to keeping abreast of developments and trends in higher education IT and expanding or deepening their informal peer networks. While CIOs see more value in formal networking and reading about higher education in general, managers value activities that can improve their job skills and/or advance their careers (e.g., management development programs and seeking advice from mentors). Although staff share several activities with CIOs and managers and find them valuable, the rank order of their importance is very different; moreover, the most highly valued professional activity for staff is improving formal technical skills, an activity that ranks in the bottom half of the list for CIOs and managers.

**Table 6. Activities contributing to professional growth and development**

Activity	CIO	Manager	Staff
Attending conferences focused on higher education IT	4.36	4.14	3.86
Engaging in informal peer networking	4.18	3.93	3.73
Reading about current IT news/developments	4.16	3.90	3.72
Engaging in formal peer networking (as part of an organized group, consortium, etc.)	4.12	3.84	3.63
Reading about current higher education news/developments	4.11	3.80	3.48
Completing “stretch” assignments outside my role or outside my annual goals	4.00	3.79	3.75
Obtaining advice from a mentor	3.94	3.94	3.67
Delivering presentations (at or outside my institution)	3.93	3.78	3.47
Participating in formal management development programs	3.81	3.86	3.37
Attending general IT conferences without a particular focus on higher education	3.68	3.47	3.46
Teaching IT seminars, classes, or courses	3.64	3.42	3.53
Attending non-IT conferences	3.53	3.19	3.17
Writing professional articles, books, or book chapters	3.41	3.27	3.32
Taking formal technical training classes	3.09	3.40	3.95
Creating or contributing to blogs or online discussion groups	3.03	3.03	3.12
Earning certifications (e.g., PMP, ITIL)	3.00	3.29	3.57
Earning a competency-based certificate (e.g., a badge or other credential)	2.98	3.16	3.43
Taking a MOOC	2.74	2.99	3.28

*Note:* Means listed in the CIO, Manager, and Staff columns are derived from a scale of 1 (no contribution to your professional growth in your current position) to 5 (great contribution). Different shadings illustrate how the top 5 activities track across each management level.

Finally, respondents were asked which professional activities they are encouraged to engage in by their supervisor (see table 7). Attending conferences was the top item across all management levels, reflecting the importance of conferences in higher education as a mechanism both for learning and for developing one’s professional network. Again, here we observe managers tracking closely with CIOs, with the top 4 activities being identical. The top items for staff are quite different, however, including a tie for both first and second place. It is perhaps telling that the two second-place activities—“Engage in informal peer networking” and “Participate in formal management development programs”—represent a tie between network building and professional development.

**Table 7. Supervisor encouragement of professional activities**

Activity	CIO	Manager	Staff
Attend conferences focused on higher education IT	57%	59%	49%
Read about current higher education news/developments	51%	52%	32%
Read about current IT news/developments	50%	51%	14%
Engage in informal peer networking	48%	51%	44%
Deliver presentations at or outside my institution	43%	40%	23%
Engage in formal peer networking (as part of an organized group, consortium, etc.)	38%	41%	41%
Complete “stretch” assignments outside my role or outside my annual goals	34%	34%	31%
Attend general IT conferences without a particular focus on higher education	31%	35%	49%
Participate in formal management development programs	30%	40%	44%
Obtain advice from a mentor	28%	31%	9%
Attend non-IT conferences	26%	16%	16%
Teach IT seminars, classes, or courses (for credit or professional development)	18%	21%	25%
Author or coauthor professional articles, books, or book chapters	15%	15%	15%
Create or contribute to blogs or online discussion groups	12%	19%	33%
Take formal technical training classes	10%	27%	29%
Earn competency-based certifications (e.g., a badge or other credential)	9%	20%	18%
Earn certifications (e.g., PMP, ITIL)	5%	20%	11%
Take MOOCs	4%	7%	24%

Note: Different shadings illustrate how the top 5 activities track across each management level.

Because the same set of options were offered for each of the preceding items (i.e., activities in which respondents engaged, the contributions of these activities to respondents’ professional development, and what respondents’ supervisors encourage them to do), we are able to explore more deeply the relationships between these factors and better understand the forces at work in professional development activities. Specifically, structural equation modeling (SEM) reveals the following relationships between these factors:

- Employees are more likely to engage in specific professional development activities when their supervisors encourage them to do so.
- Employees are more likely to view specific professional development activities as making a great contribution to their professional growth when they have engaged in those activities.

- Employees are more likely to view specific professional development activities as making a great contribution to their professional growth when their supervisors encourage them to engage in those activities.

Staff, managers, and even CIOs rate opportunities for building their technical, management, and leadership skills as important in keeping them at their institution. This suggests that supervisors can facilitate the retention of employees by encouraging them to engage in professional development activities that are suitable to their interests, talents, and position.

## Retention

Having employees who engage in professional development activities is useful for building a workforce that can keep pace with the constantly changing IT landscape. Certainly engagement in professional development activities is a factor in keeping employees satisfied, but it takes more than professional development activities to retain a workforce in which an organization and an institution have invested significant resources. To better understand issues related to retention, we asked respondents about their likelihood of pursuing employment opportunities outside their current institution in the next year and whether they anticipate that their next position will be at their current institution. In 2013, 32% of the IT workforce said that, due to the economic climate, the likelihood had increased that they would pursue professional opportunities outside their current institution; in the current study, 48% of the IT workforce said that they will pursue employment opportunities outside their current institution in 2016. What does it take to retain employees in the IT workforce?

Some factors are beyond the control of the institution or the employee's supervisor. The longer an individual has worked in higher education, for example, and the longer an individual has worked at the current institution, the less likely that employee is to pursue employment opportunities outside the current institution. In this regard, employee retention can be, to a certain extent, self-reinforcing. Many other factors (see table 8), however, are within the institution's and the supervisor's control.

Supervisors can facilitate the retention of employees by encouraging them to engage in professional development activities that are suitable to their interests, talents, and position.

**Table 8. Importance of various factors in retaining IT professionals at their current institution**

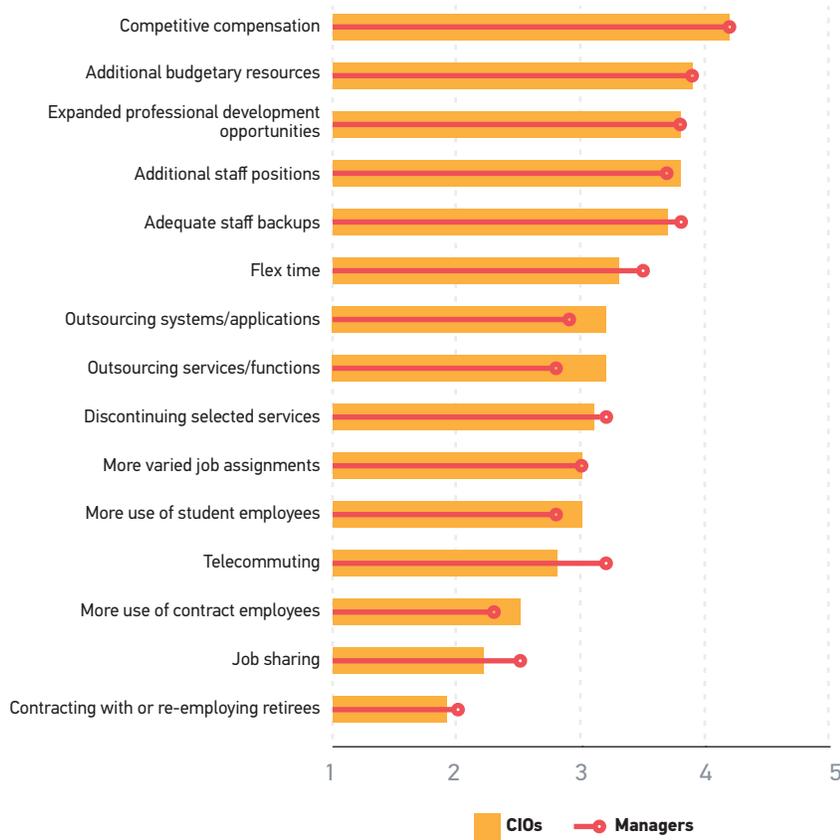
Factor	CIO	Manager	Staff
Quality of life	4.49	4.49	4.43
My boss/leadership	4.42	4.33	4.12
Work environment	4.38	4.35	4.33
My staff	4.35	4.18	3.95
My colleagues	4.25	4.06	4.03
Occupational stability	4.07	4.18	4.29
Opportunity to build my leadership skills	4.01	4.09	3.55
Benefits	3.98	4.16	4.21
Reputation of the institution as a good place to work	3.95	3.79	3.68
Opportunity to build my management skills	3.93	3.96	3.30
Geographic location	3.88	3.97	3.90
Reputation of the institution for academic excellence	3.80	3.58	3.41
Monetary compensation	3.73	3.92	3.91
Performance recognition	3.65	3.72	3.67
Cost of living	3.48	3.69	3.70
Work hours	3.44	3.90	4.05
Long-term career path in IT	3.38	3.65	3.56
Reputation of the institution for technological excellence	3.38	3.45	3.23
Opportunity to build my technical skills	3.06	3.63	4.02
Long-term career path outside IT	2.56	2.70	2.76

*Note:* Means listed in the CIO, Manager, and Staff columns are derived from a scale of 1 (not at all important) to 5 (extremely important). Different shadings illustrate how the top 5 factors track across each management level.

In the 2014 workforce report, “My staff” was the most important factor for retaining CIOs at their current institution, while “Benefits” were the most important factor for staff and managers. In the current study, “Quality of life” was the most important factor for all three employee categories, with “Work environment” second for staff and managers. The same was true when these factors were analyzed by generation: “Quality of life” was the most important factor for Baby Boomers, Gen Xers, and Millennials, with “Work environment” second for Gen Xers and Millennials. This shift, along with the increase in the percentage of the IT workforce pursuing professional opportunities outside their current institution, mentioned above, may be further evidence of the continuing economic recovery. Social science research tells us that periods of economic turmoil encourage people to focus on material security, but in periods of growth and/or stability, quality-of-life issues matter more.<sup>18</sup> In the former scenario, for example, benefits may be an important factor for employees if a spouse/partner is un- or underemployed; in the latter, individuals may feel freer to prioritize higher-order factors such as quality of life and work environment or to take chances on new lines of employment.

### **Important Items to Maintain the IT Workforce**

We asked CIOs and managers to rate a series of items on the basis of their importance in maintaining an IT workforce that would be adequate to meet the needs of their institution in the next three years (where 1 = not at all important, and 5 = extremely important) (see figure 15). Managers and CIOs are largely in agreement on the top 5 most important factors, each of which depends on the availability of institutional resources. Such alignment reflects both a mutual understanding of the broader institutional context in which CIOs and managers are operating and an awareness of the budgetary parameters required to operate an IT unit. Once we move beyond the top 5, however, we observe a significant divergence of opinion as to what is required to maintain an adequate IT workforce. CIOs are much more likely than managers to see outsourcing—of systems and applications and of services and functions—as important; likewise, CIOs are more likely to think that using more student and contract employees is important in maintaining the IT workforce. Managers, on the other hand, are significantly more likely than CIOs to think that providing staff with opportunities for telecommuting and job sharing are more important.

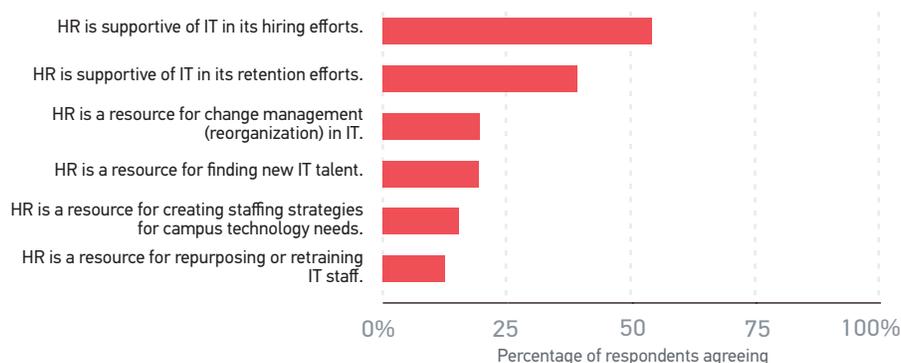


**Figure 15. Mean importance of workforce maintenance factors**

The differences between CIOs and managers on these issues are likely a function of their roles and their proximity to the staff. CIOs, for example, are more likely than managers to consider broader IT trends and macro-level solutions and are probably more distant, both physically and organizationally, from their regular staff; this might make them more likely to consider outsourcing and alternative staffing options. Managers, who have the responsibility to work closely with their staff members on a regular basis, are more likely in tune with their wants and needs (e.g., telecommuting) and the opportunities for creative talent management (e.g., job sharing).

## Human Resources

Higher education IT’s perspective on HR is an ambivalent one. Although a majority of CIOs and managers claim that HR is either not an obstacle (28%) or only a minor obstacle (25%) to their effectiveness in their position, a quarter view HR as either a major (15%) or a critical (10%) obstacle. This ambivalence toward HR appears to depend largely on the type of support IT expects to receive for different activities. Figure 16 shows a clear division in the evaluations of traditional HR support functions such as hiring (54% favorable) and retention (39% favorable) versus more specialized tasks such as change management (reorganization), finding new IT talent, creating staffing strategies for campus technology needs, or repurposing/retraining IT staff (all less than 20% favorable). Indeed, CIOs’ and managers’ evaluation of HR’s traditional functions significantly predicts their perception of HR as an obstacle.<sup>19</sup> CIOs, who spend about twice as much time addressing HR, staffing, and professional development issues than managers (medians of 10% and 5%, respectively), rate HR’s contributions to hiring and retaining staff significantly higher than do managers.



**Figure 16. CIOs’ and managers’ perceptions of HR support**

These findings are consistent with those from the 2014 report and are likely the product of similar forces and circumstances. Because college and university HR departments are responsible for managing human resources for IT as well as for non-IT units, their approach is generalized and may not be attentive to IT’s specific needs (e.g., identifying new IT talent, familiarity with new skillsets, being attuned to campus technology needs). Furthermore, higher education HR,

like any other bureaucracy, is slow to change policies and adopt procedures that might accommodate the faster-paced needs of IT; the result is bottlenecks and frustration.<sup>20</sup> Clearly, HR remains an important institutional partner to IT in terms of meeting its workforce needs. However, these results suggest that our previous recommendation that HR work to help IT with organizational change and development appears to have gone largely unheeded. Perhaps the onus lies instead with IT to take the first steps. CIOs could leverage their position within the institution to open lines of communication and broker a new relationship with HR leaders as a way to alleviate the obstacles and frustration IT managers and (to a lesser extent) CIOs appear to experience.

## Conclusions

The previous workforce report, in 2014, found that the IT workforce was adapting to an era of decreased budgets. This report finds much evidence of economic recovery in institutions of higher education: Positions are not being eliminated at the rate they were in the past, and as more hires are being made, the size of central IT units appears to be stabilizing. Turnover of the IT workforce is also stabilizing, with employees remaining at institutions far longer than the national average for the U.S. workforce in general, providing opportunities for staff to work their way up into managerial roles. Despite this longevity at institutions, nearly half of the IT workforce is likely to pursue employment opportunities outside their current institution in the near future, a considerable increase from 2013. A supervisor's encouragement to engage in professional development activities and employees' quality-of-life factors are critical for staff retention.

## Recommendations

- Individuals with hopes of becoming IT managers should remain at their current institution and consider working their way into IT sectors that touch on administrative and enterprise-wide computing. CIO aspirants should remain in higher education, work toward acquiring an executive leadership position, and be prepared to leave their current institution.
- IT units should continue to ensure salary equity between men and women at the CIO and manager levels and should work toward eliminating salary differences between genders among staff.
- Women and minorities continue to be underrepresented in the higher education IT workforce; Millennials are also underrepresented. IT leaders should work toward having their workforce better represent the wider society.
- Given both the inability of IT to create new positions quickly and the prevailing opinion that HR is unsupportive, CIOs and managers should reach out to and cultivate better relationships with HR departments to better address IT's unique hiring needs.
- Staff who aspire to managerial positions should seek out opportunities to improve their soft skills and develop management skills. For CIOs and managers, soft skills such as effective communication, influencing others, and managing relationships are areas of potential professional development.
- Professional growth and development recommendations depend on the management level of one's current position: 1) Staff should identify and work with a mentor and participate in formal management development programs; 2) managers should engage in more formal peer networking (e.g., consortia, professional organizations) and improve their knowledge of higher education news and developments; and 3) CIOs should go to higher education IT conferences, engage in networking activities, and keep abreast of news and developments germane to their position. Consider the [\*Advance Your Career with EDUCAUSE\*](#) resource, which is customizable to your management level and level of investment in professional development and can point you to relevant community, content, events, and programs.
- Given that the major obstacles to IT effectiveness are insufficient resources and too many/unclear goals and priorities, IT leaders should document staffing needs for incremental and new initiatives as part of making a case for augmenting the workforce in order to achieve the institution's expanding expectations of IT.

- Supervisors should grow and develop the employees they want and need to have. Supervisors have it within their power to facilitate the retention of employees by encouraging them to engage in professional development activities that are suitable to their interests, talents, and positions.
- CIOs might consider a more holistic approach to workforce maintenance that moves beyond macro-level solutions such as outsourcing and/or alternative hiring practices. Managers, who work closely with staff on a daily basis and understand their needs, should be consulted to arrive at solutions that increase the likelihood of retaining talent (e.g., telecommuting, job sharing).

## Methodology

Survey invitations were sent to 30,161 IT professionals in the EDUCAUSE database. A total of 1,188 respondents provided data that could be used for analysis, resulting in a response rate of 4%.<sup>21</sup> Respondents were from all 50 U.S. states except Wyoming and from 31 countries; 692 institutions of higher education were represented, which is 15% of all institutions of higher education in the United States. Non-U.S. respondents made up 9% of the sample. Data collection took place in November and December of 2015.

## Acknowledgments

A report of this length and complexity, and the survey that preceded it, is always a group effort. The authors have many people to thank: Ben Shulman, Statistician, for his work cleaning and analyzing the data; Jamie Reeves, Research Assistant, for assistance with content analysis of qualitative data; and Kate Roesch, Data Visualization Specialist, for her excellent work producing the graphics in this report and for tolerating our many requests for revisions. The contributions of our reviewers and subject matter experts improved this report immensely: Susan Grajek, Vice President for Data, Research, and Analytics; Eden Dahlstrom, Chief Research Officer; Tracy Petrillo, Chief Learning Officer; Melissa Woo, Vice President for IT/CIO at Stony Brook University; and Joe Moreau, Vice Chancellor of Technology & CTO of the Foothill–DeAnza Community College District.

## Notes

1. The first study was conducted in 2010 and the report published in 2011. The second study was conducted in 2013 and published in 2014. This study was conducted in 2015 and published in 2016. Throughout this report, references to the data collected in these studies refer to the year the study was conducted.
2. U.S. Department of Labor, Latest Annual Data, [“Women of Working Age.”](#)
3. American Association of University Women, [“Solving the Equation: The Variables for Women’s Success in Engineering and Computing,”](#) 2015.
4. U.S. Bureau of Labor Statistics, [“Employee Tenure in 2014,”](#) September 18, 2014.
5. The reverse is also likely true; the U.S. Bureau of Labor Statistics also reports that median tenure increases sharply for older employees.
6. U.S. Bureau of Labor Statistics, [“Median Age of the Labor Force, by Gender, Race and Ethnicity,”](#) December 8, 2015.
7. Pew Research Center, [“The Generations Defined,”](#) May 8, 2015.
8. Pew Research Center, [“Labor Force Composition by Generation,”](#) May 11, 2015.
9. U.S. Bureau of Labor Statistics, [“Labor Force Statistics from the Current Population Survey: Household Data Annual Averages: 11. Employed Persons by Detailed Occupation, Sex, Race, and Hispanic or Latino Ethnicity,”](#) February 10, 2016.

10. Jacqueline Bichsel, *Overview: The 2015–16 Administrators in Higher Education Salary Survey Report* (Knoxville, TN: CUPA-HR, March 2016).
11. No members of the Greatest Generation are represented in our sample. Millennials were dropped from the model due to between-term collinearity.
12. Again, the Greatest Generation was not represented in this sample, and Millennials were excluded due to between-term collinearity. Being a member of the Silent Generation did not predict salary significantly ( $p = 0.7587$ ).
13. In a multivariate ordered logistic regression model of institution type on cabinet membership, only AA and public MA institutions correlated significantly with cabinet membership.
14. For 11 of the past 12 quarters (2013–2015), the United States has experienced positive real GDP growth. Source: U.S. Bureau of Economic Analysis, “[Quarter-to-Quarter Growth in Real GDP](#),” March 25, 2016.
15. EDUCAUSE Core Data Service, 2015 and 2011.
16. EDUCAUSE and JISC, *Technology in Higher Education: Defining the Strategic Leader* (Louisville, CO: EDUCAUSE in partnership with JISC, March 2015), p. 11.
17. Heather Boushey and Sarah Jane Glynn, *There Are Significant Business Costs to Replacing Employees*, Center for American Progress, November 16, 2012.
18. See the work of Ronald Inglehart on the subject of materialism and post-materialism for more information: Ronald Inglehart, *The Silent Revolution: Changing Values and Political Styles Among Western Publics* (Princeton: Princeton University Press, 1977); Ronald Inglehart, *Culture Shift in Advanced Industrial Society* (Princeton: Princeton University Press, 1990); and Ronald Inglehart, *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies* (Princeton: Princeton University Press, 1997).
19. Ordered logistic regression of perceptions of HR support on viewing HR as an obstacle return significant relationships between hiring and retention. Post hoc Monte Carlo simulations ( $n = 1,000$ ) reveal that those who strongly agree that HR is supportive of IT in its hiring efforts are 42% more likely to see HR as only a minor or no obstacle than those who strongly disagree. Similarly, those who strongly disagree that HR is supportive of IT in its retention efforts are 41% more likely to see HR as a major or critical obstacle than those who strongly agree.
20. Jacqueline Bichsel, *Today’s Higher Education IT Workforce*, research report (Louisville, CO: EDUCAUSE Center for Analysis and Research, January 2014), pp. 38–39.
21. The 2013 survey had 2,293 respondents, and a response rate of 7%.