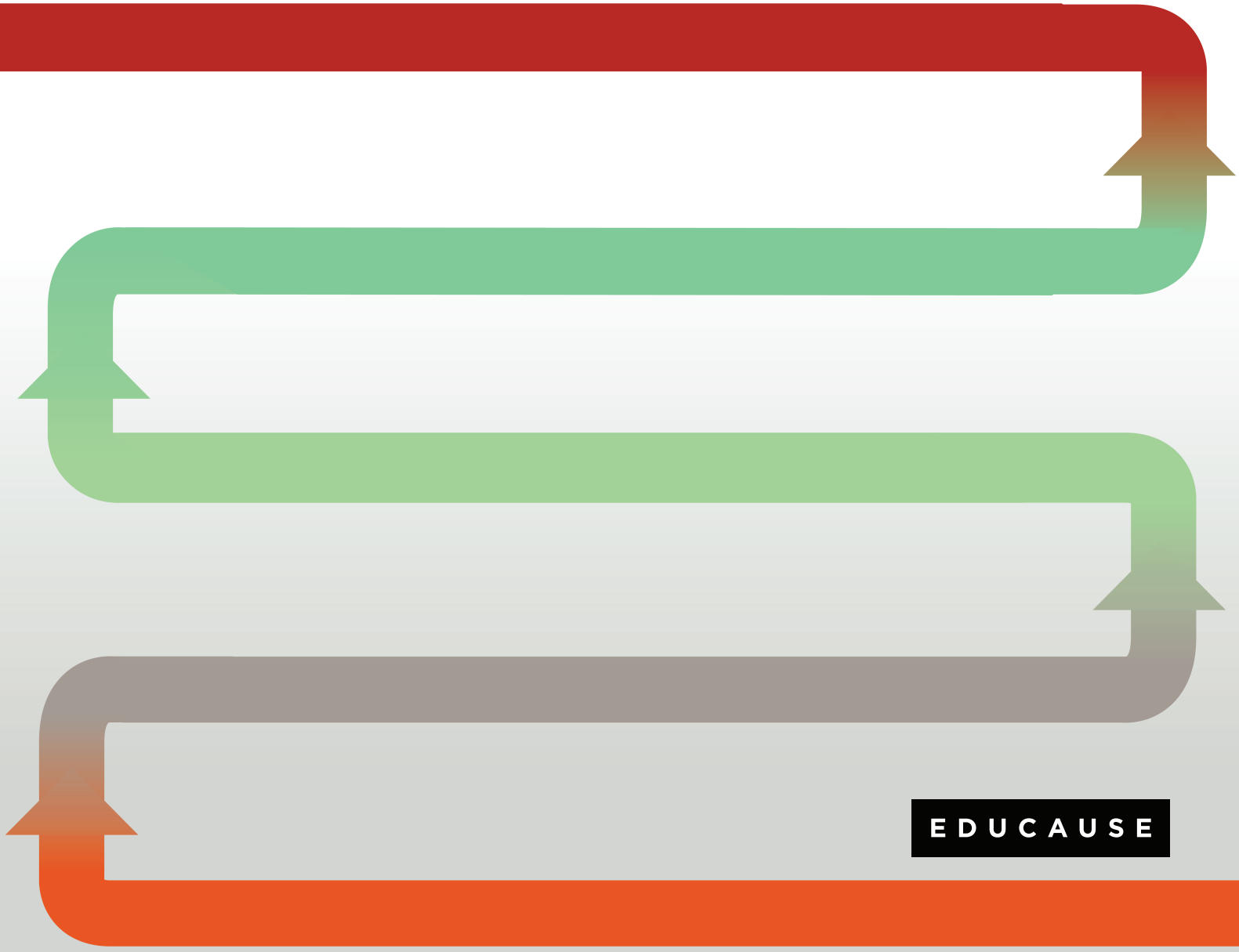
EDUCAUSE CENTER FOR ANALYSIS AND RESEARCH

Trend Watch 2015: Influential IT Directions in Higher Education



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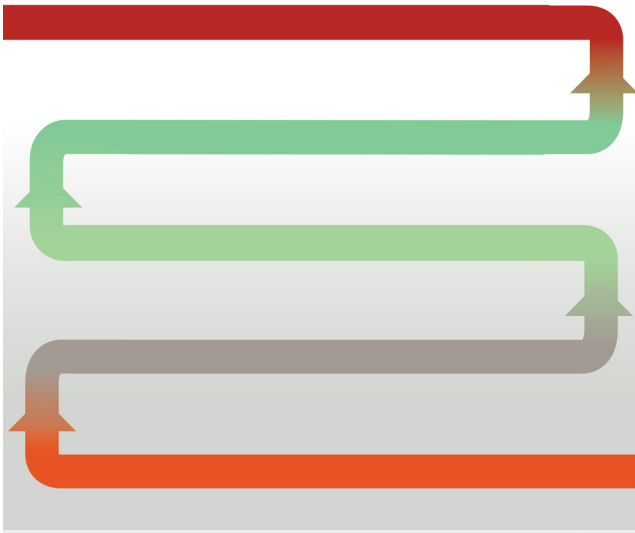

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EDUCAUSE is a nonprofit association and the foremost community of IT leaders and professionals committed to advancing higher education. EDUCAUSE programs and services are focused on analysis, advocacy, community building, professional development, and knowledge creation because IT plays a transformative role in higher education. EDUCAUSE supports those who lead, manage, and use information technology through a comprehensive range of resources and activities. For more information, visit educause.edu.

Introduction

New technologies, management practices, and end-user preferences have produced a number of IT trends that promise greater efficiencies or increased institutional or individual efficacy. These trends have been highly visible, widely discussed, and broadly covered in publications, blogs, and presentations. With so much discussion of the benefits of agility, the need for business process redesign, the ubiquity of social media, and the movement to the cloud, it's easy to assume that colleges and universities are adopting these and other new practices en masse. But what is actually in place at our institutions? Which types of institutions are most affected by—or leveraging—IT trends that occupy so much mindshare?

EDUCAUSE compiled a set of 15 trends related to consumerization, analytics, and efficiency identified or commonly used by influential and established groups, such as the New Media Consortium and Gartner, or widely discussed by EDUCAUSE members in gatherings and online.

- Access for diverse devices
- Agile approaches to change
- Business process redesign
- DevOps movement
- Enterprise data management
- Green technology
- Growth of social media
- IT complexity
- Migration to the cloud
- Mobile device diversity
- Personal clouds
- Reduced reliance on service desk
- Shared services
- Shift to students as creators
- Software-defined networking

This report presents data on the actual influence of these trends on IT strategy in higher education.

Summary

- Four trends are exerting the most influence on higher education's IT strategy: IT complexity, mobile device diversity, cloud adoption, and business process redesign. Each trend has either been incorporated into IT strategy or is a major influence on emerging strategy in more than 6 in 10 institutions.
- The four trends with limited impact (strongly influencing fewer than 20% of institutions) are the shift from students as consumers to students as creators, reduced reliance on the service desk as the primary model for support, software-defined networking (SDN), and access for diverse devices and endpoints.
- Readers want to know how results apply to institutions like theirs. Institutional demographics (size, Carnegie Classification) are only occasionally related to the influence of these trends on IT strategy. The greater differentiator is an institution's approach to technology adoption: In general, these trends are most influential for the IT strategy of early adopters and least influential for the IT strategy of late adopters.
- Migration to the cloud is the one trend that is consistently influential for all demographic groups and technology adoption paces.
- Several of the trends raise the question of data management practices (access for diverse devices, enterprise data management, growth of social media, increasing adoption of personal clouds, and mobile device diversity), highlighting the need for data governance strategies that address issues of data classification, storage, stewardship, access, compliance, risk, security, and training.
- Many trends speak to evolving staff roles and the need to adapt staff development and talent management. Nontechnical skills such as relationship management, contract management, and communication are important for many trends, while technical skills in data integration, networking, and mobile application development are important for others.
- Taken together, these trends require a balance as they influence IT strategy, with, for example, IT complexity impeding agile approaches to change management and increasing adoption of personal clouds potentially conflicting with enterprise data management. Other trends might be used to help achieve that balance, such as migration to the cloud, the DevOps movement, business process redesign, and SDN.

The Trends

We assessed the 15 IT trends in an EDUCAUSE survey in the summer of 2014. The 346 respondents were asked to indicate the extent to which each trend influenced their IT strategy:

- Don't know (unfamiliar with this trend)
- Not at all
- Tracking but no influence yet
- A minor influence
- A major influence
- Already incorporated

Multiple responses from an institution were removed for analysis.

The trends can be divided into three categories: trends that influence analytics strategies, trends related to consumerization of technology and information, and trends that help institutions become more efficient.

Analytics Trends

- **Access for diverse devices:** Internet connectivity is already built into many mobile devices, most notably cell phones and tablets. The Internet of Things is bringing even more embedded computing devices to our networks, including RFID- and GPS-based devices, with implications for analytics initiatives that can leverage new data sources and for data management strategies that must handle the increased volume of data from a complex mix of disparate devices. Not only do institutions need to consider data management strategies, but they also need to ensure that both their networks and their service desks are adequately provisioned to support this large variety of devices. Also, information security policies and practices must evolve to reflect this increase in volume and type of data.
- **Enterprise data management:** An enterprise data management strategy coordinates processes, technologies, and resources related to the growing variety of data used by institutions. So-called shadow systems often result in multiple data sources and versions that need to be reconciled. Whereas institutions were once able to rely solely on their own internally produced data—often through enterprise data warehouses—for strategic decision making, data are now distributed across those traditional data sources as well as in noninstitutional data sources such as social networking systems. Considering these hybrid data sources is important in developing a broad institutional data strategy, as is a data governance effort that addresses data quality, security, stewardship, access, and compliance. New staffing roles and responsibilities may be required to manage this new way of handling data, with greater emphasis on data integration and analysis.

Consumerization Trends

- **Growth of social media:** With the widespread adoption of cell phones and other mobile devices, combined with increased use of social media, students and faculty alike come to campus as members of their own preexisting social communities. The growing ubiquity of social media is changing communication patterns and expectations, and end users are accustomed to instant information that is directly relevant to them. Institutions can take advantage of this trend by considering the ways social media differ from traditional media—for example, in immediacy, usability, and reach—and building media, communications, alumni, institutional advancement, and other strategies with those characteristics in mind. Strategies should also address privacy concerns and the potential for teaching and learning applications.
- **Mobile device diversity:** An increasing user appetite for mobile devices accompanies the ubiquity of social media and the increase in personal cloud use. Given that many mobile devices are personally owned, the institution has very little say in what hardware or software its users purchase, complicating the support that IT departments can provide. End users rely increasingly on their personal clouds for storage, and the line between personal and institutional computing is blurring. In addition, comprehensive testing across this diversity of devices is impractical, yet end users expect websites, applications, and publications to display well across all mobile devices. Finally, IT strategies need to consider a variety of security and risk-management issues that include growing instances of intrusions and loss, inadequate security and credentialing for data storage, and exposure risks for personal and institutional financial information.
- **Personal clouds:** Just as social media is increasingly important to end users, so is the use of personal clouds for end-user data storage, content sharing, and synchronization. Users expect to be able to seamlessly access their files and data from any device, anywhere, any time. Often these are institutional data, raising issues of security, compliance, data recovery, preservation, and privacy. It is becoming increasingly difficult to mandate the use of institutional storage space, and institutional strategy needs to consider data issues related to personal clouds, training to help users understand their responsibilities, and support strategies.
- **Shift to students as creators:** As institutions shift pedagogical approaches from passive to active learning, students are designing and creating rather than simply consuming content. Across all disciplines, institutions are starting to modify degree and course plans to enable students to learn through media creation, design, and entrepreneurship. This work necessitates technology environments and facilities that support hands-on learning, impacting IT strategy through the need to build and manage these technical environments as well as to support faculty and students through this transition.

Efficiency Trends

- **Agile approaches to change:** Agile software development calls for adaptive planning, continuous improvement, and rapid and flexible response to change. These concepts can also be applied to change management in general. With the rapid pace of technological advances, the decreasing ability for IT shops to control their users' technology ecosystems, and the demands for increased accountability, IT strategies that take an agile approach to change management are critical. The software design strategies of flexibility and continuous improvement are finding their way into efforts related to strategic planning, desktop management, IT governance, and infrastructure planning. In addition, institutions that are working to develop cultures of innovation may find that agile approaches increase cost-effectiveness.
- **Business process redesign:** Examining and redesigning work processes through business process management can uncover opportunities for greater efficiency, possibly allowing for cost savings or reallocation of resources. For example, business process improvement can decrease the need for customization of administrative systems and increase alignment between business processes and institutional mission. Because processes tend to span functional-unit boundaries, strategies are most successful when they include multiple units at an institution. Business process is more than simply workflow, encompassing workflow design, systems capabilities, motivation, human resources, policies, rules, funding, and other factors. All should be considered in a business process redesign strategy.
- **DevOps movement:** DevOps efforts usually emphasize people over tools, focusing on developing a collaborative relationship between development and operations staff to improve efficiency and provide better service. Strategies may include ways to streamline operations by automating and standardizing repetitive tasks and creating self-service applications. An institutional strategy that considers DevOps can take advantage of past work and save time on testing, potentially freeing resources for other activities. Lack of a current, standard DevOps definition can create confusion, and the DevOps implementation that works for one institution may not work for another. A strategy that adopts a simplified definition can be a good starting point for developing a common understanding for developers and operations staff.
- **Green technology:** Green, sustainability technology strategies may call for standards for computer power usage, changes to power and HVAC systems in data centers, or even developing a cloud-first strategy to decrease data center use altogether. These strategies may be driven both by the need to decrease costs and by the desire to be good environmental stewards.
- **IT complexity:** The pace of change in technology continues to increase. As institutions try to keep up, they find that the environments they manage are becoming more complex. New technologies need to be incorporated into the

environment, older technologies need to be updated, and end users expect it all to work seamlessly. As the IT environment grows, IT complexity grows exponentially.

- **Migration to the cloud:** Cloud computing is becoming mainstream, with more than 90% of respondents reporting that it bears at least a minor influence on IT strategy. For any institution, determining the right mix of cloud and on-premises services is an important decision. A cloud-first strategy is becoming increasingly common, in that cloud services offer potentially lower costs and better services, faster deployment, easier upgrades, and immediate scalability. Cloud services may also allow IT to spend less time delivering technology and focus instead on strategic partnerships with campus functional units. However, migration to the cloud may also necessitate developing new IT duties—such as data integration, contract and vendor management, and collaboration with business units—while retiring existing roles, making workforce management an important component of adopting a cloud strategy.
- **Reduced reliance on service desk:** The increasing reliance on mobile devices and personal clouds presents a challenge to the service desk. End users often turn to web-based or informal alternatives for tech support, and the service desk may no longer be the hub for technology activity that it once was. This change may present an opportunity for institutions to refocus their service desks on areas that either most enable productivity or best meet demands for training and development specific to the institution. Refocusing may also mean enabling more self-support, perhaps via knowledge management for troubleshooting or self-provisioning tools, as a way to manage the costs of support and extend support windows to meet expectations for 24/7 support.
- **Shared services:** Shared services—the provision of a service by one part of an organization or group where that service had previously been provided by more than one part of the organization—offers an economy of scale that may lead to decreased costs and greater value for the institution. However, attaining that economy of scale can require a challenging and large scope expansion. Strategies that include leadership engagement, good change management practices, shared governance, and a long-term financial model will lead to greater success in shared services efforts.
- **Software-defined networking:** Software-defined networking (SDN) allows system administrators and network engineers to respond quickly to changing network requirements through rapid scaling and dynamic configurations. SDN strategies may allow administrators to manage network services in simpler ways and enable end users and applications to customize the network to their needs. Some institutions are using SDN to create separate research networks or campus network bypasses for speedier data transfers. Because SDN is still in its early years, standards are evolving and use cases are few.

Findings

We classified trends into four categories, based on the degree of influence they have on institutional strategies:

- **Most influential:** Already incorporated or exerting a major influence on emerging IT strategy in 61% or more of institutions
- **Taking hold:** Already incorporated or exerting a major influence on emerging IT strategy in 41–60% of institutions
- **Worth understanding:** Already incorporated or exerting a major influence on emerging IT strategy in 21–40% of institutions
- **Limited impact:** Already incorporated or exerting a major influence on emerging IT strategy in 20% or fewer institutions

The trends differed widely in the influence they are exerting on institutions (see figure 1). IT complexity is influencing the greatest proportion of institutions. It was already incorporated or exerting a major influence in 3 out of 4 institutions (75%). At the other end, access for diverse devices is a major influence on or already incorporated into IT strategy at only 13% of institutions.

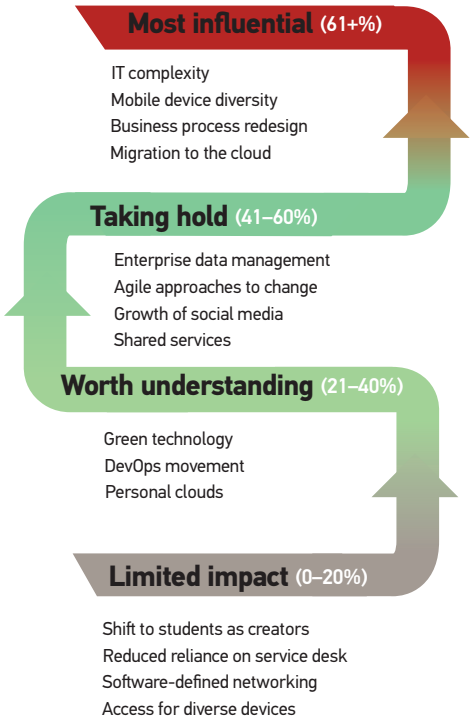

Figure 1. Trends and their influence on IT strategy: All institutions

Demographic Differences

Only one trend—migration to the cloud—was immune to institutional differences, as measured by Carnegie Classification, institutional size, or approach to technology adoption (early, mainstream, or late adopters). The influence of other trends varied by these factors.

The influence of few of the trends varied with Carnegie Classification and institutional size (see figures 2–12). Shared services and SDN varied by both institutional size and Carnegie Classification—they have greater influence in larger institutions. Doctoral universities, with broader missions and often greater resources, are generally assumed to be furthest ahead among higher education institutions. This was only the case with SDN and shared services. Shared services, however, are also exerting as large an influence in public master's institutions as in doctoral universities.

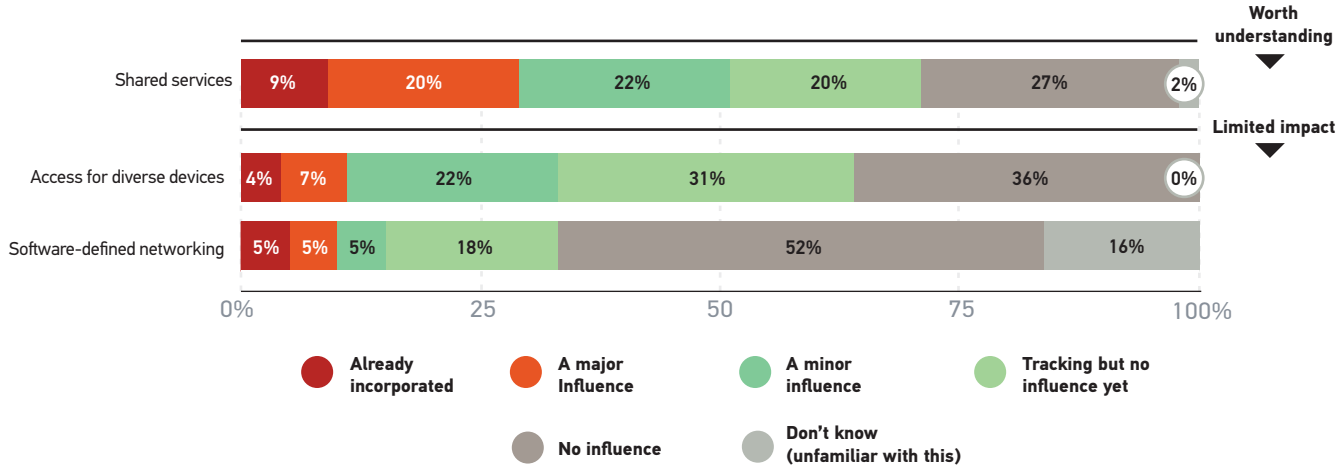

Figure 2. Trends and their influence on IT strategy: <2,000 FTEs

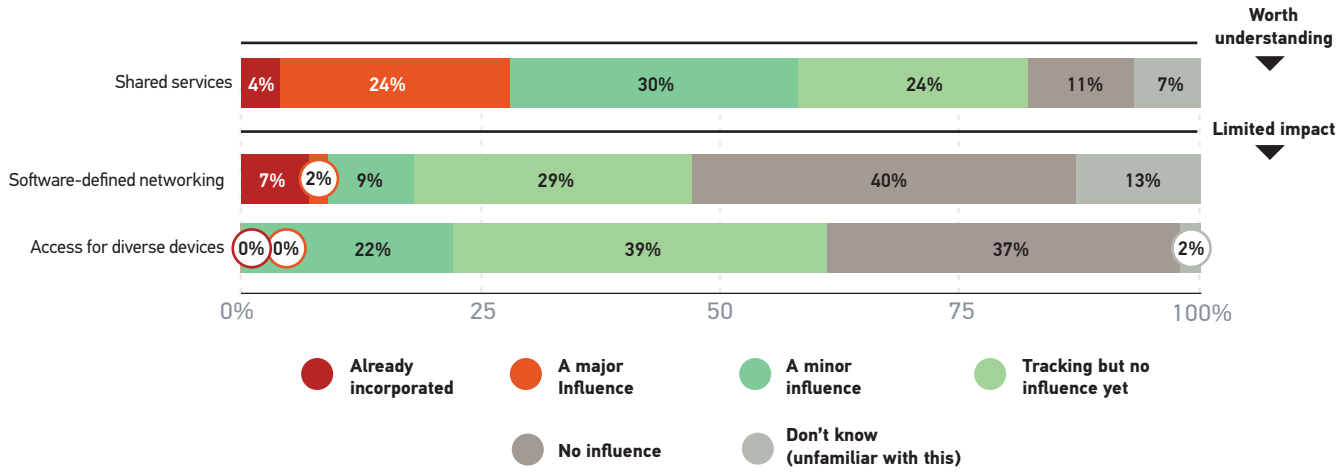

Figure 3. Trends and their influence on IT strategy: 2,000–3,999 FTEs

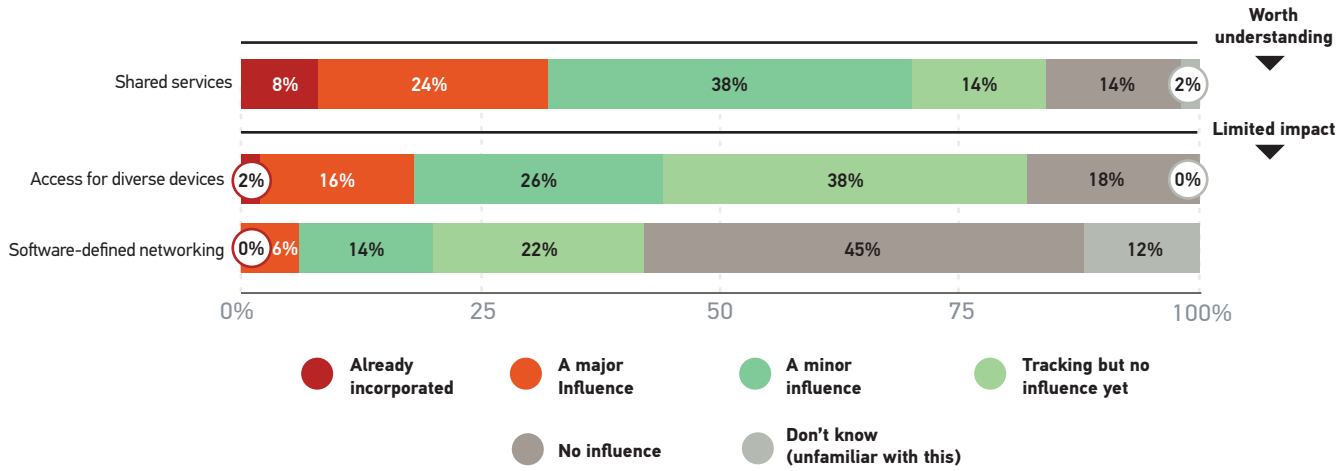

Figure 4. Trends and their influence on IT strategy: 4,000–7,999 FTEs

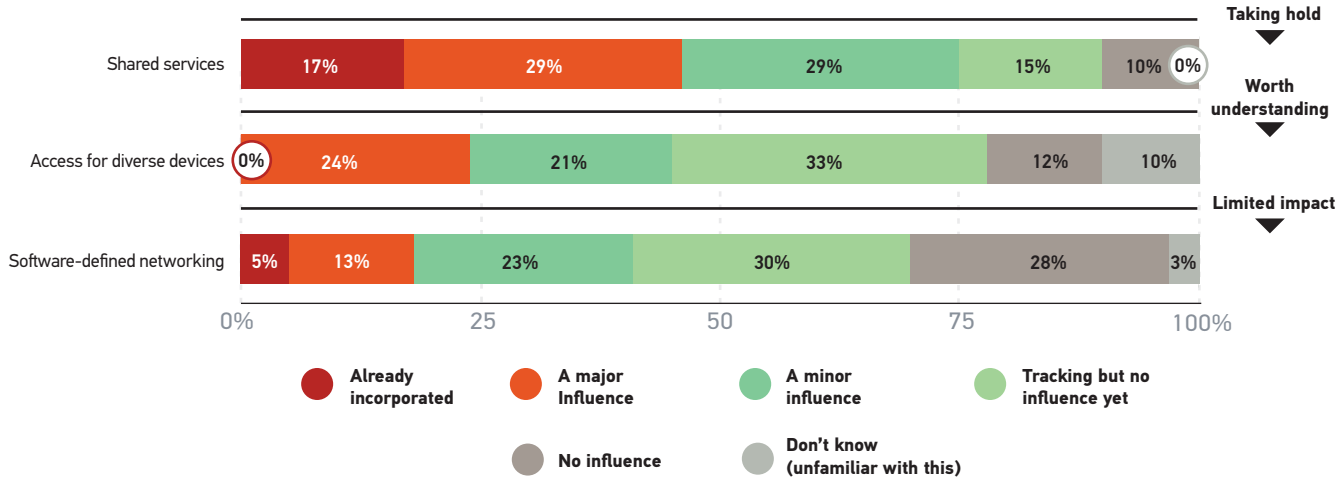

Figure 5. Trends and their influence on IT strategy: 8,000–14,999 FTEs

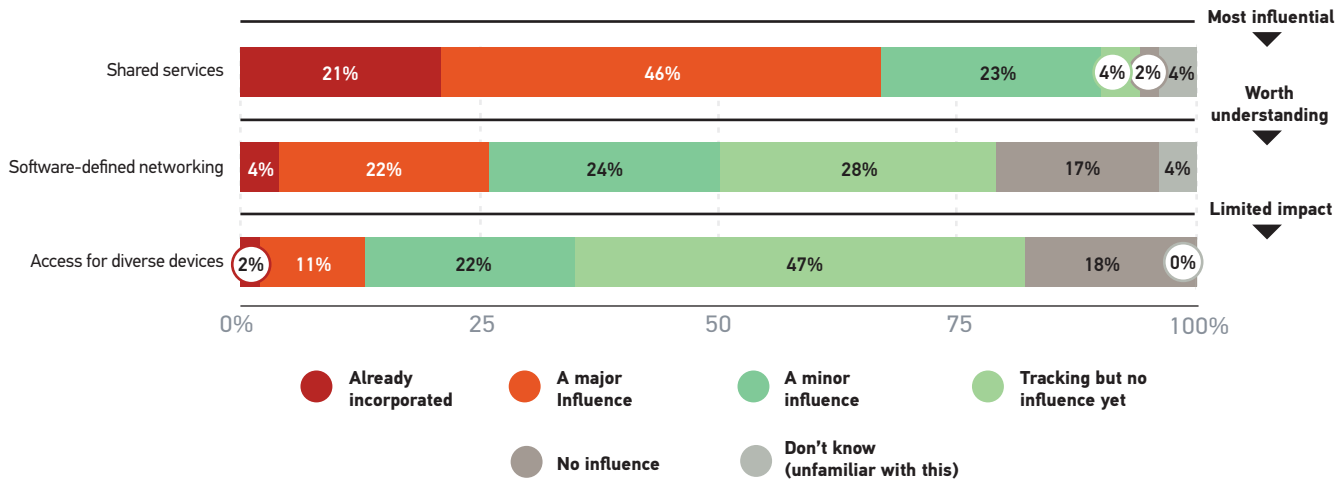

Figure 6. Trends and their influence on IT strategy: 15,000+ FTEs

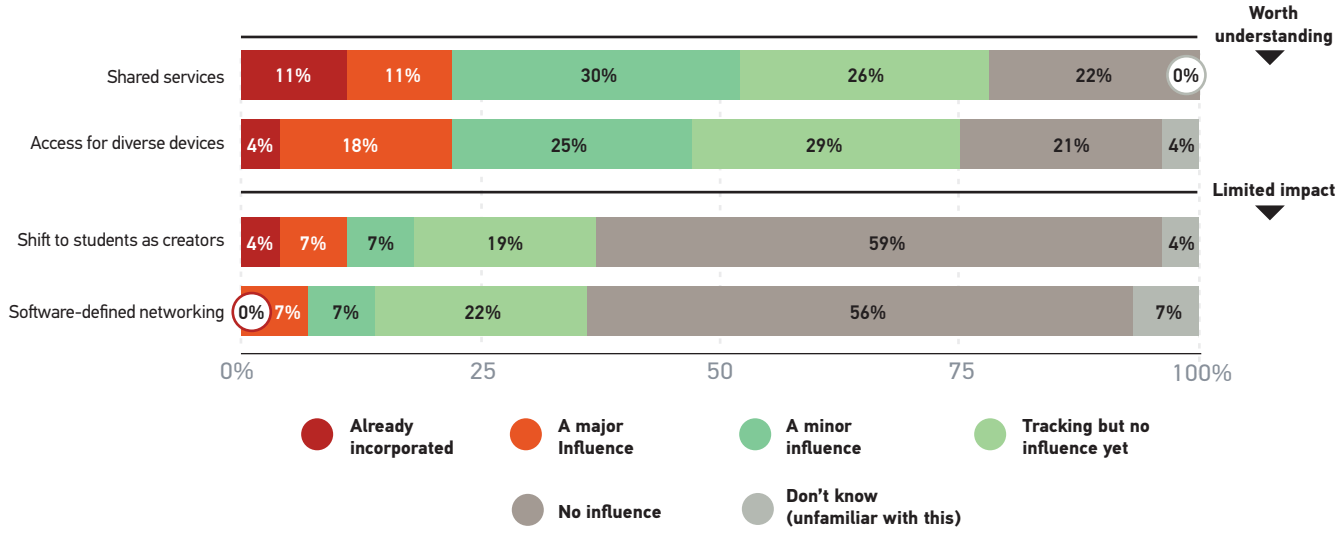

Figure 7. Trends and their influence on IT strategy: AA

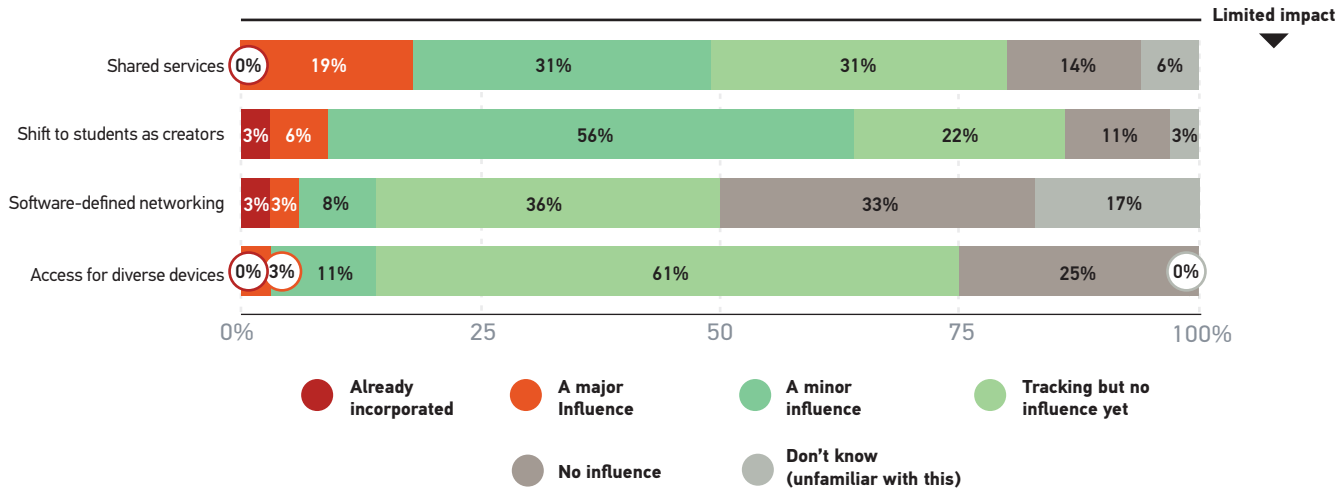

Figure 8. Trends and their influence on IT strategy: BA

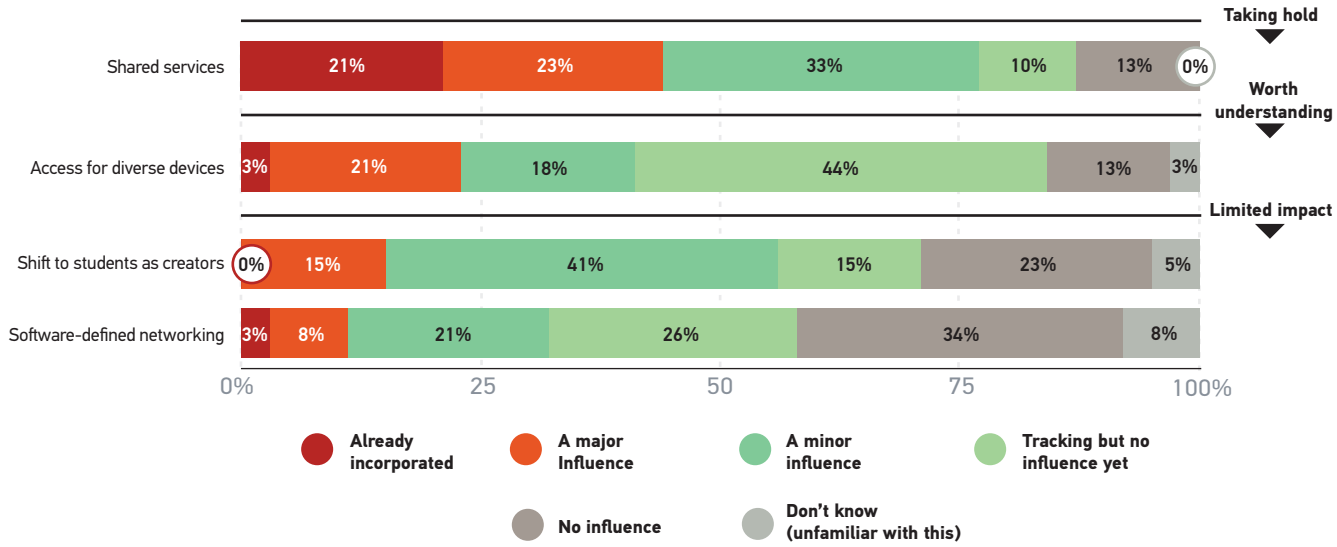

Figure 9. Trends and their influence on IT strategy: Public MA

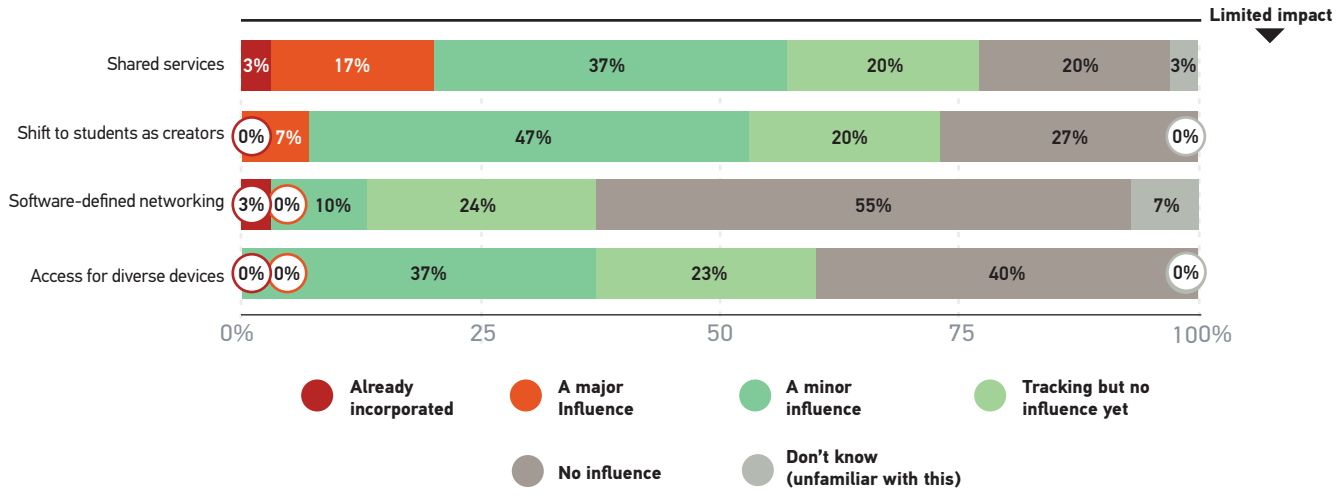

Figure 10. Trends and their influence on IT strategy: Private MA

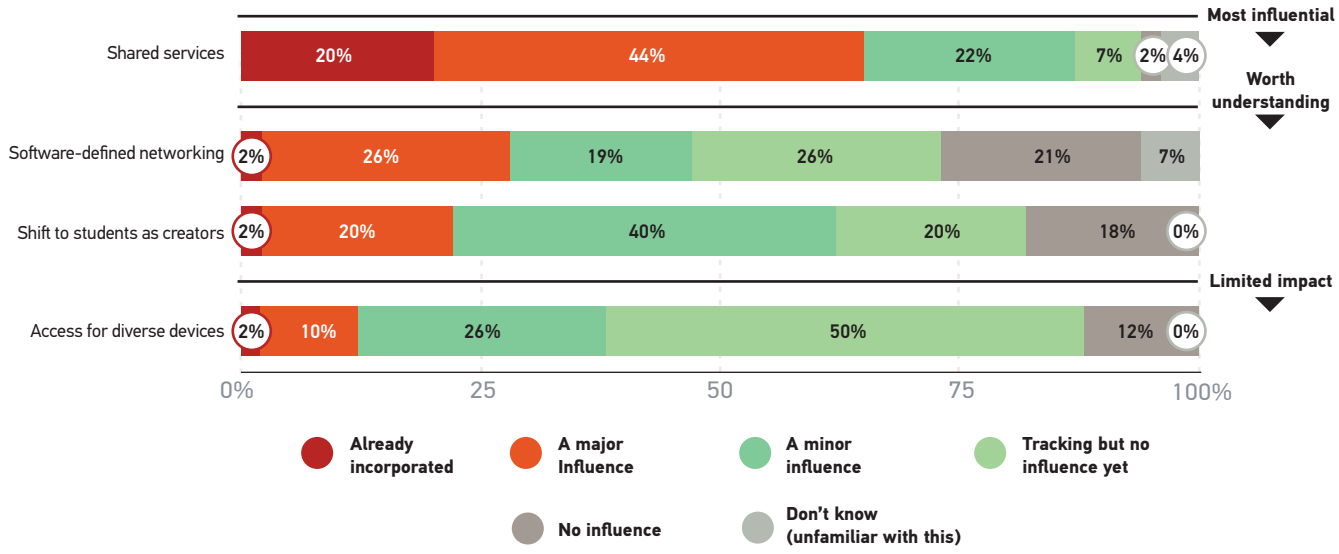

Figure 11. Trends and their influence on IT strategy: Public DR

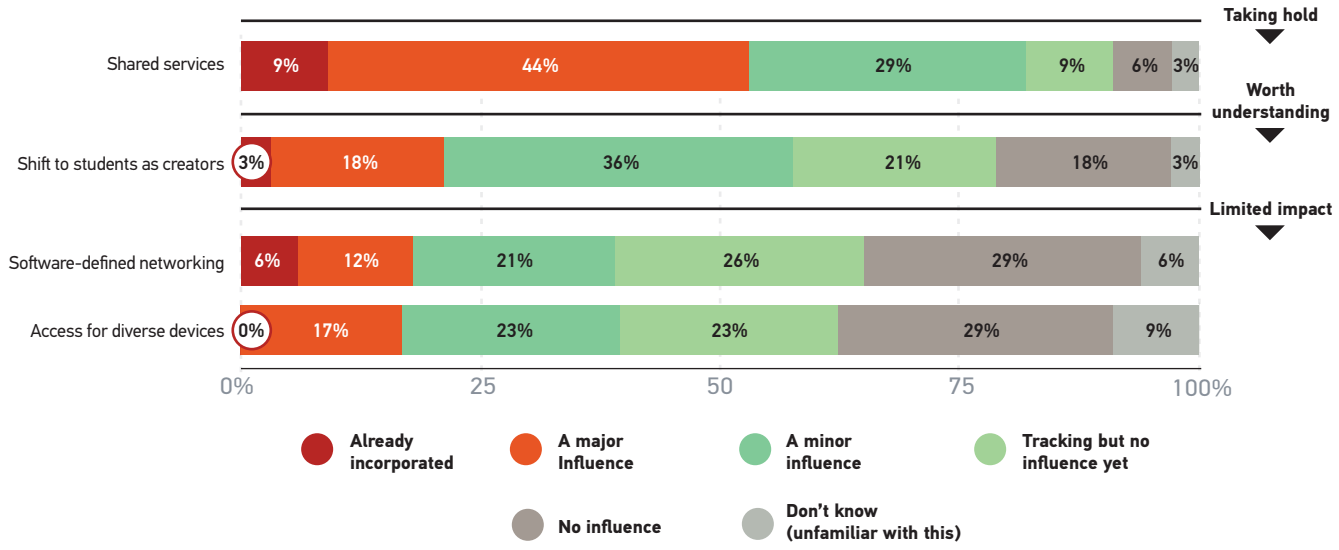

Figure 12. Trends and their influence on IT strategy: Private DR

Access to diverse devices is most strongly influencing AA and public MA institutions and institutions with 4,000–15,000 FTEs. Smaller and larger institutions are less influenced, as are BA and private MA institutions.

The *NMC Horizon Report > 2014 Higher Education Edition*[1] identified the shift from students as consumers to students as creators as a Mid-Range Trend that will be driving changes in higher education within three to five years. It is currently having little impact. Community colleges are least likely to be influenced by this trend.

Pace of Technology Adoption as a Differentiator

An institution's approach to technology adoption has the most widespread influence on trends. Some institutions adopt technology early, some late, and some in the mainstream. This range of approaches to technology adoption is found in all kinds of institutions, large and small, public and private, community college or doctoral university (see figures 13 and 14).

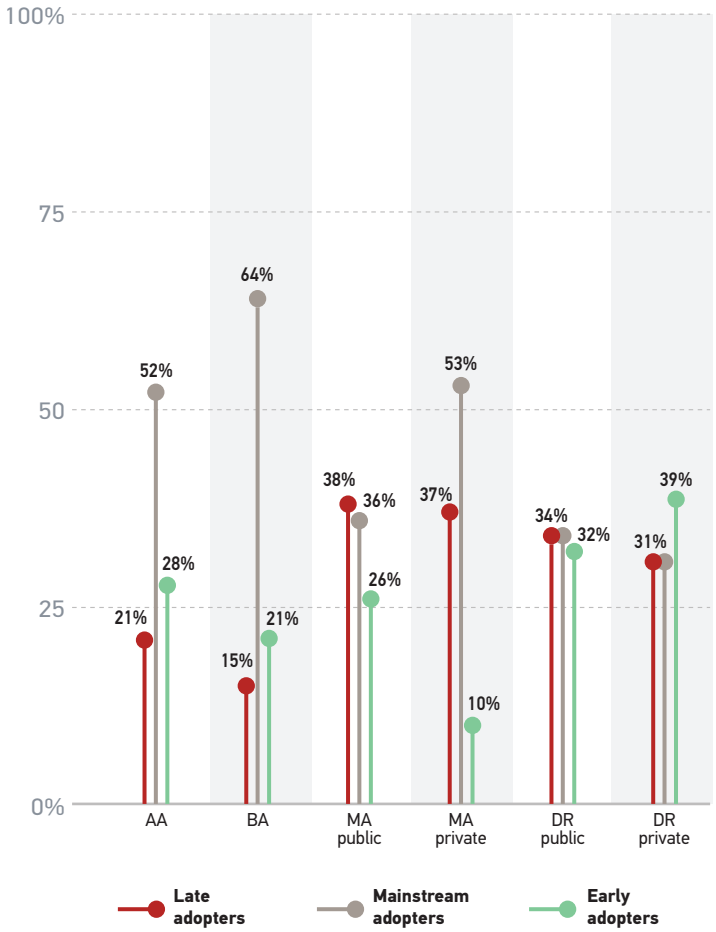

Figure 13. Approach to technology, by institutional type

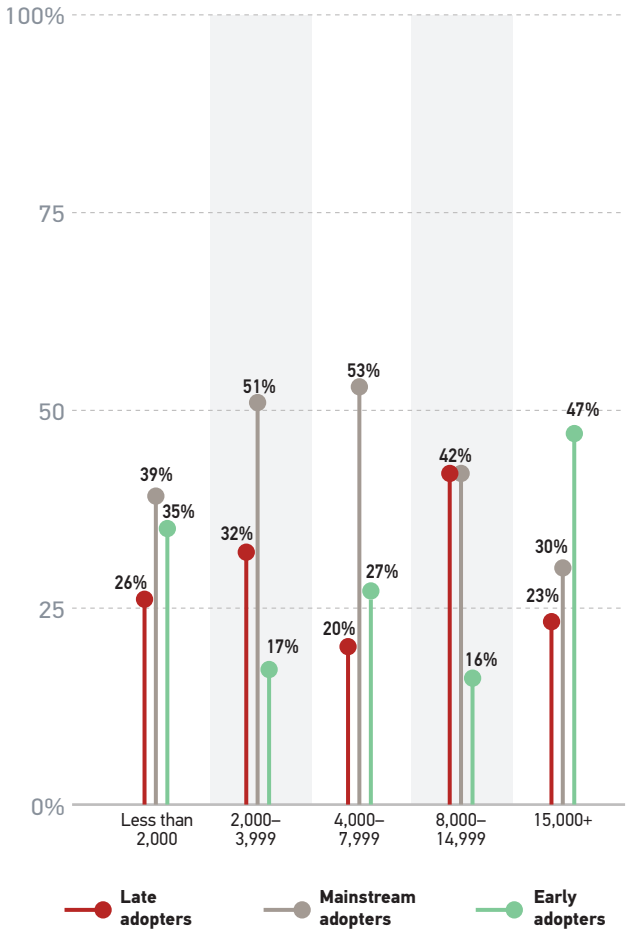

Figure 14. Approach to technology, by institutional size

The influence of 12 of the 15 trends varies based on whether an institution is an early adopter (31% of institutions), a mainstream adopter (40% of institutions), or a late adopter (29% of institutions); see figure 15.

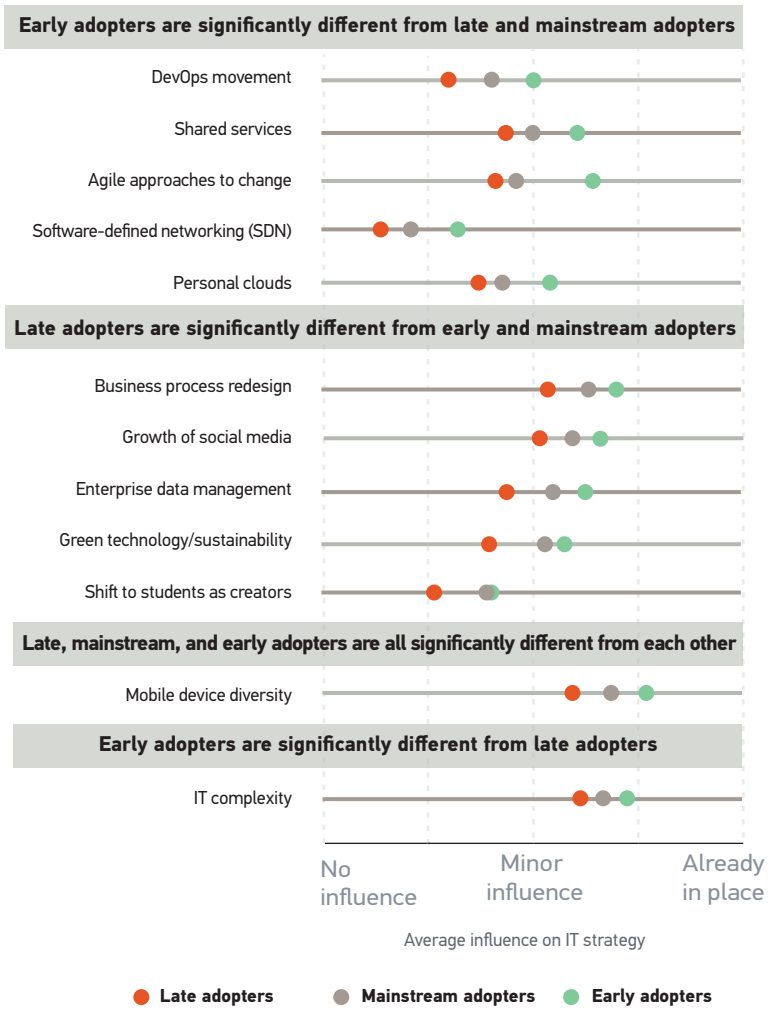

Figure 15. Influence of approach to technology adoption on IT trends

In the case of some trends, early adopters are significantly more influenced than mainstream or late adopters:

- DevOps movement
- Shared services
- Agile approaches to change
- SDN
- Personal clouds

In other cases, late adopters are significantly *less* influenced by particular trends than mainstream or early adopters:

- Business process redesign
- Growth of social media
- Enterprise data management
- Green technology
- Shift to students as creators

Mobile device diversity differs significantly across all three groups: 81% of early adopters, 71% of mainstream adopters, and only slightly more than half (56%) of late adopters have already incorporated mobile device diversity into their IT strategy or report that it is exerting a major influence.

With IT complexity, which is the most influential trend overall, early adopters are significantly more influenced (81% have already incorporated it into or view it as a major influence on their IT strategy) than late adopters (69%). Mainstream adopters (74%) are not clearly differentiated from either group, however.

Among early adopters, mobile device diversity, IT complexity, migration to the cloud, business process redesign, enterprise data management, agile approaches to change, and growth of social media were all most influential (see figure 16). One trend, access for diverse devices, had limited impact. Four trends were most influential for mainstream adopters (IT complexity, mobile device diversity, migration to the cloud, and business process redesign), and four had limited impact (reduced reliance on service desk, shift to students as creators, access for diverse devices, and software-defined networking; see figure 17). For late adopters, only IT complexity was most influential, and the four trends with limited impact were the same four trends that had limited impact among mainstream adopters (see figure 18).

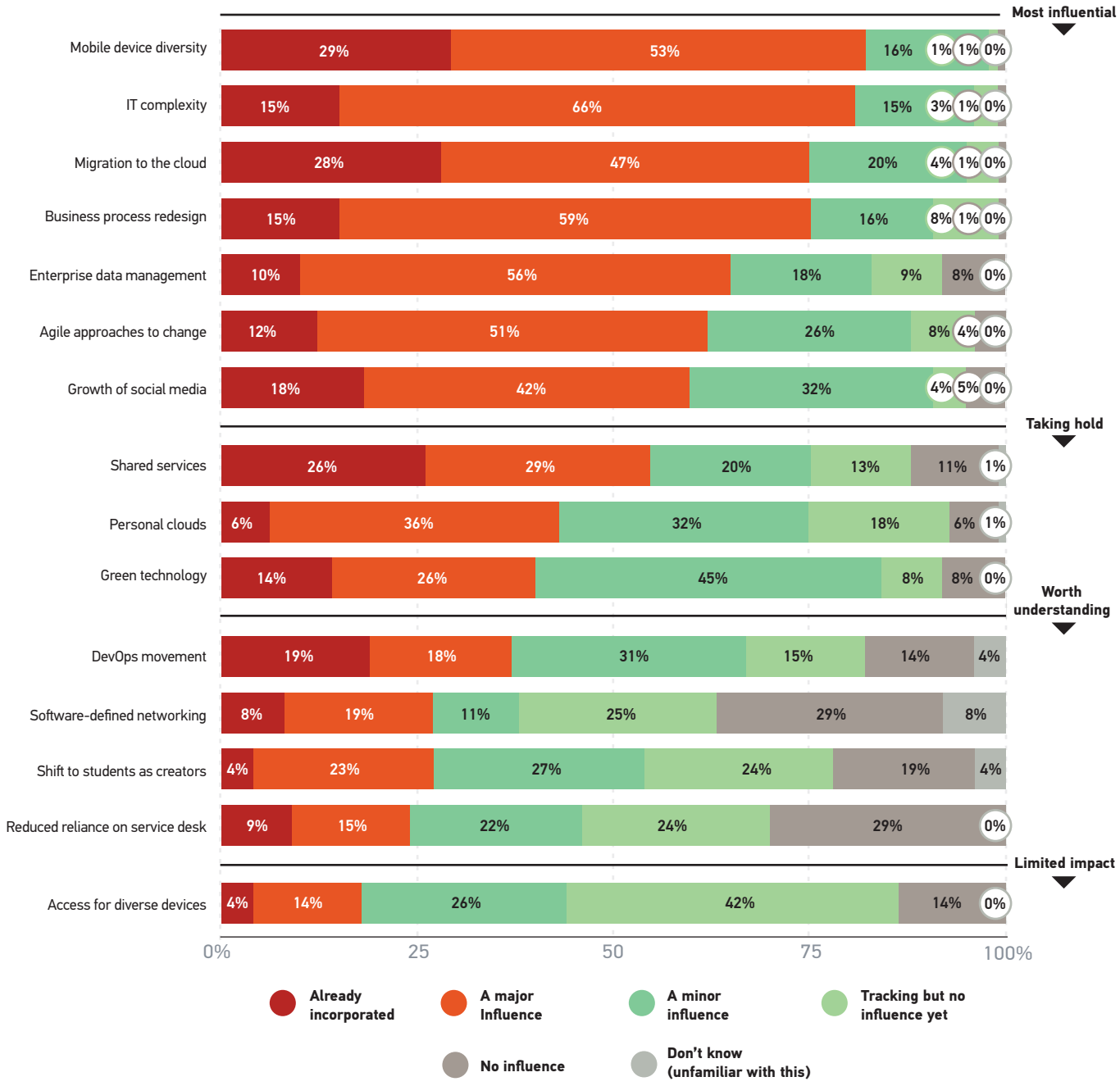

Figure 16. Trends and their influence on IT strategy: Early adopters

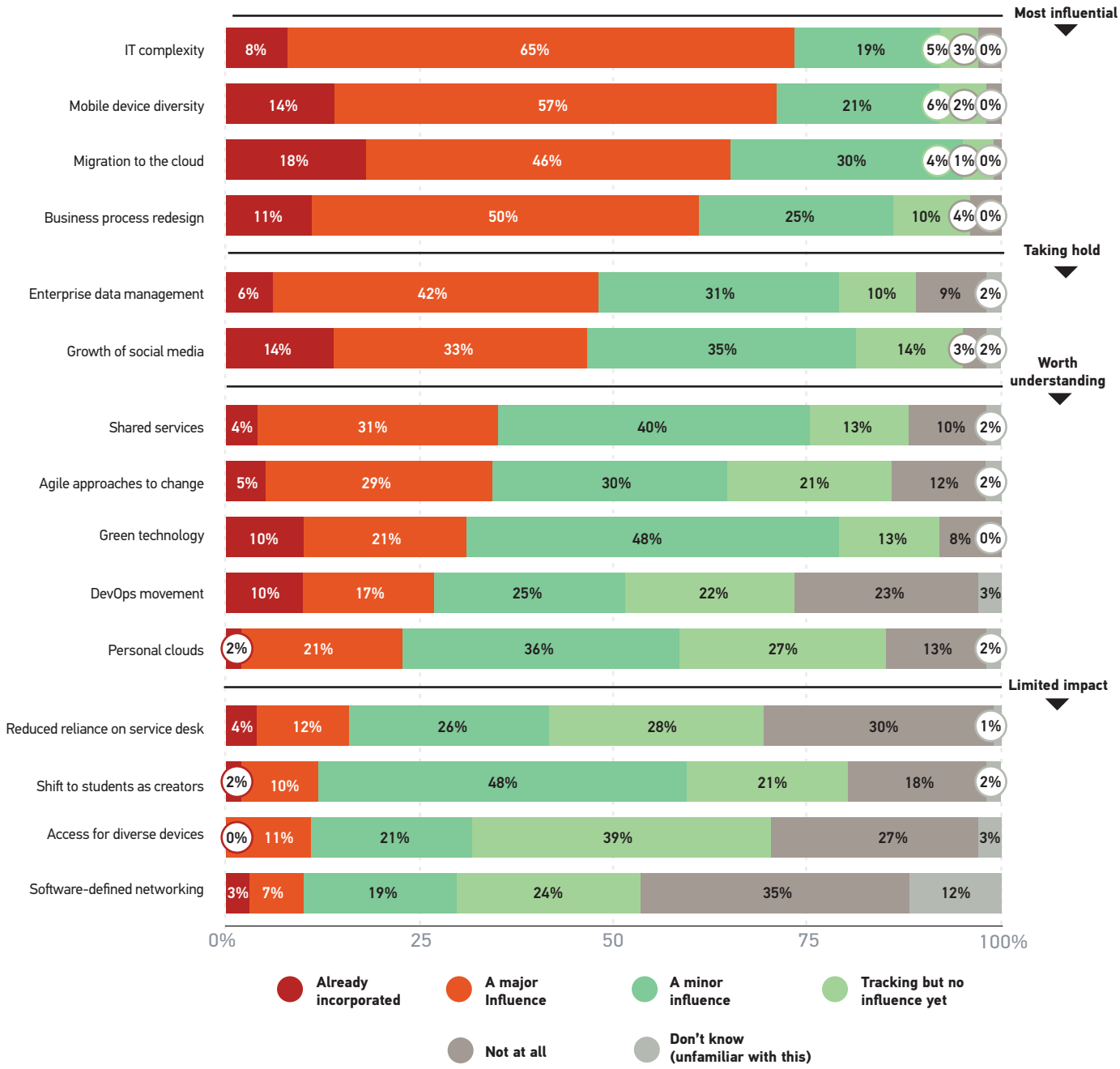

Figure 17. Trends and their influence on IT strategy: Mainstream adopters

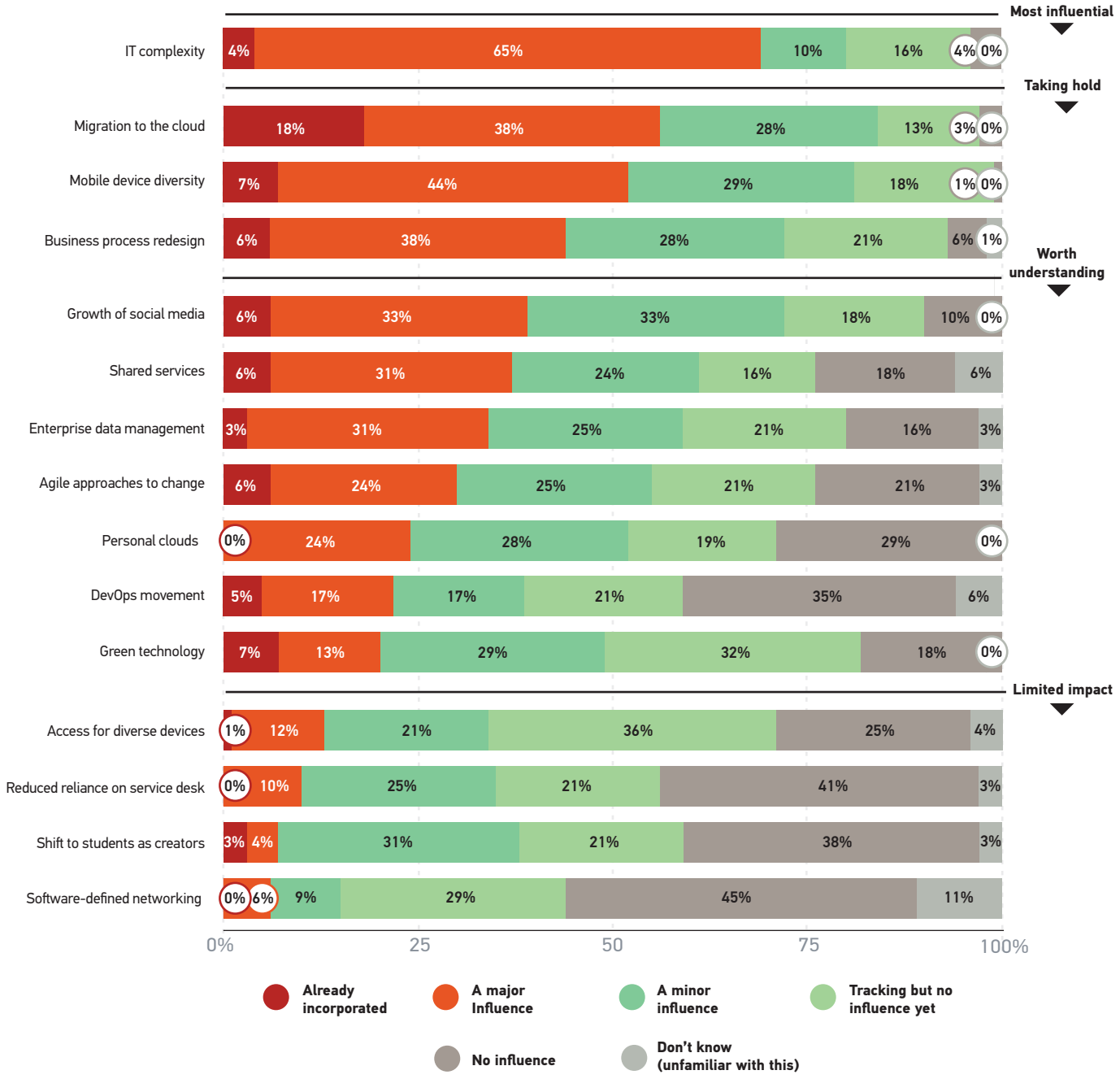

Figure 18. Trends and their influence on IT strategy: Late adopters

Advice

Institutions should consider these strategies for addressing the 15 trends.

Strategies for Analytics Trends

Access for diverse devices

- Recognize that this trend is foundational to preparing to support the Internet of Things, which offers the prospect of new data sources for analytics and innovations in automation.
- Address diversity of data and devices as part of existing data governance structures and security policies, or develop governance and security strategies that include issues raised by the increased volume of data and diversity of endpoints.
- Plan for adjustments to both infrastructure and support to address growing device use. Consider cloud services for at least a partial solution if on-premises infrastructure is inadequate. Develop self-support services to relieve pressure on the service desk.
- Consider the possibilities of DevOps as a way to automate requests for access.
- Explore SDN as a way to separate traffic for specific types of data or devices from the campus network.

Enterprise data management

- Develop data governance structures that address access and ownership issues, data definitions, security, and compliance. Include representation from across the enterprise.
- Develop a data-classification scheme based on the level of the data's sensitivity and on the data's value and criticality to the institution; at a minimum, the scheme should apply to all enterprise data.
- Improve data security awareness by educating end users about the data classification scheme and building policies around storage requirements for different classifications of data.
- Consider using an enterprise data warehouse as a common repository for core data sets from a variety of internal sources, and explore the possibility of incorporating other types of data through frameworks such as Hadoop.
- Examine staffing roles to determine whether new responsibilities may be required, with perhaps a greater emphasis on data integration and data analysis.

Strategies for Consumerization Trends

Growth of social media

- Educate end users about personal and institutional privacy issues.
- Work with faculty to help them incorporate social media into their teaching and learning efforts, while also taking data security and privacy into consideration.
- Advocate for the development of campus communication strategies that include social media characteristics such as immediacy, usability, and reach.

Personal clouds

- Develop policies for the storage and retrieval of institutional data that include considerations of security, compliance, and preservation.
- Provide training and other resources in the areas of data classification, data storage, and data ownership.
- Be sure institutional methods for storing data are easy enough that end users will not try to circumvent official storage means.

Mobile device diversity

- Consider moving toward a mobile-first development strategy to ensure access via mobile devices.
- Ensure that network infrastructure and bandwidth are sufficient for the sharply climbing number of devices being brought to campus.
- Augment IT staff with students to help support mobile devices, taking advantage of their broad use of diverse devices.
- Develop policies to address security risks related to loss, intrusion, and data access that balance agility and openness with risk management.
- Educate end users about their responsibilities regarding exposure to personal and institutional financial information.

Shift to students as creators

- Consider creating "makerspaces" where students and faculty can work on projects, collaborate, and build, using a wide range of materials and technologies.[2]
- Build alliances with campus leadership, faculty, students, and staff to help the institution understand the importance of developing strategies to address this trend.
- Design flexibility into teaching spaces so they can be used for a variety of purposes and repurposed as needs change.

Strategies for Efficiency Trends

Agile approaches to change

- Accept that change is inevitable, and build flexibility into projects and planning efforts.
- Encourage collaboration and communication across silos, and help IT staff and end users understand each other's concerns and needs.
- Consider frequent, short meetings in which changes are accepted and discussed.
- Identify appropriate circumstances for using agile techniques and incorporate them accordingly.
- Keep the user community aware of projects and initiatives through regular communications that highlight agility.
- Develop policies that support staff, faculty, and student work that is in line with institutional efforts in innovation and entrepreneurship.

Business process redesign

- Collaborate with business units to examine business processes for potential streamlining of activities and increasing efficiency of systems and services.
- Use upgrades and new implementations as a time to examine business processes.
- Recognize that standardization is of little value if it doesn't greatly reduce the proliferation of redundant applications or the need to customize applications.
- When considering customizations, determine whether they will provide additional institutional value. Avoid customizations that do not add value to institutional goals or mission.
- Work with end users to help them understand the long-term costs of maintaining customizations.
- Involve end users from across the enterprise to increase buy-in and acceptance and to spread information about the business process redesign work.

DevOps movement

- Because DevOps does not yet have a standard definition, agree on an institutional definition before beginning an initiative.
- Encourage communication and collaboration between development and operations staff from the beginning of the project.
- Consider an initial project that could benefit from automation and consistency, one where end users could more quickly and easily get their work done if some repetitive activities were standardized and automated.
- Set aside staff time for innovation related to DevOps to provide opportunities for staff to gain experience and confidence in DevOps ideas and techniques.

Green technology

- Work with other campus leaders to develop institutional sustainability goals, and then develop technology goals that fit within those larger goals.
- Raise awareness of personal computing best practices through regular campus communication channels.
- Purchase equipment and products designed for energy efficiency.
- Conduct a data center energy audit and address issues that are uncovered.

IT complexity

- Develop expertise in service management as a way to organize IT work and priorities, and consider a long-term strategy focused on the delivery of services rather than the delivery of technologies.
- Adopt a comprehensive enterprise architecture approach to contain and manage technical and business process complexity.
- Consider cloud sourcing to reduce IT staff resources required to maintain technologies; redistribute those resources to other areas.
- Develop professional development plans that help IT staff members keep their skills current. Encouraging innovation and entrepreneurship among IT staff can also help them maintain their skills.
- Keep informed about emerging trends such as DevOps that have the potential to streamline IT activities.

Migration to the cloud

- Develop objectives for migration to the cloud to guide decision making and track progress.
- Establish institutional IT governance processes to ensure the institution is at least aware of which applications, data, and infrastructure are moving outside the institution.
- Develop a sourcing strategy that considers cloud options for new institutional services.
- Consider a vendor's future cloud options, even if initial implementations will be run on premises, in order to create a path for future cloud use.
- Develop and apply rigorous data classification and security standards. Involve institutional legal counsel and procurement services in all cloud service agreements.
- Keep in mind that integration with existing on-premises services and other cloud services may be necessary, requiring staff skilled in data integration.
- Develop staff expertise in contracts and vendor management. Strengthen ties with the institutional procurement organization to tap into their expertise, help them understand the implications of their work for IT, and achieve an institution-wide approach.

Reduced reliance on service desk

- Build out self-support tools that can range from simple knowledge bases to tools that let users help themselves, such as through password resets or applications that provide administrative access.
- Analyze service desk usage statistics and use the data to shore up areas of heavy activity while decreasing efforts in others.
- Develop service desk expertise in areas specific to institutional need, such as specialized, advanced application training
- Train student workers to provide support for mobile devices.
- Consider outsourcing the service desk during nonbusiness hours to meet online teaching and learning needs.

Shared services

- Focus efforts on the delivery of a service rather than a particular technology.
- Negotiate service level agreements (SLAs) to ensure service expectations are understood and achievable.
- Make use of existing consortial or system relationships.
- Develop change management practices that include representation from across the organization and engage institutional leaders at a high level.
- Develop shared governance and oversight.
- Create communication plans that include all affected areas within or across the organization, and help end users understand the goals of the shared services effort.

Software-defined networking

- Clearly define the vision for an institutional SDN initiative and the expected benefits.
- Start with a small initiative that helps build staff expertise and knowledge before moving on to a large-scale implementation.
- Evaluate vendor offerings carefully. Because SDN implementations are so variable, a careful evaluation of institutional needs as well as the key drivers for SDN is key to successful vendor selection.

General Advice and Conclusions

Determine which of these trends is most important to your institutional strategy. Many institutions don't have sufficient resources or mindshare to adopt them all, nor do they need to. Is efficiency most important? Consumerization? Analytics? Start with the trends that will advance your strategy.

Recognize that these trends are interconnected.

If your institution has favored a slower approach to technology adoption, now may be the time to consider a change. Many trends and technologies are moving from emergent to widespread adoption. Institutions that can move at a faster pace are able to increase the efficiency of IT and business processes and make room for more affordable and nimble innovation. These benefits contribute directly to institutional strategy at a time when higher education needs to reduce its costs to students, improve their rates and pace of success, and adopt digital innovations that instructors, researchers, and scholars need to advance their work and careers.

If you are having trouble making the case for a faster pace or new approaches, various EDUCAUSE resources can help in several ways:

- Helping institutional leadership understand technology's value and implications
  - Executive briefs developed specifically to help presidents, provosts, and other institutional leaders understand the strategic significance of specific IT-related areas[3]
  - The 2015 Top 10 IT Issues resources[4] and Strategic Technologies[5] report that make the case for change
- Benchmarking and improving your progress
  - The EDUCAUSE Core Data Service[6] enables institutions to compare their progress to that of current and aspirational peers, as well as identify role-model institutions to learn from.
  - EDUCAUSE Maturity Indices help institutions understand dimensions underlying success with analytics,[7] e-learning,[8] research computing,[9] information security,[10] and student planning and advising services[11] and enable them to measure existing capabilities and determine what's needed to advance.
- Networking and collaborating with peers
  - Make use of EDUCAUSE constituent groups to get insight from others on strategies they have used for adopting a faster pace.[12]
  - Attend conferences to network with others and learn about their approaches.
  - Participate in EDUCAUSE working groups to collaborate with peers on solutions to technical and management challenges.[13]

IT complexity, the trend with the widest influence on higher education, is a major challenge. Complex and unmanaged IT environments add both cost and risk to colleges and universities. Instead of being able to use IT to advance institutional strategy and improve innovation, IT organizations and their constituents—due to the complexity in IT—must focus on fixing problems; managing redundant systems, processes, and data; and responding to breaches. Instead of advising institutional leaders on IT's potential contributions to institutional strategy, CIOs' leadership conversations devolve into how to fix broken infrastructure. Unless higher education can tame the complexity in IT, technology will fail to achieve its highest benefits to increase efficiency, reduce costs, improve educational outcomes, and advance research and scholarship. Technology offers a path through higher education's near- and long-term challenges, if we can apply it carefully. The efficiency trends that inform many institutions' IT strategies can contain and reduce IT complexity. Until we shore up IT's foundations, institutional IT and higher education itself will fail to make the progress we need to make in this critical period.

Notes

1. L. Johnson, S. Adams Becker, V. Estrada, and A. Freeman, *NMC Horizon Report > 2014 Higher Education Edition* (Austin: The New Media Consortium, 2014).
2. *7 Things You Should Know about Makerspaces*, ELI, April 9, 2013.
3. See "Resources for Presidents and Senior Executives."
4. Susan Grajek and the 2014–2015 EDUCAUSE IT Issues Panel, "Top 10 IT Issues, 2015: Inflection Point," *EDUCAUSE Review*, January 12, 2015.
5. Susan Grajek, *Higher Education's Top 10 Strategic Technologies for 2015*, research report (Louisville, CO: ECAR, January 2015).
6. See the EDUCAUSE Core Data Service website.
7. See the Analytics Maturity Index.
8. See the E-Learning Maturity Index.
9. See the Research Computing Maturity Index.
10. Available as part of the EDUCAUSE Core Data Service.
11. Ibid.
12. See the EDUCAUSE Constituent and Discussion Groups website.
13. See the ECAR Working Groups website.