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Methodology and Participant Demographics

All models are wrong, but some are useful.

—G. E. P. Box

The ECAR IT security study used a multifaceted research methodology to gather both quantitative and qualitative data from 435 higher education institutions (414 U.S. institutions and 21 Canadian). We believe this is the single most comprehensive gathering ever of IT security information in higher education. The data provide a view of one segment of higher education's collective experience with IT security as well as in-depth institution-specific perspectives. Note that some tables presented in this study will have fewer than 435 respondents; we adjusted these tables for missing information.

Research Approach

We undertook five data collection and analytical initiatives: a literature review, consultation with a select group of IT security leaders in higher education, a quantitative Web-based survey, qualitative telephone interviews, and four in-depth case studies.

The literature review helped identify and clarify issues and create a working set of hypotheses to be tested. However, the extant work focusing primarily on higher education and IT security is minimal. The vast majority of the electronic magazine literature focuses on business. Books and articles in professional journals analyze available technologies. Exceptions are the publications of

EDUCAUSE and the *Chronicle of Higher Education*. The federal government's publications and the professional organizations place great emphasis on planning, policies, preparedness, and awareness.

We paid particular attention to IT security surveys undertaken by the various security magazines, often with the assistance of consulting firms. When appropriate, we included questions that mirrored those in these surveys, which enables a limited but useful comparison of higher education with other sectors of the economy.

Because security technologies and practices are undergoing such rapid change, probably the best information available is on the Web. We include a short bibliography (Appendix D) listing the Web sites we used and found helpful. This bibliography is not intended to be comprehensive.

Consulting with IT security leaders in higher education helped us identify and validate the most interesting research questions and hypotheses that would frame the construction of a quantitative survey instrument. Richard Katz's foreword to this study acknowledges their participation. On the basis of these discussions and the literature review, a research framework was finalized in February 2003, allowing development of the online survey to begin.

ECAR fellows and staff and John Voloudakis of Cap Gemini Ernst & Young designed a quantitative Web-based survey. EDUCAUSE staff sent an e-mail invitation with the survey's Web address and access code information to 1,473 EDUCAUSE member institutions. Senior college and university administrators, most of them CIOs and other IT leaders, from 435 institutions responded to the survey. Their responses provide a detailed understanding of how higher education approaches IT security. The survey questions appear on the ECAR Web site, <http://survey.educause.edu/survey/it-security_preview.html>. Appendix B lists institutions that responded to the survey. We note that the information collected is confidential. We present no quantitative survey data that would make it possible to identify a particular institution or respondent, and the data files used for analysis were purged of any data that would have similar consequences.

Qualitative telephone interviews with 42 information technology executives, managers, and faculty members at 18 institutions provided in-depth information on key IT security issues (see Appendix A for names of participating individuals). We selected interviewees on the basis of peer nomination. In addition, we chose institutions that had responded to the core survey as follows:

- ◆ They characterized their IT security program as highly successful.
- ◆ They agreed or strongly agreed that their institution had gone beyond federal and state government recommendations for IT security.
- ◆ They agreed or strongly agreed that their institution had provided needed resources to address IT security issues.
- ◆ They had had a significant incident reported in the press.

- ◆ They had formal institutional IT security policies in place at their institution.
- ◆ They had at least one full-time central IT security staff member.

The institutions chosen were

- ◆ Austin Community College
- ◆ Embry-Riddle Aeronautical University
- ◆ Emory University
- ◆ Florida Memorial College
- ◆ Georgia State University
- ◆ Humboldt State University
- ◆ Maricopa Community Colleges
- ◆ North Dakota University System
- ◆ Pace University
- ◆ Portland State University
- ◆ South Dakota State University
- ◆ University of California, Irvine
- ◆ University of Chicago
- ◆ University of Michigan—Ann Arbor
- ◆ University of Notre Dame
- ◆ University of Wisconsin—Madison
- ◆ Westminster College
- ◆ Yale University

All subject institutions are EDUCAUSE members. To obtain adequate depth and breadth of practice, we chose institutions that varied in size and mission, and included both public and private institutions.

We conducted four in-depth case studies. The first three focused on single institutions: the Massachusetts Institute of Technology, Indiana University, and the University of Washington. All three have deployed exemplary security systems from which others may learn effective practices. The fourth case study examines management procedures for press-reported security incidents at the Georgia Institute of Technology, the University of Montana, and The University of Texas at Austin. These case studies are designed to complement the core study and will be published separately.

We did not include the following topics in this study because they are important and large enough to warrant separate study:

- ◆ business continuity or disaster recovery,
- ◆ physical security,
- ◆ legal and ethical issues (such as copyright violations, pornography),
- ◆ legislative mandates (for example, FERPA, HIPAA, TEACH Act),
- ◆ specific technologies by vendor,
- ◆ software licensing,
- ◆ confidentiality, and
- ◆ privacy.

Carnegie Class As a Distinguishing Factor

The study grouped the sample by a modified Carnegie Classification of Institutions of Higher Education.¹ The Carnegie taxonomy describes the institutional diversity in U.S. higher education. Most higher education projects rely on the classification to ensure a representative selection of participating individuals and institutions. We also believe that security strategies will differ by Carnegie class because missions, academic culture, and size vary significantly for each Carnegie group.

The study collapsed the categories as follows to obtain larger numbers for statistical and descriptive purposes:

- ◆ Doctoral/research universities—extensive (Dr. Ext.) typically offer a wide range of baccalaureate programs and graduate education through the doctorate. They award 50 or more doctoral degrees per year in at least 15 disciplines.
- ◆ Doctoral/research universities—intensive (Dr. Int.) typically offer a wide range of baccalaureate programs and graduate education through the doctorate. They award at least 10 doctoral degrees per

year in three or more disciplines, or at least 20 doctoral degrees per year overall.

- ◆ Master's colleges and universities (MA) typically offer a wide range of baccalaureate programs and graduate education through the master's degree. The study grouped both Master's Colleges and Universities I and Master II together.
- ◆ Baccalaureate colleges (BA) are primarily undergraduate colleges with major emphasis on baccalaureate programs. The study grouped the three baccalaureate college groups into a single BA group.
- ◆ Associate's colleges (AA) offer associate's degrees and certificate programs but, with few exceptions, award no baccalaureate degrees.
- ◆ Specialized institutions (Specialized) offer degrees ranging from the bachelor's to the doctorate and typically award most degrees in a single field. Specialized institutions include theological seminaries and other specialized faith-related institutions; medical schools; medical and other separate health professions; schools of engineering and technology; schools of business and management; schools of art, music, and design; schools of law; and teachers colleges. The data presented for these schools must be interpreted in light of the enormous diversity of institutions within this category.

We also provide data, where appropriate, on higher education system offices and for the 21 Canadian institutions in our study, recognizing that they vary by size and mission. We elaborate on differences between public and private institutions. Forty-three percent of the institutions in our study are private; 57 percent are public. We found little difference, however, along this dimension.

Institutions Surveyed and Their Characteristics

Figure 3-1 compares the distribution of the institutions that responded by their new Carnegie class, EDUCAUSE membership, and the universe of higher education institutions in the United States. The responding schools much more closely mirror the EDUCAUSE membership than they do the national population of institutions by Carnegie class.² We have strong participation from doctoral-extensive institutions (52 percent) and doctoral-intensive institutions (30 percent), but the survey is weaker in terms of the other Carnegie classifications. We found that for IT security, however, the number of devices on the network rather than Carnegie class often proved a more significant differentiator.

Note also that the study relied on volunteers to complete the survey rather than on a random sample, and this limits the statistical conclusions that are possible. Nevertheless, the overall 30 percent response rate from EDUCAUSE member institutions gives us

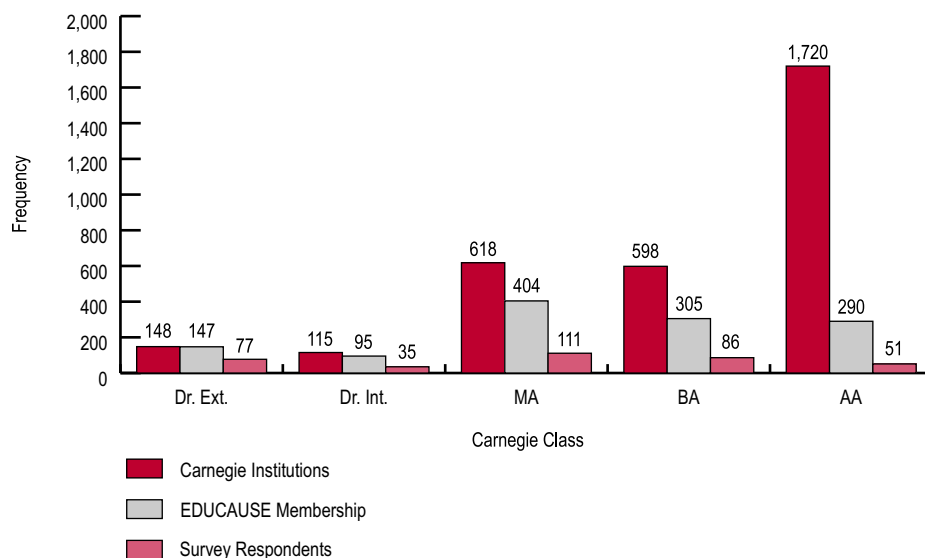
confidence that the study's respondents portray a reasonable image of the EDUCAUSE membership, especially for doctoral and master's institutions.

A statistical analysis of the data's representativeness proved inconclusive. The findings do not support the conclusion that the institutions surveyed represent the population as a whole. Nor do they support the opposite conclusion that the respondents fail to represent the EDUCAUSE membership. Neither conclusion is statistically significant.

Institution Size: Number of Students, Network Users, and Devices

IT security literature on the business sector uses size as a significant variable that explains, in part, how much corporations are willing to spend on security. The larger the corporation and the greater the number of users, the lower the per-capita expenditure on security. Does size make a difference in higher education? We tested several hypotheses that consider the impact

Figure 3-1.
Survey Respondents by Carnegie Class and EDUCAUSE Membership



of size on various aspects of IT security by looking at the number of enrolled students, the number of users on the network, and the number of devices on the network.

The mean student enrollment of the institutions in our study was 7,169. For purposes of analysis, we've divided the institutions into six groups, as shown in Figure 3-2.

Smaller institutions dominate our study. Forty-nine percent have 4,000 or fewer enrolled students. Only 5 percent of the institutions in the study have more than

25,000 students. But that is the reality of the higher education environment.

Connected Devices, Users

Figure 3-3 shows the number of devices connected to institution networks. Sixty-one percent of the institutions in our study have 5,000 or fewer devices, and 79 percent have 10,000 or fewer. Less than 5 percent have more than 40,000 devices on their networks.

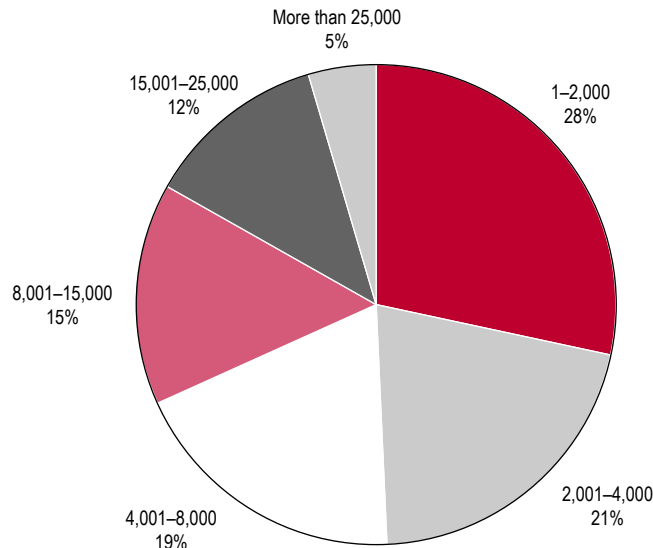


Figure 3-2.
Student
Enrollments
in Institutions
Studied

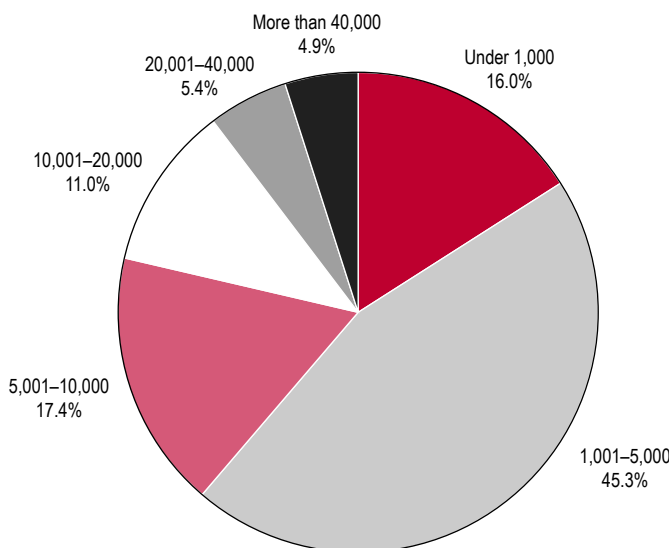


Figure 3-3.
Number of
Devices on
Institution
Networks

Much the same can be said for number of users, as Figure 3-4 shows. Sixty-one percent of the institutions have 10,000 or fewer users, and 74 percent have 20,000 or fewer. Less than 12 percent have more than 40,000 users on their networks.

Institutions with more than 10,000 devices and 20,000 users are for the most part public and, not surprisingly, doctoral institutions. We found that respondents for institutions having the most users on a network also had the most professional security experience.

The Respondents: Position and Experience

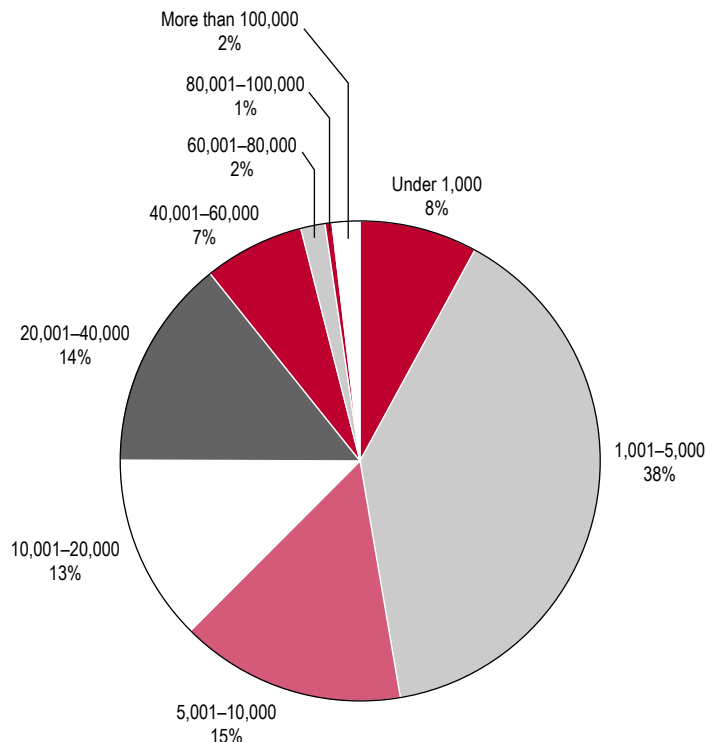
The survey was completed largely by CIOs (42 percent), chief IT security officers (12 percent), and other IT staff (38 percent) and reflects their experiences, observations, and opinions on IT security (see Figure 3-5). Academic, financial, and other administrative

officers represent 8 percent of the respondents. We emphasize that this study largely represents a CIO/IT management view of IT security moderated by other institutional leaders' observations obtained through complementary in-depth qualitative surveys and by those of the study's advisors.

Of the 180 CIOs who answered the survey, 80 percent work at master's, baccalaureate, and associate's institutions. In contrast, 63 percent of the 53 chief information security officers who completed the survey held their positions at doctoral institutions. For the doctoral-extensive institutions only, the chief information security officer was more likely than any other position to complete the survey. At all other Carnegie class institutions, the CIO most often completed the survey.

The respondents, as a whole, have extensive IT security experience (see Figure 3-6). Forty-six percent of respondents indicated

Figure 3-4.
Number of Institutional Users



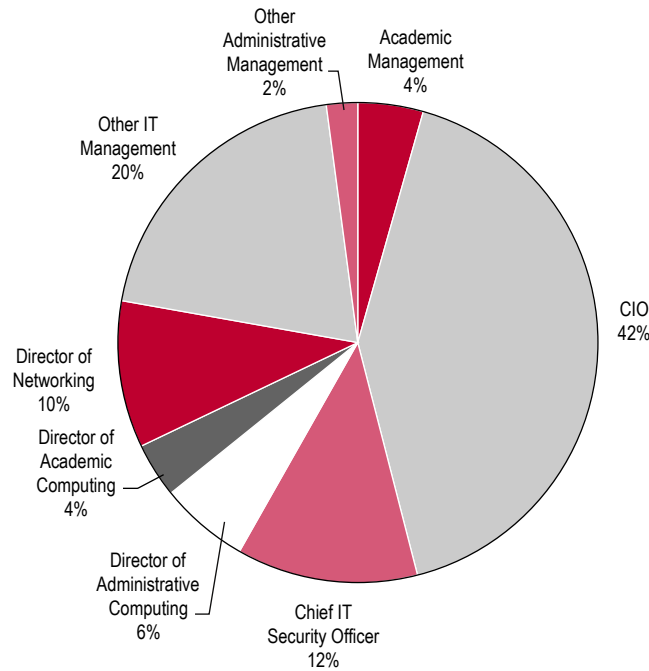


Figure 3-5.
Survey Respondents' Titles

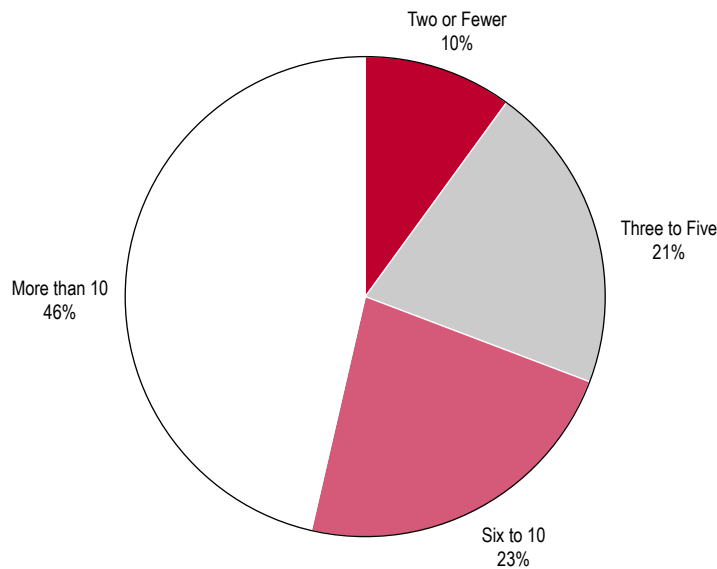


Figure 3-6.
Respondents' Years of IT Security Experience

that they had more than 10 years of IT security experience, and more than two-thirds had at least six years of experience. Less than 10 percent had two years or less IT security experience. We found no difference in these percentages between private and public institutions. To a very small degree, associate's institutions had fewer individuals with 10 years or more experience, but the

small sample size leads us to caution against generalizing from our data.

Years of IT security experience viewed by administrative position is worth noting. Sixty-one percent of the CIOs had 10 years or more of IT security experience (67 percent in Canada), and 79 percent had six years or more of experience (77 percent in Canada). Directors of administrative computing had

the most IT security experience, with 62 percent having 10 years or more and 85 percent having six years or more. Ironically, the position with the least experience was that of IT chief security officer. Thirty percent of IT security officers completing the survey had 10 years or more of experience, and 51 percent had six years or more.

Our respondents bring a great deal of experience to our study and provide a broad view of IT security from a variety of IT positions and institutions within higher education. We are gratified by the number of respondents, which makes the findings more than simply the observations of a small subset of the industry. In the chapters that follow, we present respondents' collective view of IT security in higher education. Chapter 4 provides an overview of the

security technologies in use at 435 institutions. In Chapter 5 we describe the security culture—the human side of IT security, by which we mean leadership and organization, values, and rules embodied in policies and procedures.

Endnotes

1. See <<http://www.carnegiefoundation.org/Classification/CIHE2000/defNotes/Definitions.htm>>.
2. The Carnegie Classification of Institutions of Higher Education recognizes 1,669 associate's institutions, whereas the American Association of Community Colleges (AACC) membership currently includes 1,171. The AACC numbers are based on the definition of colleges eligible for membership in the AACC constitution: colleges that award the associate degree and are regionally accredited. The Carnegie count includes career colleges and colleges accredited by the Accrediting Council for Independent Colleges and Schools.