Software Architecture

Lab. Project

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CPU Project

On a warm, sunny day in late October, Chip Puller parks his car and walks into his office at Central Pacific University. It feels good to be starting as a systems analyst, and he is looking forward to meeting the other staff.

In the office, Anna Liszt introduces herself. "We've been assigned to work as a team on a new project. Why don't I fill you in with the details, and then we can take a tour of the facilities?"

"That sounds good to me," Chip replies. "How long have you been working here?"

"About five years," answers Anna. "I started as a programmer analyst, but the last few years have been dedicated to analysis and design. I'm hoping we'll find some ways to increase our productivity," Anna continues.

"Tell me about the new project," Chip says.

"Well," Anna replies, "like so many other organizations, we have a large number of microcomputers with different software packages installed on them. From what I understand, in the 1980s there were few personal computers and a scattered collection of software. This expanded rapidly in the 1990s, and now everyone uses computers. Some faculty members use more than one computer. The current system that is used to maintain software and hardware, which was originally quite useful, is now very outdated and quite overwhelmed."

"What about the users? Who should I know? Who do you think will be important in helping us with the new system?" Chip asks.

"You'll meet everyone, but there are key people I've recently met, and I'll tell you what I've learned so you'll remember them when you meet them.

"Dot Matricks is manager of all microcomputer systems at Central Pacific. We seem to be able to work together well. She's very competent. She'd really like to be able to improve communication among users and analysts."

"It will be a pleasure to meet her," Chip speculates.

"Then there's Mike Crowe, computer maintenance expert. He really seems to be the nicest guy, but way too busy. We need to help lighten his load. The software counterpart to Mike is Cher Ware. She's a free spirit, but don't get me wrong, she knows her job," Anna says.

"She could be fun to work with," Chip muses.

"Could be," Anna agrees. "You'll meet the financial analyst, Paige Prynter, too. I haven't figured her out yet."

"Maybe I can help," Chip says.

"Last, you should—I mean, you will—meet Hy Perteks, who does a great job running the Information Center. He'd like to see us be able to integrate our life cycle activities."

"It sounds promising," Chip says. "I think I'm going to like it here."

"So the project involves more than simply performing maintenance work on the current programs," Chipsays. "Are we using a formal methodology for analyzing and designing the new system?"

"Yes," replies Anna. "We are also using Microsoft Visio to create and modify the diagrams and some simple repository information. We also have a CASE tool, Visible Analyst, to analyze and design the system. We've recently installed the products on the computer in the office."

With a few easy mouse clicks, Anna comes to a context-level data flow diagram (see Figure Fig.1).

"It's very useful to begin thinking of the system this way," Anna says as they look at the diagram on the screen.

Chip agrees, saying, "I can very easily see what you think is happening with the system. For instance, I see that the external entity Management supplies hardware and software inquiries and receives the corresponding responses in return. It shows the system within the larger organization."

"I've also drawn a preliminary E-R diagram of the system," Anna says as she brings up the entity-relationship diagram onscreen (see Figure Fig.2). "It may need modification as we learn more about the system."

"Yes, the many-to-many and one-to-many relationships are very clear when you look at this," Chip says, viewing the screen.

"There is one more view of the system," continues Anna, opening the use case diagram. "This is the preliminary use case diagram for our system (see Figure Fig.3). We are going to use it to obtain some valuable feedback from the users. The use cases are not all complete, but I can show you one of them." Anna clicks on the use case symbol, displaying the use case description in the repository shown in Figure Fig.4.

"You've got a good start here," Chip continues as he eyes the use case description. "This helps to understand the activities that take place. Let's get to work and see what needs to be done next."

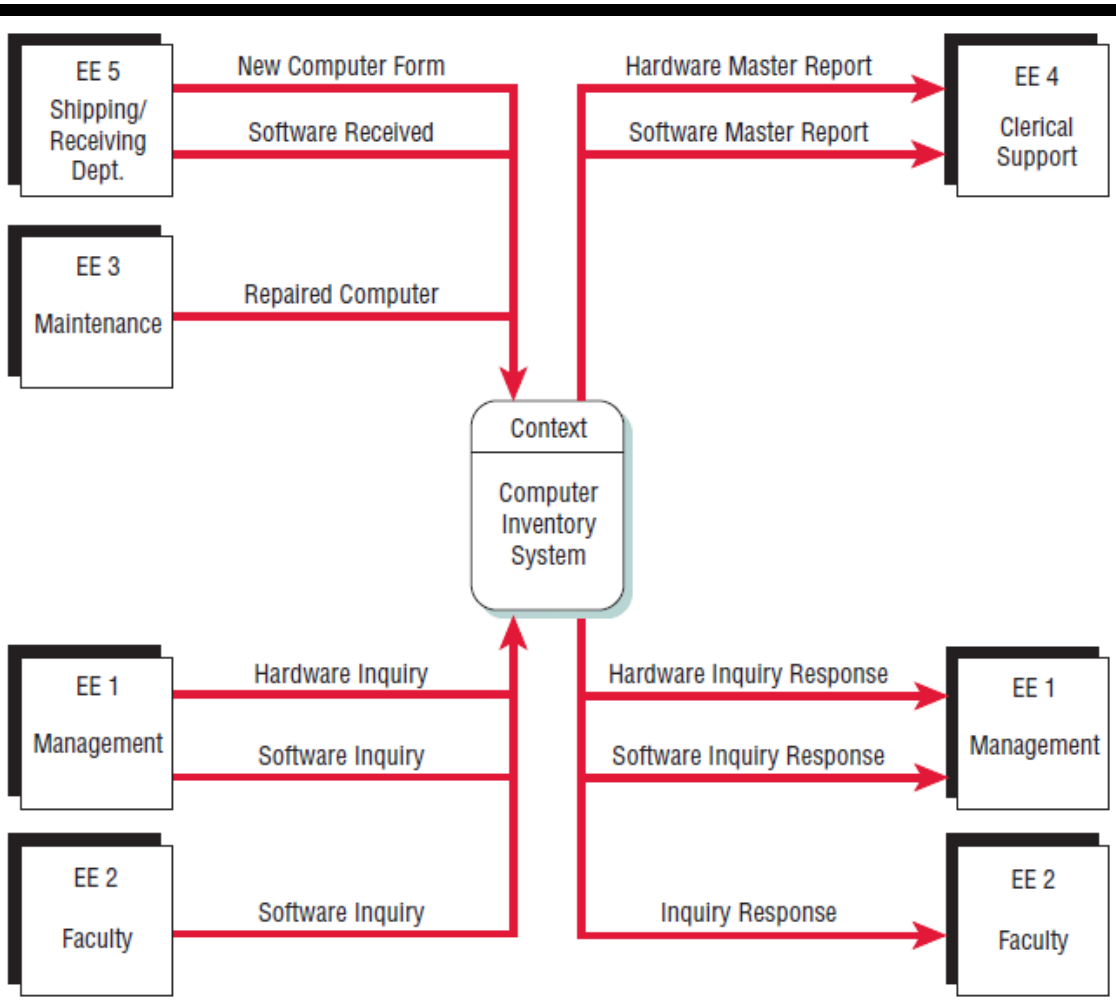


Fig.1 Context-level data flow diagram, current system

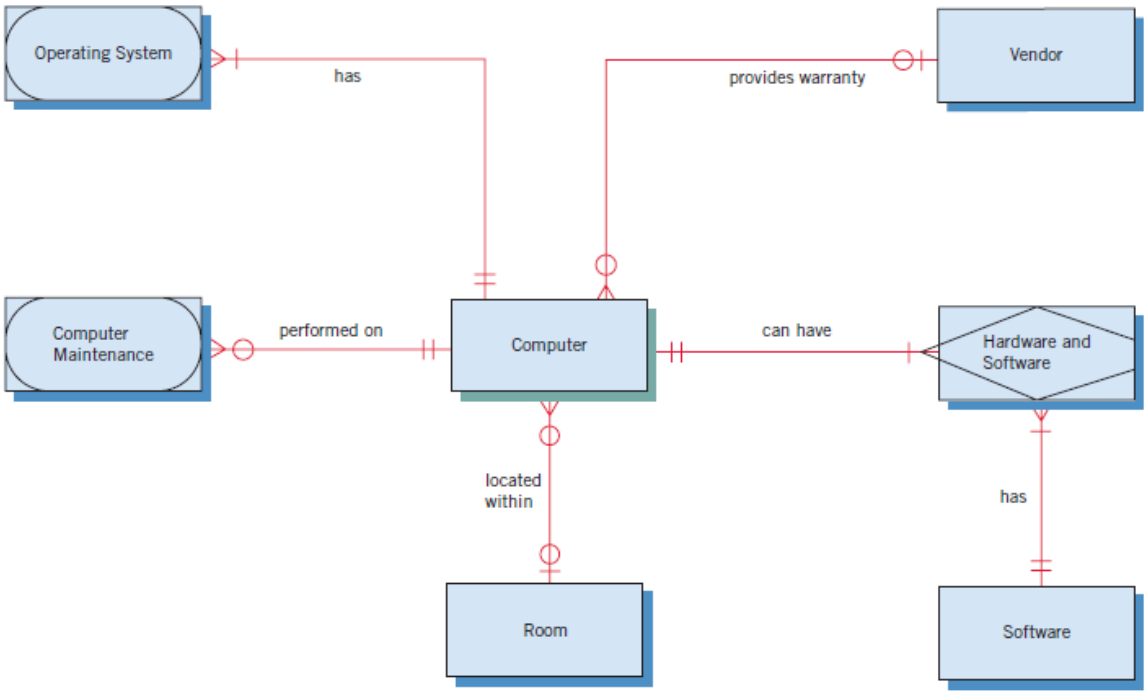


Fig.2 Entity-relationship diagram, current system.

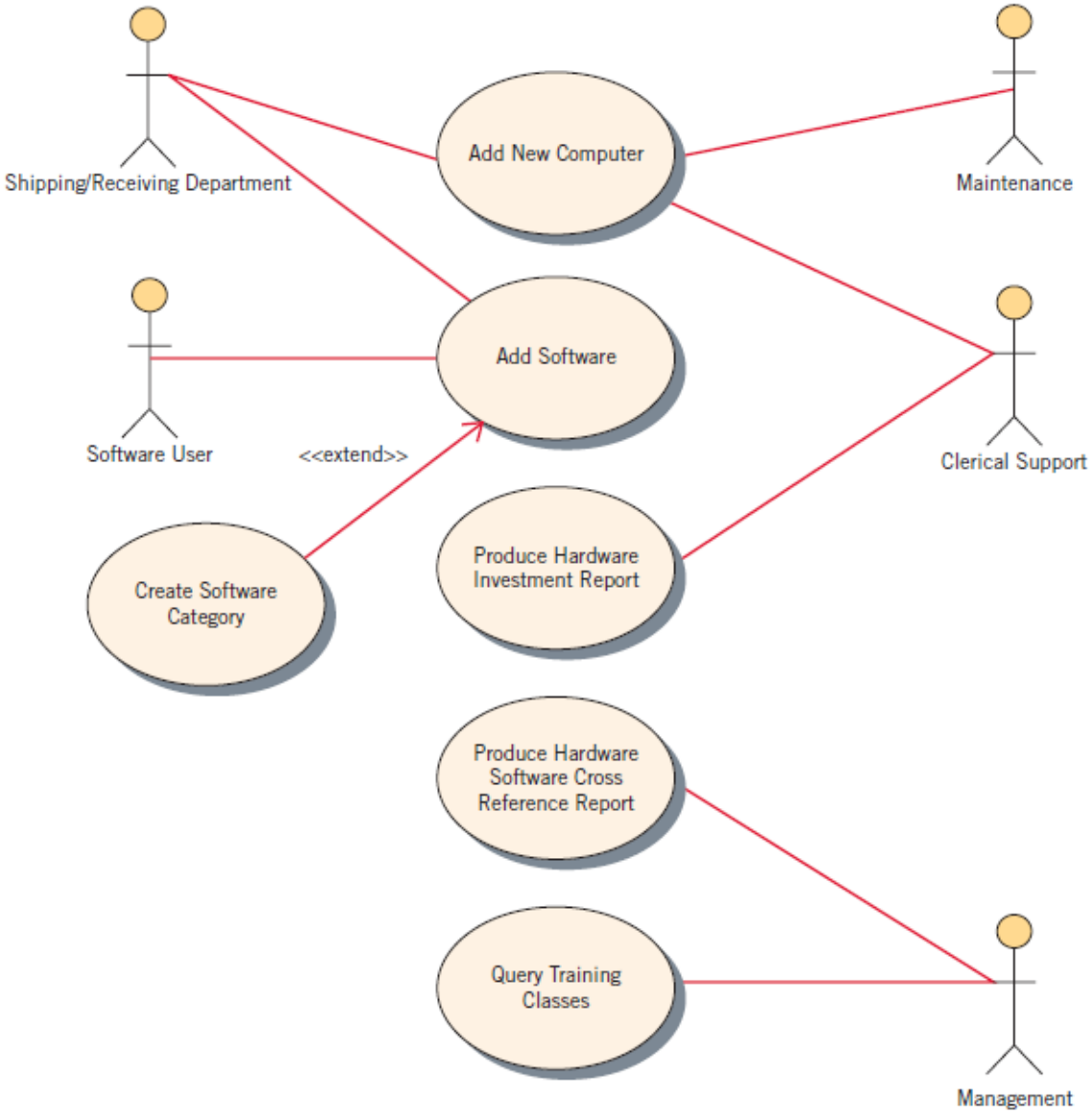


Fig.3 Use case diagram for the CPU computer system.

Use case name:	Add New Computer
Area:	Computer Inventory
Actors:	Shipping/Receiving Department, Maintenance
Stakeholder:	Faculty, Student, Staff
Level:	Blue
Description:	Add a new computer and generate a list of all machines for software installation
Trigger:	Add Computer menu choice clicked
Trigger Type:	☑ External ☐ Temporal
Steps Performed (Main Path)	**Information for Steps**
1. Information is entered about new computers.	Invoice and specification sheets
2. Computer is added to Computer Master.	
3. Pending orders are updated with computers that have been received.	Computer Master
4. Produce the Installation Listing report for all desktop models.	Pending Order database table
5. Produce Software Installation Listing report showing all standard. software for all received computers.	Computer Master
	Computer Master
Preconditions:	Computer has been received by the receiving department.
Postconditions:	A computer has been added to the database and reports have been generated.
Assumptions:	User has successfully logged on with access to Add Computer screen.
Success Guarantee:	A computer has been added to the database and required reports printed.
Minimum Guarantee:	Computer has been received and will be added later.
Objectives Met:	Add and install new computers.
Outstanding Issues:	What course of action should be taken when pending computers do not match those received.
Priority (optional):	High
Risk (optional):	Medium

Fig.4 Use case scenario for the CPU computer system.

Chip enters Anna's office one day and says, "I think the project will be a good one, even though it's taking some long hours to get started."

Anna looks up from her screen and smiles. "I like what you've done in getting us organized," she says.

"I hadn't realized Microsoft Visio and Visible Analyst could help us with project management this much. I've decided to do a PERT diagram for the data-gathering portion of the project. It should help us plan our time and work as a team on parallel activities."

"Can I take a look at the PERT diagram?" asks Chip.

Anna shows him a screen with a PERT diagram on it (see Fig.5) and remarks, "This will help immensely. It is much easier than planning haphazardly."

"I notice that you have Gather Reports, Gather Records and Data Capture Forms, and Gather Qualitative Documents as parallel tasks," notes Chip, gazing at the screen.

"Yes," replies Anna. "I thought that we would split up the time that it takes to gather the information. We can also divide up the task of analyzing what we have learned."

"I notice that you have a rather large number of days allocated for interviewing the users," notes Chip.

"Yes," replies Anna. "This activity also includes creating questions, sequencing them, and other tasks, such as taking notes of the office environment and analyzing them. I've also assumed a standard of six productive hours per day."

"After we interview the users, we will want to create a problem definition for the system, listing the issues and objectives," continues Anna. "Once this is finished, we'll have the users review it and assign weights. When this is complete, the next step is to create a list of user requirements."

"Sounds like a good plan," Chip remarks after a thoughtful pause. "Should we get started with a question list?"

Anna glances at her watch. "Not now, it's getting late. I think we've made a lot of progress in setting up our project. Let's call it a day, or should I say evening? Remember, I got us tickets for the football game."

Chip replies, "I haven't forgotten. Let me get my coat, and we'll walk over to the stadium together."

Walking across campus later, Chip says, "I'm excited. It's my first game here at CPU. What's the team mascot, anyway?"

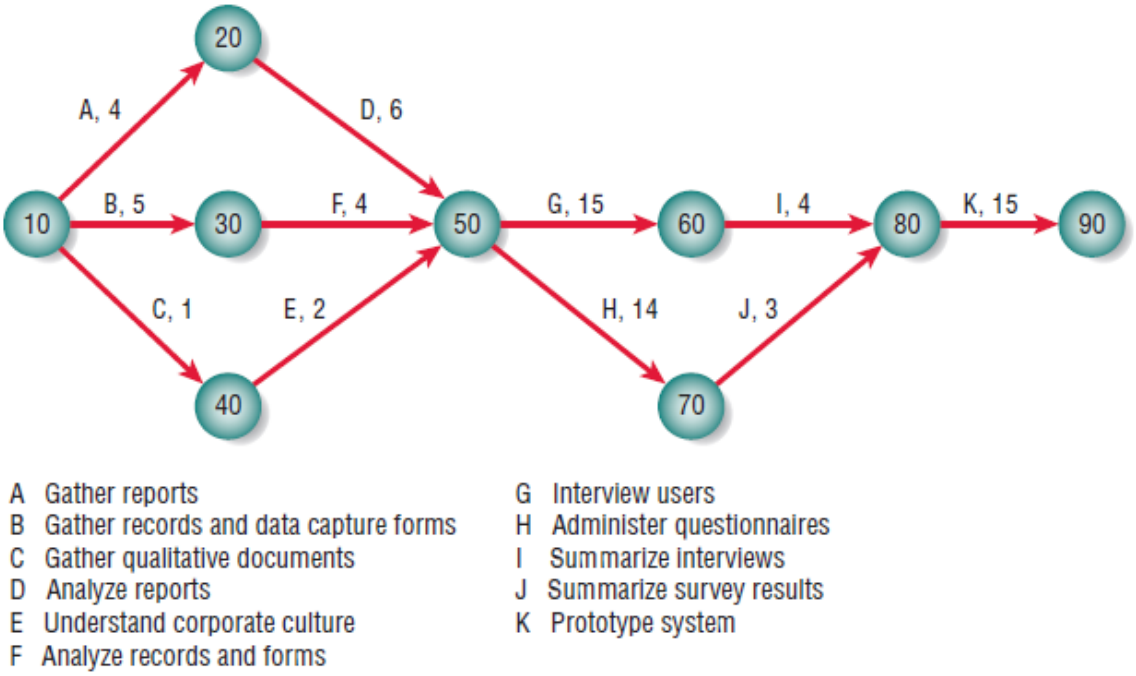
"Chipmunks, of course," says Anna.

"And the team colors?" Chip asks, as they enter the stadium.

"Blue and white," Anna replies.

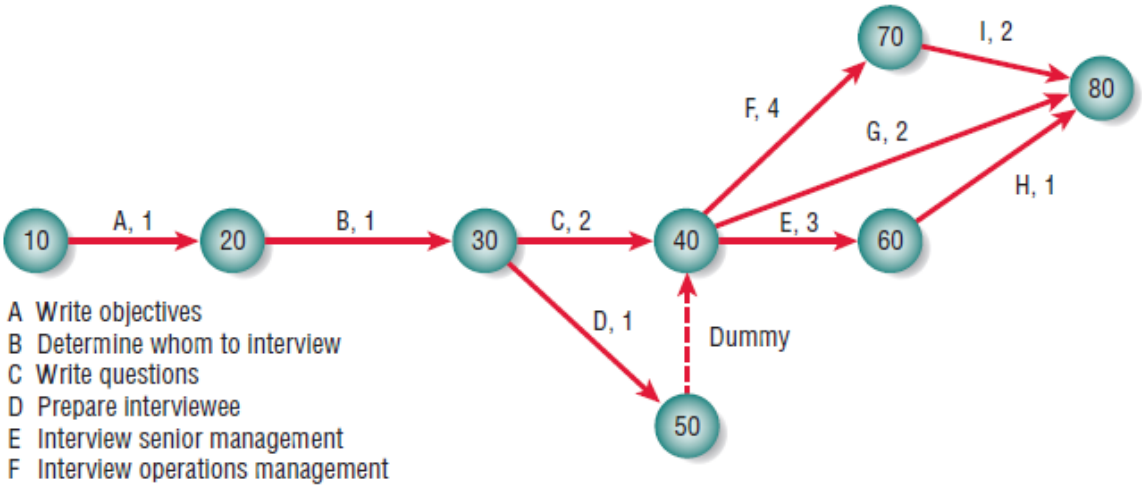
"Oh, that's why everyone's yelling, 'Go Big Blue!'" Chip says, listening to the roar of the crowd.

"Precisely," says Anna.



A Gather reports
B Gather records and data capture forms
C Gather qualitative documents
D Analyze reports
E Understand corporate culture
F Analyze records and forms
G Interview users
H Administer questionnaires
I Summarize interviews
J Summarize survey results
K Prototype system

Fig.5 A PERT diagram for Central Pacific University that is used for gathering information.



A Write objectives
B Determine whom to interview
C Write questions
D Prepare interviewee
E Interview senior management
F Interview operations management
G Record and analyze observations
H Summarize management interviews
I Summarize operations interviews

Fig.6 A PERT diagram for Central Pacific University that is used for the interviewing users phase.

"I've scheduled preliminary interviews with five key people. Because you've been so busy with Visible Analyst, I decided to do the first round of interviews myself," Anna tells Chip as they begin their morning meeting.

"That's fine with me," Chip says. "Just let me know when I can fill in. Who will you be talking to first? Dot?"

"No secret there, I guess," replies Anna. "She's critical to the success of the system. Her word is it when it comes to whether a project will fly or not."

"Who else?" asks Chip.

"I'll see who Dot refers me to, but I set up appointments with Mike Crowe, the hardware and maintenance expert; Cher Ware, the software specialist; and Paige Prynter, CPU's financial analyst."

"Don't forget Hy Perteks," says Chip.

"Right. The Computing Support Center will be important to our project," says Anna. "Let me call and see when he's available."

After a brief phone conversation with Hy, Anna turns once again to Chip.

"He'll meet with me later today," Anna confirms.

After completing her interviews, Anna sits at her desk, reviewing the interview summaries and the memos that were gathered during the summer. Several stacks of papers are neatly filed in expansion folders.

"We have so much information," she remarks to Chip, "yet I sense that we are only working with the tip of the iceberg. I don't have a solid feeling for the difficulties of faculty members and research staff. Are there additional problems we haven't heard about?"

Chip looks up from his work of trying to extract key points for defining the problems. "I wonder if we should do more interviews, or perhaps gather more documents," he says.

"But how many interviews should we conduct, and who should we interview?" Anna asks. "Suppose we interview several staff members and base the new system on the results? We could interview the wrong people and design a system to satisfy only their needs, missing key problems that the majority of faculty and staff need to have solved."

"I see what you mean," Chip answers. "Perhaps we should design a questionnaire and survey the faculty and research staff."

"Great idea!" Anna says. "How should we decide which questions to include on the survey?"

"Let's speak with some key people and base the survey on the results. A good starting point would be Hy Perteks, because he is always talking with the faculty and staff. I'll give him a call and arrange a meeting," Chip says.

Chip arranged the meeting for the following morning. It is to be held in a conference room adjacent to the Computing Support Center.

Chip opens the meeting: "Thanks for meeting with us on such short notice. We're thinking about surveying the faculty and research staff to obtain additional information that will help us define the system concerns."

"I think it's a tremendous idea," Hy replies. "I would also like to find out what type of software should be available in the Computing Support Center and the type of training we should provide. Information about the major package types used should be obtained," Hy continues. "Web creation and video software is essential. We should find out which package each user likes and, equally important, which version of the package. I know that many are using Dreamweaver and others are using Freeway Pro. Database software also varies although many are using Access. Same for video creation, with Camtasia being the most popular.

"Another consideration would be what type of specialized software is used by groups of faculty members," muses Hy. "Many of the people in the math department are using Mathcad. Others are using various software packages for a number of courses. For instance, the information science people are using Visio, but a few are using Visible Analyst. I've also heard that we're getting some biology and astronomy software. And the art department uses Macs almost exclusively. Many of the faculty are getting heavily into software for image construction, such as Photoshop and Flash."

"Other than software packages and versions, what types of information should we capture?" asks Chip.

"I would like to know what level of expertise each person has," responds Hy. "No doubt some are beginners, whereas others have a good knowledge but have not mastered all the features of a particular package. Some are experts. They know the software inside and out. I'm interested in the beginners and intermediate users, because we should be providing different training for them. Knowing who's an expert helps, too."

"Is there anything else you feel we should find out about in the survey?" asks Chip.

"The only other thing that I worry about are problems that result in a faculty or staff member not using the software," Hy replies.

"What do you mean?" asks Chip.

"Well, suppose a person has the software but it is installed incorrectly or displays some sort of security or access rights message," replies Hy. "I've had some inquiries about this matter recently. One person said that they were working with Windows Vista with their data on a USB hard drive, and it would not grant them access rights. There's a faculty member in math, Rhoda Booke, who has consistently shown interest in hardware and software issues. I've helped her a number of times, and she's always friendly and grateful. You should interview her for sure."

"Thanks once again for all your help," says Chip. "We'll get back to you later with the results of the survey."

Anna arranges a meeting with Rhoda and explains the nature of the project and why she was selected as a faculty representative. The meeting was held in a small conference room in the math department.

"We'd like to have the faculty perspective on problems encountered with computers and the associated software," says Anna. "Our goal is to provide the faculty with the best possible resources with the least number of problems."

"I'm really glad to be a part of the project," exclaims Rhoda. "I've been using classroom software for 10 years or so, and what a learning experience it has been! Thank goodness Hy is available as a resource. I've taken hours of his time, and it's been well worth the effort. I feel much more productive, and the students are using software that helps them grasp the material more thoroughly."

"That's good, but are there some difficulties that you've been experiencing?" asks Chip.

"Well, becoming familiar with the software is a major hurdle. I spent a good portion of last summer, when I wasn't working on my book, learning how to use some of the classroom software for both algebra and calculus. The stuff's great, but I got stuck several times and had to call for help. It's necessary to understand the software to prepare lesson plans and explain to the students how to use it."

"How about problems with installing the software or hardware?" Anna asks.

"Oh, yes!" exclaims Rhoda. "I tried to install the software, and it went smoothly until the part, where I went to receive updates from their website, and there were some problems with registration," laughs Rhoda.

"Then there were setup problems," Rhoda continues. "I needed to figure out what to move to the cloud and what to include on the local hard drive. We also learned that the software had never been updated. The physics faculty had the same problem."

"Are there any other concerns you feel that we should include on our survey to the faculty and research staff?" Chip asks.

"It would be useful to know who is using the same software in different departments and what software is supplied by which vendor. Perhaps if we purchase many packages from one vendor, we could get a larger discount for software. The department software budget is already overwhelmed," Rhoda says.

"Thanks for all your help," Anna says. "If you think of any additional questions we should include on the survey, please do not hesitate to call us."

Back in their office, the analysts start compiling a list of the issues to be contained on the survey.

"We certainly need to ask about the software in use and about training needs," remarks Anna. "We should also address the problems that are occurring."

"Agreed," replies Chip. "I feel that we should include questions on software packages, vendors, versions, level of expertise, and training concerns. What I'm not so sure about is how to obtain information on problems the faculty and staff are encountering. How should we approach these issues?"

"Well," replies Anna, "we should focus on matters with which they are familiar. We might ask questions about the type of problems that are occurring, but certainly not technical ones. And the survey should not ask any questions that we could easily look up answers to, such as 'Who is the vendor for the software?'"

"I see," replies Chip. "Let's divide the questions into categories. Some would be closed questions and some would be open-ended. Then there's the matter of which structure to use."

"We'll use Zoomerang to administer the survey on the Web," continues Anna. "And we'll send email reminders about the cutoff date for the survey."

INTERVIEW ONE

Respondent: Dorothy (Dot) Matricks, manager, Academic Computing

Interviewer: Anna Liszt

Location: Dorothy's office

Anna: (Extending her hand as she enters Dorothy's office) Hello, Dorothy. It's good to see you once again. I think we last saw each other when they had the reception for the new president.

Dot: (Rising from her desk, shakes hands with Anna) Please, call me Dot. And I remember that reception, too. It was fun. Please, have a seat (she indicates a chair beside her desk) while I call Pat to put a hold on my phone calls. I didn't know at the time we'd be working together. But (she continues with a laugh), it seems sooner or later computer people find each other. I've heard through the grapevine that your group is contemplating helping us out of our quagmire here.

Anna: I'm not sure it's a "quagmire," but the administration has requested that the systems and programming group help you to manage your computers with a system of your own.

Dot: (Sits back in her chair with a chuckle) I couldn't be more delighted. That means that my efforts to get some help—or should I say my unabashed pleading—has not fallen on deaf ears. Tell me more.

Anna: I thought I'd keep this first interview short, about a half an hour to forty-five minutes (glancing at her watch). My overall objective is to find out about usage of computers on campus currently, from your perspective. Later we can get into the system you use to manage the computers and its strengths and weaknesses.

Dot: It's easy enough to give an overview, because it's something I often communicate to people. Let me begin with a little history so you can understand where I'm coming from. We started getting involved with PCs way back in the early eighties. We thought we were very high-tech to be buying them as fast as they were produced. This exploded in the nineties and continues to grow today.

Anna: Yes. Not many schools or even businesses had a plan for implementing personal computer systems.

Dot: Don't be misled by the haze of history. We purchased some PCs early, mostly for the accounting area. But we didn't have a plan, except that we reacted to demand. The beginning was slow, but once hardware and software became available, we grew explosively. Once a marketing professor saw what accounting was doing, he or she would say, "What's new for me? We don't want to deal with the mainframe unless we have to." And so we grew and grew. We now have about 2850 networked computers, including laptops. Each is typically networked to a printer or several printers. Some are connected to a scanner. Do you believe there are more than 6,000 tagged items in our inventory? By the end of next fall, 200 more computers will be added. You have probably noticed that we have a mix of brands. Windows machines used primarily in the business courses, and Macs are used in the art and visual communications department. Science areas like to use both Windows machines and Macs, it seems. By the way, we use the term computer to represent any desktop or notebook computer. Both are kept in

inventory. We use the term hardware to include not only computers but scanners, digital cameras, printers, projectors, and other digital equipment.

Anna: (Nodding as she absorbs Dot's response) That's a lot for anyone to manage. But you seem to be up-to-date on what you have in inventory. What system are you using now to keep track of it all?

Dot: I've been here since the beginning, and I honestly believe we've done better than most, but still the database system we use is inadequate. Again, my analysis is that just like we outgrew old machines, we have outgrown our management system. But we are reluctant to fiddle with it too much.

Anna: Why?

Dot: Well, I guess it's because something is better than nothing, even if something is antiquated. We try to be resourceful. It all started in the late eighties. I, and the few other people who were assigned to computer support (on a part-time basis, back then), began to realize that something had to be done to prevent chaos. People were asking us for things, and we couldn't lay our hands on them. At the same time, computers were breaking down, and we did not know who had the service contract on them, if they had ever been serviced, and so on. We sensed disaster in the making. From our old mainframe experience, we started trying to organize what we had in a logical way. We all agreed to get a system running with a little off-the-shelf database package (which was not user-friendly, may I be the first to point out). We had very much of a family atmosphere at the time.

Anna: What functions did the package perform?

Dot: It was very basic information, which is what we desperately needed at the time. It sounds simple now, but we took some time and we were thrilled to have inventory information, including the type of equipment, the manufacturer, initial cost, room number where equipment was located, serial number, and equipment purchase date. Even that took extensive updating.

Anna: Is it the same system you run today?

Dot: Yes and no. Same software, but we've been through three updates.

Anna: What other improvements were made?

Dot: After using the system for a couple of years, we knew what we wanted. We added fields to capture the memory size on each computer, and other features of the hardware.

Anna: And is this the same system you are using now?

Dot: Yes. Yes it is. We can print a number of reports and some summary information. But don't get the wrong impression. The system as it stands is clearly inadequate. You won't get much argument on that point from anyone you interview. But we did what we could with what we had at the time. In fact, there are still a few members of the original group here. I will admit that it's been interesting to watch the computers grow. It makes me feel like I had a hand in helping develop a very important area.

Anna: What do you see as the strengths of the current system?

Dot: I was in it from the start, so I find it fairly easy to use. And it's flexible enough to produce a variety of reports. It's brought us quite far and it does provide the elementary information required to manage the computers.

Software Architecture

Anna: Earlier you alluded to some limitations of the system. What are the specific weaknesses you were speaking about?

Dot: (Reflecting before she speaks) In a way they are not weaknesses of the system per se, but they are changes in the types of computers we are seeing that the system was not far-sighted enough to accommodate. For instance, the types of optical drives that are available. The laptops have their own optical drives that we don't replace but the desktops and newer laptops are including Blu-ray drives, but don't ask me anything about the technical differences! Many have single hard drives, but some have dual hard drives. Some of the computers are connected to two monitors.

Anna: How do you track what software is installed on which machine?

Dot: Well, unfortunately, we don't have a good grasp of that. We started to track it, but as I mentioned, the whole computer area exploded campuswide. We spend so much time putting out brush fires that we're losing the battle to keep track of the information we have.

Anna: Are there similar problems with maintaining the equipment?

Dot: You're getting the idea, now. We fix whatever we can as soon as possible. Some of the machines are shipped out on warranty. We don't even dream of preventive maintenance on desktops, even though we are agreed that it is important.

Anna: Really, I am interested in what you are dreaming about for the new system. What would you like it to accomplish?

Dot: That's easy for me to summarize. All the weaknesses I've outlined should be addressed. I'd like it to have a dossier about each machine, and when it was purchased. We have a refresh program that replaces computers after a certain interval, which depends on the machine. Laptops are refreshed at a shorter duration. I would also like to have good cost and repair information maintained. As changes occur, we need to keep the database up to date.

Anna: Anything specifically related to software?

Dot: Software cross-referencing is a must.

Anna: One of the items I picked up on during our conversation today has been your dissatisfaction with the capability of the old system to keep pace with the computers growth. How would any future plans affect the system we develop?

Dot: Certainly we will be adding and refreshing a significant numbers of machines every year. The requests for machines far exceed the budget for several years. We expect that new technology will purchasing machines with much more computing capability as well as advanced technology, such as Blu-ray DVD burners. The system must be able to keep track of all this information.. Also, the use of individuals using notebooks is growing steadily. .

Anna: (Glancing at her notes) We've covered quite a bit, I think I am beginning to understand what the old system does and doesn't do, what you'd like to see in the new system, and what you project for growth in the coming years. Is there anything else that you think is important for me to know that I haven't asked?

Dot: It's an oversight of mine, but I should mention that we also have computers on our four satellite campuses in outlying areas. Those machines and all they entail need to be included in our system plans.

Anna: I know there are several people who can help with this project. Is there anyone in particular you would recommend that I talk to?

Dot: There are several people that you will want to seek out. They will be very useful to us. Mike Crowe is our technical support and maintenance expert. He's been here almost as long as I have. You will enjoy him very much. His counterpart in software is Cher Ware. She's easy to talk with. Don't forget to touch base with Paige Prynter. She's in charge of financial information about the PCs. She'll have what you need in that area. And Hy Perteks runs the Computing Support Center for us. Certainly you will want to see him before you're done.

Anna: Yes. In fact, they are already on my schedule. We must be thinking alike. As I summarize our interview for the systems team, I may have some follow-up questions for you.

Dot: I'm delighted to be a part of this. Call me anytime.

Anna: (Standing up and extending her hand to Dot) Thanks very much for your time. The information you provided gave me a solid start. I will be back in touch.

Dot: (Shaking hands and standing) Let me know how I can help. My door is always open.

INTERVIEW TWO

Respondent: Mike Crowe, maintenance expert, technical support for personal computers

Interviewer: Anna Liszt

Location: Mike's workroom, at a workbench

Anna: (Entering his workroom and extending her hand) Hello, Mike. I'm Anna from systems and programming. The administration has asked my team to develop a system to keep track of maintenance costs, preventive maintenance, and other information about the computers. Dot said you'd be a good person to talk to.

Mike: (Shakes her hands heartily. Clears a spot for Anna to sit beside the workbench) Hello Anna. What do you need to know?

Anna: I'd like to ask you some questions regarding the maintenance and support of the computers.

Mike: (Looks around a room strewn with open computers, cables, parts that defy description, tools, and general clutter) As you can see, we're constantly working on the machines that have problems. Some of these are breakdowns, but a lot of the work is upgrading machines to include new capabilities. These things on the workbench are getting memory expansion; those over there are having new Blu-ray read/write drives installed. . The computers stacked in boxes behind me are to be installed in Room 472. They'll be using VMWare for virtualization and have multiple operating systems.

Anna: Tell me about your preventive maintenance program.

Mike: (Laughs) When we have time. We would like to blow the dust off every desktop machine, keyboard, and printer, and vacuum the computers periodically.. Often we simply don't have the time to accomplish this work.

Anna: How many people are working on maintenance?

Mike: Me, my assistant, and quite a few students who work part-time for me.

Anna: How do you know when to perform the periodic maintenance?

Mike: Well, we don't have any exact way to do that. Normally, we go from room to room, as we have time, usually over the summer. When a room is completed, we write it on a list. Let me show you the clipboard we use. We just keep it hanging on the wall. Because the students do a lot of the preventive maintenance, I'm not directly involved in each room. I spot-check their work. You know how kids are, though. Sometimes they forget to write which rooms they've completed, and I have to get after them. But I rely on them. They're good, for the most part.

Anna: What aspects of maintenance would you like the new system to help you with?

Mike: I've seen some systems at other places, and they can get pretty fancy. I don't think I need anything that complicated. I would like to know which machines are still under warranty. That's a big one. Right now, if a machine breaks down I have to look through stacks of information to find out the warranty period and when we bought the thing.

Anna: (Nodding as she makes a note) What else would be useful?

Mike: I'd like to know which machines are lemons, which ones are constantly breaking down, I mean. I'd take those right out of the high-usage areas. Knowing how often we had to repair the machine would be useful. It would be great to have a list of machines showing which ones need preventive maintenance the most. That would probably cut down on the number sent in for repairs. Last week we had a laptop that one professor was using and it kept losing the installed programs, and every time he put in a USB drive, it thought that it was new. We had to send it out for repairs, and since he had sensitive information, such as student email and grades, we had to back it up and scrub the hard drive clean.

Anna: Do all the machines have the same preventive maintenance interval?

Mike: No. (Mike's portable pager sounds. In response, he goes to the phone and has a short conversation about a computer problem.) Now, where were we? Oh, yes. The interval between maintenance. There is different timing for each machine. It would be good to keep that information on a database somewhere. It also depends on whether it's a desktop or notebook. The notebooks don't really receive any periodic maintenance.

Anna: Is there anything else you would like to add that I haven't covered?

Mike: Let me say it again, loud and clear. We need warranty information. Also, it would be good to get a report saying which machine needs preventive maintenance and when. Putting it in order of room numbers where the machines are located would make it easy to find the things. We would like to have a Web site problem reporting that would enable folks to report problems when they occur, assuming they can use a different machine. The Web site would have a form to complete that would capture the problem information and send it to us as an e-mail.

Anna: (Standing and extending her hand to shake Mike's) Thanks for your time, Mike. May I get back to you with any further questions and also have you review my interview summary?

Mike: (Standing and shaking hands) Sure. Just have the office page me and leave your number. If you build me a system like the one I just described, I'll put it to good use.

INTERVIEW THREE

Respondent: Cher Ware, software specialist, personal computer systems

Interviewer: Anna Liszt

Location: Cher's office

Anna: (Entering the open office and extending her hand to the woman perched on an old sofa to one side of the office) How do you do? I'm Anna from systems and programming. Dot mentioned that you would be an important person to talk to about building a new system for managing the computers. I'd like to ask you some questions about the systems you have for managing software.

Cher: (Gesturing to a spot on the sofa next to her and shaking hands with Anna) Sure. I was expecting you. Dot told me all about you. She keeps us going. She is order itself. I'm happy to talk to you because I know that we need a system for managing our software. It's not like I haven't been trying to keep a grasp on all this, but we've had a fantastic explosion of software. It's growing like The Thing That Ate Sacramento. I feel like we're living in a science fiction flick half the time. The software is clearly trying to gobble up our database capacity. Just to track it takes a lot.

Anna: (Laughing) Well, what are some of the basics about The Thing, the software that's in use here at CPU?

Cher: Well, it started around the early eighties. Or was it 1985? I lose track. The seventies were the best for me personally, but the whole millennium was good too. What was your question?

Anna: How many software packages did you have in the eighties through the nineties, and the early part of the 2000s?

Cher: Very early on, there were only a few. Some simple packages. A word processor, a database, a spreadsheet. Boy, when you think of how things have changed!

Anna: Can you contrast that to the number of packages that are in use now?

Cher: A humongous variety now. Lots and lots of versions of each of them, too. You don't see plain vanilla packages anymore, either. There are several packages for Website creation, several databases, multiple graphics packages, and so on. Then we have software for the science and math programs and Mac packages, such as animation software, for the art department. And they're pretty jazzy, too. Some people are using Linux and multiple operating systems using virtualization. And many people wants software that allows you to create video from computer screens and that cool animation stuff. You know, I don't actually know how many packages there are.

Anna: How does the current system work for managing software?

Cher: It's a simple database system that was developed years ago. We never expected to see the growth that we have. Almost since the beginning, our system hasn't been able to maintain all the information we need. Information is also missing. Let me say it better. Not all the software packages have been captured by our system. Many times a professor gets software for class or research and forgets to tell us about it. I wish that I wasn't the last person on earth to know about nifty updates and new packages. If there was just one process for registering software with us that everyone had to follow, life would be rosier.

Anna: What process is followed when your office receives a new piece of software?

Cher: We inventory it, inform the professor that it has arrived, and enter the information into the database. Then it is delivered to the lab or to the prof who requested it.

Anna: What happens to the older version of the software, if there is one?

Cher: Chaos city. I mean we are talking nightmare time. Golden oldies should be deleted from the hard drives and scratched, but that's not the case. Often we have several versions of the same software in several different labs and campuses, even though we try not to let it happen. Microsoft Word is a good example. We haveWord 2003 and Word 2007. The same is true for our versions of Dreamweaver and many other packages. Really, though, sometimes there's a good reason for having multiple versions, because not all the equipment in all the labs is upgraded to run new software, but more importantly is training on the software. Also, some software is used by more than one course and the students should not have to switch versions from one course to another, especially if they have invested heavily in purchasing their own software. For example, a series of courses requires them to have their own personal copy of Photoshop.

Anna: Do site licenses add further complications?

Cher: You guessed it. Recently, we've been getting site licenses for some of the most commonly used software. We create an image of the software installed on all of the machines in a lab and it is used to refresh a machine when there are problems or over the summer for an upgrade to the lab. If there is no site license, we need to know how many copies of a particular package we have and on which machines they're located.

Anna: How do you determine which machines or labs will have a new package installed?

Cher: We like to think we have that under control. The normal situation is to use the labs that are designated for that application. For example, Photoshop is installed in Room 320, the art department's lab. The latest version is an awesome package, by the way. Typically, scientific packages would be installed in the science- and math-complex labs, but only the machines in the information sciences lab have enough memory in them. So that's where the new scientific packages wind up.

Anna: Describe the problems you encounter when locating a machine for installation of new software.

Cher: Sometimes we have requirements for operating systems and memory, such as when we install virtualization software, such as VMWare. We don't really know which machines have the required configuration. That kind of information is not maintained by either our system or the hardware system. Sometimes the machines don't have enough memory, especially the older ones, and the software runs so very slowly. Sometimes the hard drives are simply full. We usually investigate these cases, though. Lots of times students put their own games and stuff on machines. We take them off when it's noticed and re-image the machine if its really bad..

Anna: Explain what happens when you receive a request for the location of a particular software package.

Cher: We have a sorted listing of software by its name, which also contains the room number. We can't trust it completely, though, because it's often outdated and incomplete. Not all software is registered with our area, as I mentioned earlier. For example, last week a professor asked me where he could use the language "C#." We

informed him of the labs where it was supposed to be located, and later he called to tell us that he found it close to his office, on machines that weren't supposed to have it.

Anna: Do you currently keep financial information pertaining to software?

Cher: Not on the same database. I know this is critical information that should be maintained, though. It would be extremely useful to know the total costs of each software package and category.. It would also be great to have the total cost available for an upgrade. The upgrades seem to happen so often that we can hardly install all the packages and provide training before a new release is announced.

Anna: From what you've said today, I can see that you have an incredibly complex operation. You've been very helpful explaining how the software is managed and giving me ideas about what you would like to see the new system do. Is there anything we have not covered that you would like to mention?

Cher: Well, talking to you reminded me of a lot of things I hadn't thought about for a while. I hope the new system can help out, especially in getting all software registered with our office. We'd also like to be able to tie into the hardware system to determine which machines will actually run the software we have. Sometimes we have problems migrating software with a single user license to a new machine that has replace an older one on our refresh program. Another issue that we have is changing the software image for a certain lab. We find out from the faculty which labs will be updated and have to change the image. This also happens when we receive a new site license for software that is in all labs, such as virus detection software, browsers and so on. It would be nice to have a Website that would allow faculty to view the current configuration in a lab and then add or remove software from the image. For example, this past year we started using Notepad++ for programming classes, but the previous package is also being used.

Anna: (Rises and extends her hand to shake Cher's) I will be back in touch with you as the project continues. We should be able to help out. I'll ask you to review an interview summary in a few days. Thanks very much for your time.

Cher: (Shaking hands and rising as Anna leaves) My pleasure. We have a lot of fun here, even though it's crazy. I'm happy to help any way I can.

INTERVIEW FOUR

Respondent: Paige Prynter, financial analyst

Interviewer: Anna Liszt

Location: Paige's office

Anna: (Knocking on Paige's door, and as door opens, extends her hand to shake Paige's) Hello Ms. Prynter. I'm Anna Liszt from systems and programming.

Paige: (Shaking hands, then showing Anna to a chair opposite her desk) I've been expecting you. Please have a seat. Dot told me you would be contacting me.

Anna: The administration has asked my group to help build a system to manage the personal computers, and I am doing a series of interviews with key people who will use the information provided by the system.

Paige: The system is sorely needed. What do you need to know from me?

Anna: I'd like to ask you some questions about the financial needs regarding the computers used at CPU. More specifically, what type of information are you currently receiving?

Paige: We get a report listing the cost of all the computers and a total. That is about the extent of our financial information right now.

Anna: Would it be useful to have subtotals added to the reports?

Paige: Yes. That would be extremely useful for costs on each type of machine.

Anna: Do you receive financial information on software?

Paige: You've touched on an issue that is controversial these days. We receive absolutely no computerized information on software. And, of course, the software has just snowballed. We have no idea of the total amount invested. We scrape by with outdated requisitions for software. We desperately need more information about software purchases to formulate better controls and put together reasonable budgets. We need subtotals by product and by category of software, such as word processing.

Anna: How do site licenses fit into the picture?

Paige: We would like to have the figure for the site license as a total and then not have to calculate the amount for each copy.

Anna: Your current needs are clearly pressing. But is there anything you would add to the system for the future?

Paige: Yes. We would like to input the cost of an upgrade to a particular software package and have the computer tell us how much it would cost for all the currently installed software. We also need subtotals by product for both hardware and software, along with totals. It would also be useful to have totals for each of the satellite campuses.

Anna: You've answered all the questions I have right now. Is there anything you would like to add?

Paige: Yes. We need to take an accurate inventory of the hardware periodically. Machines have an annoying habit of moving from one room to another over the course of a semester, but we need to know what we have and precisely where it is. You can imagine how time-consuming the inventory process is. Automating it would be highly desirable. There is much competition among different areas within the university, and everyone seems to ask for more than we can possibly provide. Having access to the financial information will be a vast improvement at budget time.

Anna: May I get back to you with a summary of our interview and also any further questions I might have?

Paige: Certainly. Just set up an appointment ahead of time again, and I will be glad to speak with you.

Anna: (Rising and extending her hand to shake Paige's) Thank you very much for your time. Your input will be valuable in helping to put together the new system.

Paige: (Shaking Anna's hand and rising from her desk) I hope the new system will provide us with the vital information we need. I don't like to complain, but it's been a long time in coming. Please close the door behind you.

INTERVIEW FIVE

Respondent: Hy Perteks, director, Computing Support Center

Interviewer: Anna Liszt

Location: Hy's office in the Computing Support Center

Anna: (Walking past several faculty members working on computers to get to Hy's open door; pausing at the entrance) Hello, Hy. I'm Anna.

Hy: (Getting up from a crowded desk to welcome her and extending his hand to shake Anna's) I remember you. We were at that conference together about two years ago. Please come in and pull up a chair. I got your message, and Dot emailed that you'd be by, too.

Anna: (Sitting down in a chair by the side of Hy's desk) She probably told you that the administration has asked my group to help with designing a system to manage the PCs. I've been doing a series of interviews with key people, and it's time for me to find out about the needs you are experiencing here in the computing support center.

Hy: What we need so badly that I can taste it is a centralized bank of information on the computers and the software we have.

Anna: Who is served by Computing Support Center?

Hy: Our clients come from every level of the university. We serve administrators, both on the managerial and support staff levels, and we also serve the needs of faculty for teaching and research. Our clients are pretty evenly split between those groups, with maybe a little lean toward the faculty.

Anna: What services do you provide them?

Hy: We do a lot of training. A lot. Every so often we offer classes in popular software packages. You've probably gotten some of our flyers announcing those classes. We answer, or try to answer, tons of technical questions as well. They usually are specific as to how to perform advanced tasks with the software, such as statistical analysis packages. A third category of service we perform is helping users to adapt software to their particular application. We also help in figuring out which software would be most effective in solving their problems.

Anna: It seems that the staff here has to be fairly well-versed in many different areas. Do you have an expert in each software package?

Hy: No, although I personally am familiar with the basics of most of the common packages. I receive training in the operation of the software and work on small projects just to familiarize myself with new programs. When the nitty-gritty detailed technical questions arise, I dive into the manuals and other reference materials we have here in the computing support center library. But I'm not alone. I often call on specialists who are on the faculty to help with particularly thorny problems. Most of the time I use the Web but there have been times when I have to call software vendors for help.

Anna: How often do you add new software packages?

Hy: More often than you would believe. We do upgrades, as well as altogether new software. For example, we recently updated a math package and are scheduling classes for training. We are being absolutely deluged with requests from the math and

science faculty. They are so tickled that the new package is here and available for use. There's never a dull moment. That's why I love the job.

Anna: What are some of the problems you are experiencing that might be dealt with more effectively via an improved system?

Hy: I know there's a lot that can be done that we haven't, just because no one has taken the time. For one, we need to know what version of software a person is using. You wouldn't believe how critical that is in determining the solution to a technical question, such as how to transfer files from one package to another. Lots of times the users just aren't sure of what version they're using. We'd also like to know the best Web sites and even phone numbers of software providers so we can quickly provide assistance. Sometimes it's difficult to find an expert around the university for a particular program. I meet a lot of interesting people searching for help, though.

Anna: Other people have mentioned the need to know which software is located on which machine in which room. Is this important to you?

Hy: You bet. We get requests for training, or someone wants to use software that isn't in the computing support center. If it's an oddball package, we don't know where it's located without lots of calling around.

Anna: You've told me a good deal in a short time. Is there anything else that you'd like to add that we haven't covered?

Hy: I know I talk a lot, but I mean well. Really, I think we've covered all the bases. Let me just add that I would like to have a sense of how many people would be interested in training on software that we have now. I'd also like to know what software people want us to purchase. We can't get everything, but if they don't ask, I'll never know. That's a tall order, though. I'm not sure how to get that without surveying the entire university.

Anna: (Rising and extending her hand to shake Hy's) We'll try to include as much of what you've said as we can. Thanks for your time. May I get back to you with follow-up questions if they are needed?

Hy: (Shaking her hand and rising to accompany her to the door) No problem. Service is what we're here for.