**The University Archaeological Museum**

1. Transcript of a conversation between a systems analyst and the museum's director:

ANALYST: I enjoyed the tour, but somehow I think that looking at the objects you have on display is giving me an overly simplistic view of what your museum does.

DIRECTOR: Now that I think of it, you're right. We do many more things than just display the artifacts our researchers have discovered in the field.

ANALYST: Why don't you tell me about your other activities.

DIRECTOR: Well, first of all we have a rather large digital image collection. We record the history of all of our digs that way.

ANALYST: Who manages the image collection?

DIRECTOR: We have a graduate student working part time on it. He adds new photos to our image management software and assigns keywords to the images.

ANALYST: Just exactly how are the images used?

DIRECTOR: Most of the time they're used as parts of lectures.

ANALYST: So it's the researchers themselves who later want to retrieve the images taken at their digs?

DIRECTOR: Exactly. The major problem we’re having is that the keywords aren’t assigned consistently and sometimes retrieving photos doesn’t work as well as we’d like.

ANALYST: Besides the image collection, what other activities does the museum have?

DIRECTOR: We actually administer our own digs. The museum staff helps the university’s archaeologists write grant proposals. When we are fortunate enough to get one funded, the archaeologists hire student help and support staff.

ANALYST: Who takes care of the grant monies? I mean, who does the purchasing, and the payroll?

DIRECTOR: When the museum sponsored the grant application, we do.

ANALYST: What sort of staff does it take to handle the grants?

DIRECTOR: We have two full-time grant writers, an accountant and a purchasing clerk. The grant writers act as administrators for the grants once they're funded.

ANALYST: They report to you?

DIRECTOR: Yes, they do. I get monthly summaries of all financial activity on each grant.

ANALYST: Who prepares the summary?

DIRECTOR: The accountant.

ANALYST: Are there any other activities I should know about? I haven't forgotten your artifacts, but let's leave them for last.

DIRECTOR: We do maintain a small library. It has copies of all the papers and books our researchers have written about our digs as well as several thousand books about archaeology. The library also carries subscriptions to the major archaeological journals, both print and electronic.

ANALYST: Do you have a librarian?

DIRECTOR: Not full-time. A graduate student from the Library School works there 20 hours a week. You see, the collection doesn't grow very fast. The collection has been added to the university’s main online library catalog so searching it isn’t an issue. We keep the journals in alphabetical order by journal title and then by date. Usually, when someone is looking for a journal article, they already have the citation. The student catalogs new books as they come in, files the magazines, and checks books in and out. Actually, the library works very well right now. It’s going to get even better as we move our print journal subscriptions to electronic subscriptions.

ANALYST: OK... Now we ought to talk about your artifacts. Tell me, are all of them on display?

DIRECTOR: Hardly. We have an entire floor in the archaeology classroom building full of items that we either don't have room to display or that aren't ready for display. Actually, it's the state of that lab of ours that prompted me to call you. I'm not as concerned with the amount of work it's taking to generate weekly accounting summaries, as I am with what appears to be a loss of valuable artifacts.

ANALYST: Loss? Do you think artifacts are being stolen, or are they simply being misplaced?

DIRECTOR: I'd like to think that they're being misplaced, but there's no way to tell until we come up with a better way to keep track of them.

ANALYST: How are they handled now?

DIRECTOR: Artifacts are tagged and numbered in the field. For each artifact, someone fills out a card, indicating the item's number, where it was found, and when it was found. The cards are supposed to be brought back to the lab with the artifacts. Then they're filed numerically by dig. Somehow, not all of the cards get back. We end up with artifacts with no cards, which means the artifacts are nearly

useless, since we don't know anything about the environment in which they were found. What's worse, we often have cards without artifacts. Even more seriously, researchers will insist that a particular specimen was found for which we have neither the card nor the artifact.

ANALYST (thoughtfully): A computer isn't necessarily going to solve the problem of disappearing artifacts. If it merely replaces your card file, it's not going to help you much, except in reducing the amount of paper you keep over in the lab. At least on the surface, it sounds like you need to bring your controls closer to the dig. You may wish to consider entering artifact data at the dig site, rather than waiting until the cards are returned to the museum. However, no computer by itself can force your field personnel to record data as it is generated or to keep better tabs on the physical artifacts.

DIRECTOR: I see your point. I like the idea of using the computers at the dig for more than e-mail and word processing. We can record data about the artifacts as the artifacts are unearthed. We're going to have to redefine our field procedures and institute some fairly tight controls. That's my job, isn't it?

ANALYST: Primarily. But we certainly can work together on it, if you like.

2. Transcript of a conversation between the systems analyst and the museum accountant

ANALYST: From my conversation with the Director, I understand that you are responsible for preparing monthly reports about the grants the museum administers. What reports do you prepare?

ACCOUNTANT: The monthly report is a summary of grant activity that lists the major line item expenditures for each grant. The Director doesn't really want all the details, like how much each individual was paid or which individual products were ordered. He just wants to know how much was expended for salaries, supplies, transportation, and so on. The report compares the expenditures to the budget for the grant. But that monthly report is just for internal use; it's really the simplest document we produce.

ANALYST: Oh?

ACCOUNTANT: Each agency that grants us money has its own set of reporting rules. Some agencies, like most of the private foundations, are satisfied with a level of detail similar to the internal monthly summary. However, the government needs very detailed records. Therefore, we tend to keep records with as much detail as we can. It's easier to summarize than it is to try to break down an already summarized quantity at some later date!

ANALYST: That's certainly a smart way to do things. Tell me, how do you handle the data now?

ACCOUNTANT: We're using one of the PCs in the museum office. Someone in the computer science department set up a database for us. The trouble is, since we didn't create it, we don't exactly understand how it works. The person who wrote it is long gone and we need some changes. I don't like the idea that we don't have closer control of this data.

ANALYST: What kind of changes do you need? What doesn't your current system do for you?

ACCOUNTANT: The software doesn’t always follow strict accounting principles, and we’re subject to audits by any of the granting agencies. In most cases, a small unit like ours could use any off-the-shelf accounting program that is designed for a small business. But we have some special requirements that most businesses don’t have: We have to tie grant identification to purchases. It seems to me that the only solution is another custom-built database and application.

ANALYST: That sounds like a reasonable request. You may need something new or you may be able to continue with what you have with a few modifications. We’ll need to have someone look at it carefully. What about purchasing with grants funds?

ACCOUNTANT: Now that you mention it, it would be useful to tie an accounts payable system into the grant record keeping system. I mean, wouldn't it be great if every time we encumbered some grant money on a purchase order that amount was automatically entered into the appropriate grant and the appropriate budget line item?

ANALYST: You're not asking for anything that can't be done. Is there anything else besides the grant expenditures that you'd like to handle locally?

ACCOUNTANT: I'd like to put the museum's operating expenses on the machine as well. Just the bookkeeping right now, though. Our payroll is part of the general university payroll system and that works quite well. The accounts payable for the museum itself are fairly limited, since most of our purchasing is tied up with the grants. That part of things could also be left alone.

ANALYST: What do you want the operating expense system to do for you?

ACCOUNTANT: Primarily general ledger. I'd also like it to generate monthly balance sheets. Like most museums, we are always short of money and we have to keep a close watch on our cash flow.

ANALYST: To do this for you, I need to know exactly what kinds of data you keep for both the grants and the museum. And I'd like to know generally how you classify it.

ACCOUNTANT: OK, let's start with the grants. First of all, we keep data on the people who are being paid by the grant. Salaries are big part of grant expenses. We collect the data and send it over the university’s network to the payroll department.

ANALYST: What else do you track besides people?

ACCOUNTANT: Grant expenses fall into two big categories—things that support an actual dig and things that support administrative costs. Dig costs include supplies like tents, food, tools, electrical generators, and sometimes even jeeps. Grant monies also can cover office supplies that a dig might use, like laptop computers and solar panels to provide prower for them. Many include transportation costs for the staff to and from the dig and lodging while they’re traveling. Administrative costs include overhead paid to the museum for providing accounting and other administrative services, and for storage space in the warehouse, and things like that.

ANALYST: You really can't predict, then, exactly what things will be purchased for any given grant.

ACCOUNTANT: That's true. I'd like a system that has big broad categories like “supplies,” and “salaries,” and “transportation.” Then we could associate some sort of text with each broad category that would describe exactly for what the money was spent. I'd also like to be able to associate an internal budget line number with each expense. Then, when we generated reports for the individual granting agencies, a program might translate our internal budget line categories into those requires by the agency. Can that be done?

ANALYST: I think it can.

3. Transcript of a conversation between the analyst and a field researcher

ANALYST: I'm curious about what happens when an artifact is recovered.

RESEARCHER: Why? What does that have to do with a computer system for the museum?

ANALYST: At this point, I'm not sure. The Director is concerned about losing track of artifacts. Until I know how that artifacts are handled, I can't even decide if the problem is one that can be helped by a computer or whether it's a procedural problem.

RESEARCHER: I see what you mean. Well, I can tell you how I manage my digs. Not everyone does it exactly the same, however.

ANALYST: OK.

RESEARCHER: Before we start the dig, I hold a meeting with the students who will be doing the work. The dig is laid out in a grid. I show the students how to identify anything they find by the grid coordinates and also by the depth at which the item was found.

ANALYST: How is that data recorded?

RESEARCHER: I use 3 x 5 cards. Each artifact gets a number - usually it's written on a tag tied to the artifact. The number is put in one corner of the note card. Then the date and location of the find is written on the card; there's also room to write notes about the item.

ANALYST: Does the card include a description of the artifact?

RESEARCHER: Not usually, but we do take a digital photo.

ANALYST: Is there any way to connect the photos to the artifacts when you’re still in the field?

RESEARCHER: Not until we get back to the lab and can match them up.

ANALYST: Tell me, do you have trouble keeping track of the cards?

RESEARCHER: Well, one or two always get lost along the way. We're not talking about your standard laboratory here; we're usually talking about people living and working in tents in remote, primitive locations.

ANALYST: Are cards always completed?

RESEARCHER: Except in rare instances. If we find out that a student isn't following the procedures for logging in an artifact, we'll fire the kid from the dig.

ANALYST: I've talked to the Director about how you use computers at the dig sites. From what you tell me, there may be some other things you can do with.

RESEARCHER: You mean beyond playing games at night when there’s nothing else to do?

ANALYST: <laughing> What if you had a database application that ran on your laptops that you could use to enter the same data you’ve been putting on the cards? The data could be entered as soon as an artifact is tagged. That would certainly get around the problem of lost cards, and today’s students are so comfortable with computers that they are more likely to enter data into a computer application than they are to hand-write a card.

RESEARCHER: Sounds great to me.

ANALYST: I'm glad you're enthused, but hang on for a bit. We've got a long ways to go in the design process before we come up with software that's going to work well for you.

6. Transcript of a conversation between the analyst and the supervisor of the archaeology lab and warehouse

ANALYST: I see that you store artifacts on these open shelves. How do you keep track of what's where?

SUPERVISOR: The shelf locations are numbered. When we get artifacts in from the field, we assign each one to a location. The location is written on the card that comes with the artifact.

ANALYST: Where do you store the cards?

SUPERVISOR: In drawers. We bought card catalog cabinets—like they once used in libraries—because we have so many cards.

ANALYST: How are the cards organized?

SUPERVISOR: In two ways. The original cards are filed by dig. We also make a copy of the card that we file by shelf location.

ANALYST: How, then, do you locate a specific artifact?

SUPERVISOR: Usually, it's a researcher who comes in looking for something. He just plows through all the cards for his dig until he finds what he's looking for. Then he can go to the shelf and get the thing. It's too bad there isn't some way to use a description of the artifact to make finding the card easier.

ANALYST: I've been talking to one of the field researchers about that very thing. It should be possible to come up with a set of descriptive words that can be applied to most artifacts. If all the researchers assign descriptions from a standardized list of terms as well as numbers to the artifacts, then those descriptions could be used to speed the search for one artifact.

SUPERVISOR: Could you set up a computer program for us?

ANALYST: Probably. In fact, that's one of the things computers do very well. If you were to work with descriptions in your card system, you'd have to make a third copy of each card. However, it's reasonable to expect a computer to locate information about an artifact based on its location here in the warehouse, the number assigned to it at the dig, its description, the date and place where it was found, or any combination of those characteristics.

SUPERVISOR: Y'know, so much of what the Director thinks is “lost” isn't, really. It's all here in the warehouse; we just can't find it.

ANALYST: I'll tell you what I told the Director. A computer can't solve procedural problems; all it can do is help you keep good records. If you don't insist that artifacts are returned to their assigned locations on the warehouse shelves, the best computer system in the world can't help.

SUPERVISOR: I understand. Could we set up some sort of system where each time an artifact is taken from its shelf we record its destination in the computer?

ANALYST: You mean, is it in the museum or in the lab?

SUPERVISOR: Exactly. And I'd like to know who took it, as well.

ANALYST: There's no reason we couldn't do that. Remember, though, that the computer will be only as good as the people who put data into it. A computer isn't going to insist that a lazy person enter data nor can it prevent intentional theft.

SUPERVISOR: We used to think that a computer would solve all our problems, but I really see what you mean. The computer can keep our records and give us access to them in ways we could never have with our card file system, but it's up to us to design procedures to control human behavior.

ANALYST: You've just expressed an attitude that virtually ensures that a database system will work well for you. I'm looking forward to designing a system for your museum.