Chapter 6: Moving into Design

# Teaching Tips and Strategies *(from Barbara Wixom)*

I introduce the design phase with this chapter, putting emphasis on teaching students the difference between what and how. Students sometimes have a hard time transitioning from analysis to design (i.e., understanding the differences), and I find the building a house analogy very effective. For example, by asking students to describe how a house is built – talking to people about their needs for a home, developing a rough sketch, and then creating an architectural blueprint – seems to be a good way to get them to understand the phases for developing a system.

A great quote to use:

“If I had 6 hours to chop down a tree, I’d take 4 hours to sharpen the saw.”

-- Abraham Lincoln

I spend one class session talking about the three design strategies of custom, packaged, and outsourcing. Before my class, students seem to believe that all systems are built from scratch, so I make my goal for the lecture to get them to understand two main points: 1) that packaged systems and outsourcing are viable alternatives and 2) that the organizational environment has a huge influence on any design decisions that are made. Students sometimes have a hard time grasping that the “ideal” solution may not be the most apparent because of the influence of existing technology, technical standards, politics, in-house skills, etc.

During this lecture, I also present the alternative matrix. I find a good way to go over the three design strategies is to have the students create an alternative matrix that compares the three different strategies in class. For example, I may choose a recent article in *Computerworld* that describes a company that is building a system. The students have to come up with three ways in which the system could be built (one for each design strategy). Then, in groups the students can brainstorm what would go in an alternative matrix. You could also use minicase 1 at the end of the chapter as an in-class exercise.

As a devil’s advocate, I’ll ask them how they can create an alternative matrix having so little knowledge of the alternatives. This is a good segue into the request for information and request for proposal.

I spend the second class session explaining physical modeling. Depending on my time, I may have a class session for each type of model (i.e., data and process). I make the physical modeling sessions very applied. For example, after a short lecture introducing the different characteristics of the physical model, I do in-class examples where groups have to transition a model from logical to physical. Then, after they present the physical model, I change the “rules” and create business scenarios or assumptions that would force the students to rethink the physical models.

I usually can drum up some good discussion regarding why it’s necessary to have both logical and physical models. We discuss how companies manage both models when changes occur. As we go through the physical models, I constantly point out the integration between process and data modeling.

# War Stories *(from Barbara Wixom)*

## Technical Limitations

I was on a project at M&M/Mars as a consultant, and we were building a system using Paradox for Windows back in the early 1990’s. At that time, Paradox had a major limitation – its screens only supported 1:M relationships. Thus, if you had customers and products, and the screen was showing the products that customers had purchased, there was no way to show both the customer names and the product names on the same screen.

To resolve this, we had to place the customer name and product name fields into the purchased products table so that the screen would appear with the right information. This redundancy of fields was depicted on the physical data model. Because of the concern for data integrity, we had to write programs that regularly checked to make sure that the names within the customer and product tables were in sync with the names in the purchased products table.

## Choosing to Outsource

My friend George was a client at a large non-profit organization, the Nature Conservancy, and the organization needed a computer system to handle their needs in accounting, membership, fund raising, etc. George first investigated the option of buying a packaged system to meet the client’s needs. The packaged solutions ranged around $250,000 in cost; however, the packaged applications available in the marketplace were geared towards much smaller companies. George determined that the packages did not have large-organization functionality and could not be used for the client.

Next, George investigated the option of building a custom system for the client. Unfortunately, he determined that building from scratch would cost over $10 million – much more expensive than the packages. The non-profit organization was not able to justify such a large expense.

Finally, George turned to outsourcing. It turned out that there was a very small development company (about $20 million in revenue) that was started by a couple of guys who saw a need in the large non-profit market and were creating software for a number of large non-profits, including organizations like PBS. The company was developing a standard system that it then customized to each specific non-profit’s needs. The cost of this option was $500,000 to $1 million, depending on the amount of customization that needed to be done.

George’s only doubts involved the financial stability of the small company. If anything happened to the outsourcer, the non-profit would be left with no support and an unfinished system. But, the non-profit decided to take that risk and go with the outsourced solution.

# Answer to Your Turn 6-1: Select a Design Strategy

The university needs to consider the criteria associated with the strategy of selecting a system acquisition selection. The criteria include the following:

* Understanding the business need; is it unique? Are there business needs that cannot be addressed using standardized software?
* In house experience; does development team have the functional and/or technical experience to develop in house?
* Project management; what is the level of experience of the current project manager?
* Time frame; is the time frame flexible?

# Answer to Your Turn 6-2: Weighted Alternative Matrix

Student answers will vary based on their findings and the development of their matrix.

# Answer to Concepts in Action 6-A: Out of the Box…?

Often, companies will turn to a shrink wrap solution for software needs thinking that it will be less costly, timelier, and that if it was good enough for company X it will certainly address our needs. This is a great time to discuss when it is good to buy a package and when it is not.

# Answer to Concepts in Action 6-B: Bucking Conventional Wisdom with Custom Development

If you have the skillsets in-house to create the custom applications needed it normally makes sense to utilize that talent. Nobody will understand the needs of your company more than the development staff and the analysts of the company.

# Answer to Concepts in Action 6-C: Finding Just the Right Blend

Utilizing a commercially available software package and having it modified to meet the needs of your company can be a very successful endeavor. There are two issues that the company must have, 1: An excellent working relationship with the vendor, and 2: very strong project management skills.

# Answer to Concepts in Action 6-D: Building a Custom System - with Some Help

1. The risks associated with building a custom system without having the right technical skills available within the organization include:
   1. Time needed for developers to acquire skills could delay the project
   2. Developers may already be overcommitted, may not have the time to devote to project which could delay the project
   3. Technical obstacles could cause unexpected delays
   4. Business users may become impatient with growing timeline
2. Choosing an in-house manager allows the company to maintain tight control of the project, particularly given the number of outsourced consultants. This was a large, complex project which might easily have gotten out of control had not the in-house manager clearly set expectations, defined responsibilities, etc.
3. Student answers may vary. In this case it would seem that the decision to maintain control of the project through an in-house project manager was the best choice. Since the project manager was an employee of the company there was an inherent understanding of the business and of the needs of the project which certainly would have influenced the outcome of the project. Using an outside project manager would have meant time needed for them to gain an understanding of the complexity of the project, forging relationships with the employees, etc.

# Answer to Concepts in Action 6-E: Electronic Data System’s Value Added Contract

Student answers will vary depending upon whether they believe the end result was beneficial to the city. Points to consider include:

1. Number and cost of unresolved tickets prior to implementation.
2. Cost of the new system.
3. The projected loss to the city if the new system was not implemented.
4. Number and cost of unresolved tickets after implementation.
5. Although EDS took in well over $50 million on the deal, they spent an estimated $25 million on developing the system, so their net was only $25 million.

# Solutions to End of Chapter Questions

1. *Summarize the distinctions between the analysis phase and the design phase of the SDLC.*

The difference between the two phases is that analysis focuses on determining what the business needs are, whereas the design phase takes those business needs and determines how they will be met through a specific system implementation. The analysis phase includes activities designed to discover and document the features and functions the system must have. In the design phase, those features and functions should not change (much). The focus in design is to figure out how to create a system technically that will provide all those needed features and functions.

1. *Describe the primary activities of the design phase of the SDLC.*

There are many activities that are performed during the design phase, but the specific ones that are necessary are determined once the team has decided upon the best design strategy for the project. The design strategy options are: build the system in-house; purchase a pre-written software package, or hire an outside firm to do the development. Assuming the design strategy is to build the system in-house, then the team will have a myriad of design activities to perform Their primary goal is to develop physical models of the new system that document how it will perform the functions outlined in the Analysis phase. These physical models will represent the new system’s design before the system builders start constructing it. Included in this work will be converting the logical DFDs and ERDs to physical diagrams, planning the integration of the new system with existing systems, making technology architecture decisions, and designing all system components (user interface, input, output, programs, files and databases).

1. *List and describe the content of the system specification.*

This document includes the physical process models, physical data model, architecture report, hardware and software specification, interface design, data storage design, and program design. The system specification conveys exactly what the project team will implement.

1. *Describe the three primary strategies that are available to obtain a new system.*

The three primary strategies for obtaining a new system are custom development (the company develops the system in house using corporate resources), packaged systems (purchasing a system off the shelf), and outsourcing (hiring an external developer, vendor or application service provider to create or supply the system).

1. *What circumstances favor the custom design strategy?*

The custom development strategy is appropriate when several conditions are met. First and foremost, there should be a unique business need which is unable to be fulfilled by a purchased, pre-written solution. Second, there should be functional, technical, and project management skills available in-house, and there should be a desire to build and enhance these skills. The organization should have a proven track record of development, and should have an established systems development methodology. Finally, the project timeframe should be flexible enough to accommodate the uncertainty of a custom development project.

1. *What circumstances favor the use of packaged software?*

Packaged software is an excellent design strategy when the organizational business functions are fairly common and/or the time to implement requirement is short. Accounting practices, inventory control, customer record keeping are all examples of common business functions. If the organization has no specialized business needs, the packaged software option should be the first consideration. The organization still has need of personnel with functional experience and project manager experience to facilitate the integration; however, highly technical developers are not required with the integration of packaged software. Additionally, the time frame to acquire this type of software can be extremely short as vendors can acquire the software with little or no delay.

1. *What circumstances favor using outsourcing to obtain the new system?*

Outsourcing is a good design strategy when the organization does not have the experience or resources itself to do the development in-house, or when it wishes to focus its own resources on other more strategic efforts, and wishes to let an outsourcer handle a less strategic project. It is not a good idea to outsource projects of high strategic value to the organization because the organization does not enhance its own capabilities if the work is outsourced. A very capable project manager is needed to help ensure the success of an outsourcing arrangement.

1. *What are some problems associated with using packaged software? How can these problems be minimized?*

There are two primary problems associated with purchasing pre-written software. First, the software is generally written to appeal to the widest possible market. Its features are likely to be quite generic, and may not fit the procedures of the purchasing company very well. The purchasing company will have to adapt to the software’s features, however. Second, the software has to be integrated into the organization’s existing systems environment. Often, data formats are quite different between the new package and existing legacy systems. To handle these problems to some degree, the purchasing organization can do some customization on the package, or develop workarounds.

1. *What is meant by customizing a software package?*

Customizing a software package means that the organization takes advantage of customizable features built into the software package they have acquired. This can include adding corporate logos, or changing default behavior. The amount of customizable features is application specific, so the developers should have an understanding of what features will be customizable during the acquisition decision process.

1. *What is meant by creating a workaround for a software package? What are the disadvantages of workarounds (if any)?*

A workaround is a custom-built add-on program that interfaces with thee packaged application to handle special needs. It can be a nice way to create needed functionality that does not exist in the software package. Workarounds can be useful in adding a few special features to a pre-written software package, making it more suited to the organization’s particular needs. The two disadvantages of workarounds are: (1) it will not be supported by the software vendor, and upgrades to the package by the vendor may cause problems with the workaround; and (2) the vendor may point to the workaround if any problems occur with their product.

1. *What is involved with systems integration? When is it necessary?*

*Systems integration* refers to the process of building new systems by combining packaged software, existing legacy systems, and new software written to integrate these. The key challenge in systems integration is finding ways to integrate the data produced by the different packages and legacy systems. Integration often hinges on taking data produced by one package or system and reformatting it for use in another package or system.

1. *Describe the role of application service providers (ASPs) in obtaining new systems. What are their advantages and disadvantages?*

Outsourcing firms called *application service providers* (ASPs) supply software applications and/or software-related services over wide area networks or the Internet. In this approach to obtaining software, the ASP hosts and manages a software application, and owns, operates, and maintains the servers that run the application. The ASP also employs the people needed to maintain the application. The customer is billed by the ASP for the application either on a per-use basis or on a monthly or annual fee basis. . Advantages to outsourcing to an ASP include a short set up time for getting the software in use, a low initial outlay, no software maintenance costs, no infrastructure changes to be made. Disadvantages are similar to those for purchasing a software package; specific business needs by not be met by the generic software, customization is minimal, and in this case, workarounds would not be available as the software is not on site.

1. *Distinguish between a traditional ASP and a provider of software as a service. What are the pros and cons of each solution approach?*

The traditional ASP model of obtaining software from a third party vendor is basically an approach where the ASP hosts software applications and owns, operates, and maintains the servers that run the application. In the newer software as a service (SaaS) model the vendors host and service their own software rather than managing and hosting third-party independent software. The ASP model has a relatively low cost of entry and typically a short set-up time. Personnel costs can be lowered and investments in specialized IT infrastructure often can be avoided. On the other hand, with the SaaS model, if the company already has made the investment into staff and infrastructure, these costs can be leveraged and SaaS delivered software can be modified easily to fit the specific task.

1. *Explain the distinctions between time and arrangements, fixed-price, and value-added outsourcing contracts. What are the pros and cons of each?*

A time and arrangements deal is very flexible because you agree to pay for whatever time and expenses are needed to get the job done. The actual final cost of the project will not be known until it is over. You will pay no more than expected with a fixed-price contract because if the outsourcer exceeds the agreed-on price, he or she will have to absorb the costs. The value-added contract is when outsourcer reaps some percentage of the completed system’s benefits. You have very little risk in this case, but expect to share the wealth once the system is in place.

1. *What is the purpose of a request for proposal (RFP)? How does it differ from the RFI?*

*A request for proposal* (*RFP*) is a document that solicits a formal proposal from a potential vendor, developer, or service provider. RFPs describe in detail the system or service that is needed, and vendors respond by describing in detail how they could supply those needs. For smaller projects with smaller budgets, the *request for information* (*RFI*) may be sufficient. An RFI is a shorter, less detailed request that is sent to potential vendors to obtain general information about their products and services.

1. *What information is typically conveyed in an RFP?*

The RFP expresses in detail the needs and requirements of the organization, and specifies the process it will use to evaluate potential vendors. The vendor can then create a proposal that details how it would be able to fulfill the stated requirements, and what its fees would be.

1. *What is the purpose of the weighted alternative matrix? Describe its typical content.*

The alternative matrix communicates the project’s most important criteria and the alternatives that best address them. . Adding weights and scores to the matrix allow the decision maker to prioritize the criteria. Typically, analysts take 100 points and distribute the points to the various criteria depending upon how important the criterion is deemed to be. The assignment of points is entirely subjective. Once the points have been assigned, the analyst then awards a score (1-5), of how well each alternative meets that criterion. The weighted score is the weighted points assigned multiplied by the score received. Each criterion’s weighted score is calculated, and the weighted scores summed. The alternative with the highest score would indicate the best match for the criteria.

1. *Should the analysis phase be eliminated or reduced when we intend to use a software package instead of custom development or outsourcing?*

The analysis phase is very important, even if the design strategy chosen is packaged software. It is critical to understand the business requirements for the problem domain so that the various packaged solution options can be accurately evaluated. The business requirements should drive the evaluation of the packaged software options. We do not want the features of available software packages to determine what is needed to solve the business problems.

# Solutions to End of Chapter Exercises

1. *Assume you are developing a new system for a local real estate agency. The agency wants to keep a database of its own property listings and also wants to have access to the citywide multiple listings service used by all real estate agents. Which design strategy would you recommend for the construction of this system? Why?*

There may well be good packages available for real estate offices. The needs described here would be common among all real estate offices. If a package cannot be found, then this development should be outsourced. I would not expect the real estate office to have in-house development capabilities.

1. *Assume you are developing a new system for a multistate chain of gaming stores. Each store will run a fairly standardized set of game store processes (cataloging game inventory, customer registration, game rentals, game returns, overdue fees, etc.). In addition, each store’s system will be networked to the corporate offices for sales and expense reporting. Which design strategy would you recommend for the construction of this system? Why?*

This system should be outsourced. It is important that this system be well designed and tested since it is essential to the operations of each of the video stores. It is an operational system that is not really strategic, therefore, outsourcing would be an acceptable approach.

1. *Assume you are part of a development team that is working on a new warehouse management system. You have the task of investigating software packages that are available through ASPs. Using the World Wide Web, identify at least two potential sources of such software. What are the pros and cons of this approach to obtaining a software package?*

Student answers will vary based on their findings.

1. *Assume you are leading a project that will implement a new course registration system for your university. You are thinking about using either a packaged course enrollment course registration application or outsourcing the job to an external consultant. Create a request for proposal (RFP) to which interested vendors and consultants could respond.*

Student answers will vary.

1. *Assume that you are your friends are starting a small business painting houses in the summertime. You need to buy a software package that handles the financial transactions of the business. Create an alternatives matrix that compares three packaged systems (e.g., Quicken, Microsoft Money, Quickbooks). Which alternative appears to be the best choice?*

Student answers will vary.

# Answers to Textbook Minicases

1. a. Several things need to be in place before deciding to do a project in-house. The primary consideration should be the business needs identified for the new system. If these business needs are very unique and cannot be readily fulfilled by a pre-written software package, then the firm will have to undertake the development of a custom software application (either in-house or through outsourcing). Also, the more strategic the application is to the business, the more weight that should be given to in-house development. Other issues that should be considered regarding in-house development include the availability of staff with the necessary functional and technical skills, and the organizational commitment and desire to develop/enhance the in-house systems development capability. The firm should also have a skilled project manager available for the project, and should have a proven systems development methodology in place. Finally, since there are many unknowns in the development of a custom software application, the time frame should be flexible, and the budget should be adequate to support the uncertainty of this undertaking.

1. b. Purchased, pre-written software packages are suitable when the business need for the system is fairly standard and is shared by many other firms. In these situations, it is likely that there will be a commercial product developed by a software vendor to support the business needs. There should be in-house functional skills available to understand the business needs and perform an appropriate assessment of candidate packages. The firm probably does not place a high priority on developing the system development skills of its in-house staff. A project manager will be needed to work with the software vendor and coordinate the integration of the product into the organization. Another factor to consider is the available time; purchasing packages is one of the quickest ways to obtain needed software capability, and so may be appropriate when the time pressure is great.

1. c. Although the project sponsor (in this case, Susan) may have some ideas about which approach should be used, it is not generally advisable to make that decision too early in the project. Often, there will be information discovered during system analysis that will affect the decision. Regardless of whether the application is developed in-house or purchased, there should still be a thorough analysis phase performed to understand the existing situation, define needed improvements, and develop a concept for the new system. Only after the system needs and requirements are thoroughly understood should the decision of ‘make versus buy’ be made. At this point, enough information will be known to determine if the needs are unique enough and we have sufficient commitment and capability to undertake the project in-house. Alternatively, we will also know enough after this investigation to determine if there are pre-written software packages that are viable candidate solutions for this situation. (Although the issue of outsourcing is not the focus of this question, it may also be considered at this point.)

2. Student answers will vary to this minicase, depending on the web builder packages selected by students and the selection criteria used. This problem is a great opportunity for students to set up a small software selection evaluation and actually perform and apply research to find the package that is most suitable. There are many website builder options available; many are free or available as a free trial, so students could apply a real assessment of the options.

# Supplemental Minicases

1. Birdie Masters is a chain of golf schools that operates throughout the southwestern United States and California. Using a combination of innovative teaching techniques and a staff of effective teaching pros, Birdie Masters has become quite successful and has expanded rapidly in recent years. An exciting prospect on the horizon now is an opportunity to establish locations in Japan to serve the needs of the golf-crazy Japanese market.

Janet, president of Birdie Masters, authorized a systems development project six months ago to begin development of a new golf school operations system. This networked system will link all school locations together, and enables each school location to collect basic school transaction data and maintain detailed records of lessons, classes, and student progress. The development project has proceeded smoothly through planning and analysis up to this point. The project team held several JAD sessions that included school location managers, teaching pros, and school students. The team has developed a new system concept that has the enthusiastic support of its end users. Not only will the system provide the school location managers and teaching pros convenient data entry and retrieval, but it will also permit current and prospective golf students to view course offerings and schedule classes and lessons via the Internet.

Right now, on a golf course in Tucson, a heated debate is taking place. The current issue under consideration is the appropriate design strategy to use for the remainder of this project. Jack, the director of Information Systems at Birdie Masters, and Arnold, the project manager assigned to this project, have differing views on whether this system should be developed in house or whether the development should be outsourced. Let’s listen in on the discussion.

Janet: Now, let me make sure I understand the situation here. First, the option of purchasing the software is out of the question, since our system needs are unusual and unique to our business. Is that right?

Jack: That’s correct. There’s no disagreement on this issue. Buying the software is not an option.

Janet: So, the other options are to make the software ourselves, or to hire another company to develop it for us.

Arnold: Yes, those are the basic choices we have. However, I see this as a clear situation where we should make the software ourselves. My project team is excited about this project, and we are anxious to move ahead on the design and implementation of our ideas for the new system.

Jack: Now, not so fast, Arnold. Your team has done a fine job during analysis and you’ve come up with some real innovative ideas for this system. The users are thrilled, and that’s great! I’m just not sure it’s in the best interests of our IS shop to undertake the rest of this project ourselves.

Arnold: But Jack, this project gives us the chance to develop some skills we really need to have. We’re going to have a tough time hanging on to our newer IS staff if we don’t give them the chance to do something innovative like this web-based system, and develop some up to date skills like Java. You know that keeping staff is a major headache for us.

Jack: Yes, I sure know that. I’m just not sure a major project like this is a good time for us to be learning new things. We could hire an outsourcer that already has the skills needed for the project on staff, and they wouldn’t have to go through the training our staff would. Besides, we already have a backlog of work to keep the staff busy for months without taking this on ourselves.

Janet: Will using an outsourcing firm be expensive?

Jack: We’ll get bids from several firms in order to find a good contract. Of course, we’ll be paying for the fact that the outsourcing firm has the skills that we need for this project. But, they’ll be able to come in and get it done for us faster than we could ourselves. Considering the fact that we’ve never taken on a project like this ourselves, I think an outsourcing firm will be cheaper in the long run.

Arnold: I still think you’re being shortsighted in this, Jack. We have good, talented people on staff that we want to keep. How can we keep them unless we give them new and exciting technologies and projects to work on? It might take a little longer for us to complete this project than it would an outsourcing firm, but think of the payoff in terms of higher retention and staff morale! You know we’ll have to maintain this system once it’s installed. If we hire an outsourcer, all the skills and knowledge that went into creating the system just walk out the door when the project’s over!

Janet: OK, guys. I think we need to table this discussion for later. Jack, I think you’re up.

1. Can you identify any other issues that are relevant to the decision of outsourcing versus in house development that have not been raised in this discussion?

*Answer: There are several other issues that should be discussed. One is the degree of strategic value of the system. Generally, the more strategically important the system is to the organization, the more important it is to develop the system in house (assuming they have the capability to do so). Another issue is the strategic value of the outsourcing decision itself. If we outsource this project, will we gain strategic value by allowing us to work on other key tasks? An additional, subtle issue is the global aspect of the project. There are plans to expand internationally for the first time, and we assume this system will have to support the new international locations. Is the organization capable of handling the additional challenges of global systems, or will the expertise of an outsourcing firm be required to assist with this venture?*

1. What would you recommend Janet do? Justify your answer.

*Answer: There is no clear answer to this question, and students will be able to debate both sides of the issue. Students who support the in-house development option will cite the need to provide challenging opportunities and new technologies in order to retain IS staff. There is also merit in being very familiar with a system that is strategically important to the organization. Investing in needed training and then doing this development ourselves will strengthen our IS department significantly. Students who support the outsourcing option will cite the expense and uncertainty associated with training our own staff and then undertaking a project more significant than any done before in house. The risks and uncertainties of this are high. There is always the risk that you will invest in staff training, only to have them take their new skills and leave anyway. If this project is of high strategic value, then there is some question that we can ‘gamble’ in its development by doing it in house. The question of what other work remains to be done in house needs to be answered, as does the issue of handling the international aspects of this system. The overall decision probably leans toward outsourcing, but there should be enough fodder for a good debate.*

1. Martin is project leader of a new distribution system project for the Wall-Stone Company. Today, Martin is preparing for a meeting with the key end users who have been involved in the development project so far. Overall, Martin has been very pleased with the contributions made by these end users during the Analysis phase. The team performed one JAD session involving a number of stakeholders that went very well. Other information has been gained through observation, document analysis, and interviews. Although the end users have not had any experience with this type of systems development work before, they have been open to learning about the analysis tasks that were used, and have been forthcoming with good ideas and suggestions for the new system.

At the end of last week, the new system concept was presented to the approval committee in a walkthrough session. Reaction was favorable all around, and the team was authorized to proceed with design work. Now, Martin wants to explain to the end users exactly what the team will be doing during this next project phase. In particular, the end users had become quite adept at interpreting the logical process and data models that had been developed in the analysis phase. Now, Martin wants to prepare them for the transition of those models to physical process and data models.

Develop an outline that Martin can use that concisely explains the changes that are made as logical process and data models are converted into physical process and data models.

*Answer: The steps involved in creating a physical DFD from the logical DFD include:*

1. *Add information to the data flows, data stores, and processes that identifies how each will be implemented.*
2. *Draw a line on the diagram that establishes the human-machine boundary.*
3. *Identify and add any system-related data stores, data flows, and processes that will be required for audit, control, etc. purposes.*
4. *Add any system-related data elements to the data flows.*
5. *Update the metadata in the project repository.*

*The steps involved in creating a physical ERD from the logical ERD include:*

1. *Change the logical data entities to physical tables or files and update the metadata.*
2. *Change all element attributes to fields and add field property documentation to the metadata.*
3. *Assign primary keys to all entities (if not already done).*
4. *Add foreign keys to entities to establish required entity relationships.*
5. *Add system-related tables and fields (see physical DFDs to identify new system-related data stores and data elements that may have been added).*
6. Mary is Executive Director of the Helping Hand Assistance Agency, a non-profit organization that provides support and services for adult caregivers. The Helping Hand Assistance Agency has been operating for eight years, and has seen growth in the number of clients served and the range of services provided. Mary has been in the executive director position for the last two years.

A factor that is critical to the agency’s success is its fundraising. Every year, Helping Hand has seen its donor list grow as word of its quality services spread throughout the region. Four years ago, the person who was then serving as executive director authorized the purchase of a PC-based system to manage all the data associated with fundraising and donations. The software that was purchased had an interesting history. The author of the software developed it in his spare time to assist a charitable organization with which he was involved manage its fundraising efforts. After developing the system, the author decided to market the system to other not-for-profit agencies. The price for the software was quite low, and the software did well in terms of initial sales. The author of the software promised little in the way of support for his product, however, and many of the agencies soon found that they could not adapt to some of the quirks in the software’s design. There was little that could be done to customize the software, and the author was either very slow to respond or was non-responsive to requests for modifications to the product. Eventually, the author notified all purchasers of the product that he was moving on to other ventures, and would no longer be providing support of any kind to the purchasers of his software.

The staff at Helping Hand Assistance Agency struggled to adapt to this software, and eventually got several of its routines to function correctly. They were unable to use all of the software features, however, and today, their fundraising system is a cobbled together blend of automated and manual processes. Sometimes Mary considers their fundraising success a miracle, considering the tangle of processes used.

The time seems right for the Helping Hand Assistance Agency to obtain another software package that will support their fundraising and donation activities. Mary wants to do a good job this time in finding an appropriate package. There is no question that software must be purchased; the agency has little IS expertise on its staff. Prepare a set of guidelines that Mary can follow that will assist her in selecting a suitable software package for the organization.

*Answer: It would be ideal if Mary could obtain some IS expertise to assist in this software selection process. Since funds are probably tight, she may be able to find an IS professional who would be willing to donate some time to help. Having a college class take this task on as a project is a possibility, or perhaps internships could be offered to IS students to work on this project. The project team should follow these steps:*

1. *Perform an analysis of the agency and identify the needs and requirements for this system. Even though the software will be purchased, the agency needs to have defined what it is looking for before it begins evaluating candidate packages.*
2. *Identify candidate vendors. Use personal contacts, trade publications, and other methods such as Internet searches to find companies who offer software packages that may be suitable. Try to find at least three sources of software for comparison.*
3. *Develop a statement of need that outlines the features and requirements the agency needs. This may be viewed as a Request for Proposal, although the less formal Request for Information may also be used. Send this information to the vendors and ask for a response by a specific date. If the vendor’s product fulfills the agency’s requirements, have them send documentation and prepare a demonstration.*
4. *Evaluate each vendor’s product based on the materials provided, a demonstration, and the vendor history and support capabilities. Use an Alternative Matrix to concisely compare each option using the feasibility techniques of technical, economic, and organizational feasibility. The key here is to identify the product that comes closest to fulfilling the agency’s needs, with appropriate vendor support behind it.*

# Experiential Exercises

1. Purpose: to enhance student understanding of a Request for Information.

Develop a scenario involving the acquisition of some technology that has meaning to the students. This will vary from place to place. On my campus, for example, there is a project underway to convert the student ID cards into ‘smart cards’ that will have many uses around campus. Clearly, new technology will need to be acquired to utilize these cards. Some other technology may be more appropriate for your campus.

Once a technology has been selected, have the students do some Web research for potential sources of the technology, just to gain a background. Then, working in groups, have the students prepare a Request for Information to be sent to one of the potential vendors. Emphasize the need to ask for specific information. Have the groups discuss in class their RFIs, and compare and contrast the content of each group’s work.

1. Purpose: to enhance student understanding of an Alternatives Matrix.

Assign the students a task such as selecting the hardware, software and networking technology for a computerized classroom. Working in groups, have them develop two distinct alternatives for accomplishing this task. (Simply using different vendors for the hardware could be a way of creating two alternatives. Encourage them to consider other options as well.) Once two alternatives have been chosen, have each group develop an alternatives matrix for their options. Each group should then present and explain their alternatives to the class, using the matrix as a basis for the discussion.

1. Purpose: to develop an appreciation for the positive and negative aspects of packaged software applications.

Invite a businessperson to class whose organization has acquired a packaged software solution for a significant business function (i.e., not word processing). There may be someone on your campus in an administrative office that would also be a suitable guest. Try to find someone with a business perspective, however, not a technical perspective. Have the guest discuss the process that was used (if any) to decide that purchased software was the best design strategy. Also discuss the evaluation and selection process that was used to choose the software package that was implemented. Ask the guest to discuss the organizational reaction to the software package, and how the adjusted to the new software.

1. Purpose: to develop an appreciation for the complexity of systems integration.

Invite an IS professional from your campus or a local business to class. Identify someone who has been involved in the selection and installation of a software package that had to interface with other existing systems. Ask the guest to discuss the issues that had to be confronted when integrating the software. In particular, ask about data translation programs that had to be written or other middleware that was needed to enable the new and existing systems to work together.