If architecture is concerned with the relationships among components and the externally visible properties of system components, then design will additionally be concerned with the internal structure of those components. For example, if one set of components consists of information-hiding modules, then the externally visible properties form the interfaces to those components, and the internal structure is concerned with the data structures and flow of control within a module (Hoffman and Weiss 2000, chaps. 7 and 16).

## Creating a Software Architecture

So far, we have considered architecture in general and looked at how software architecture is both similar to and different from architecture in other domains. We now turn our attention to the "how" of software architecture. Where should the architect focus her attention when she is creating the architecture for a software system?

The first concern of a software architect is not the functionality of the system.

That's right—the first concern of a software architect is not the functionality of the system.

For example, if we offer to hire you to develop the architecture for a "web-based application," would you start by asking us about page layouts and navigation trees, or would you ask us questions such as:

- Who will host it? Are there technology restrictions in the hosting environment?
- Do you want to run on a Windows Server or on a LAMP stack?
- How many simultaneous users do you want to support?
- How secure does the application need to be? Is there data that we need to protect? Will the application be used on the public Internet or a private intranet?
- Can you prioritize these answers for me? For example, is number of users more important than response time?

Depending on our answers to these and a few other questions, you can begin sketching out an architecture for the system. And we still haven't talked about the functionality of the application.

Now, admittedly, we cheated a bit here because we asked for a "web-based application," which is a well-understood domain, so you already knew what decisions would have the most influence on your architecture. Similarly, if we had asked for a telecommunications system or an avionics system, an architect experienced in one of those domains would have some notion of required functionality in mind. But still, you were able to begin creating the architecture without worrying too much about the functionality. You did this by focusing on *quality concerns* that needed to be satisfied.

Quality concerns specify the way in which the functionality must be delivered in order to be acceptable to the system's stakeholders, the people with a vested interest in the outcome of