

## **State-of-the-Art Review**

Research is an important part of a designer's job. In fact, a recent study of some of the most innovative companies by the National Research Council listed *keeping abreast of the state of the art* as one of the primary components of good design practice. The *State-of-the-Art Review* is that body of information that must be gathered in order to become expert in the area of the problem. It is the foundation for the entire design process. If it is done well the chances of achieving an outstanding design are increased greatly. It is important to note that the *State-of-the-Art Review* will be continuously updated throughout the design process as you gain experience by collaborating with customers and others who are experts in specific areas. Areas of study should include:

### ***Historical Perspective:***

It is important to consider information from the earliest known references to the problem area. This can help prevent efforts that merely serve to 'reinvent the wheel'. It is also possible that information may have been determined in the past which could now be utilized because of inadequate technology at that time. New technology might now be available to make it possible to incorporate the 'old' information into an outstanding design.

### ***Trends in the Field:***

We want our designs to meet future needs and be as long-lasting as possible. Therefore, we must anticipate future needs. One way to do this is to look at past and present trends and try to determine future trends.

### ***New Technology:***

It is the responsibility of engineers to solve problems by applying existing technology, especially the latest technology. We must search for ways to produce designs that achieve breakthroughs in quality, performance, and cost. You must investigate all new technologies that could possibly be applied to the problem.

### ***Marketing:***

Who is the customer? Where can I find them? Do I have the names of potential customers that I can approach during the design process? What does the customer want in the way of: cost, reliability, safety, performance, etc.? What is the potential market for the product? What would be the likely production volume? What service requirements are there? Who will perform the service? How is the product likely to be used? In what environment will it be used?

### ***Design:***

What are the competing products on the market? What are the results of reverse engineering one of the competitors' products? What technologies are being used? What engineering disciplines will be involved (mechanics, electronics, mechanisms, thermodynamics, etc.)? What materials are being used? Is there an opportunity to use new materials? Who are potential vendors for the design? What research journals would have information pertaining to this area? What articles on this topic have been published in the past 5 years? What periodicals are likely to have articles related to this design? What are the pertinent articles in the past 5 years?

***Manufacturing:***

What manufacturing methods are being used in producing the parts on the competing products? What are the limitations of these manufacturing methods? Are there any new manufacturing methods that could be used? How are the competing products assembled? What is the assembly sequence? Where can I find data on manufacturing costs? What fastening methods are used for the parts? Are there any assembly problems? Who are potential vendors for the manufacturing? What research journals would have information pertaining to manufacturing-related topics? What articles on the manufacturing methods we expect to employ have been published in the past 5 years? What periodicals are likely to have articles related to this design? Have there been any pertinent articles in the past 5 years?