

Top-Down Design: An Introduction for New Engineers

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Engineers no longer begin their careers by working on individual pieces of the system; they now may be involved in developing the system architecture and performance specifications

About 20 years ago, I heard a young engineer lament, “I don’t want to be stuck in a cubicle for the next five years designing one thing!” At that time, the most common engineering career path was, quite

literally, starting at the bottom—the bottom of the flow chart of product development.

Things have changed, especially in the past five to ten years. Changes in types of products and company staffing are certainly a big part of the change. In addition, the nature of design has changed as well, with chipsets that replace discrete designs and modules that perform several functions that were previously designed from scratch.

As a result, new engineers may find themselves being asked, or expected, to make major contributions at the earliest and highest levels of design. Instead of a career that clearly works from the bottom up, today’s engineers must know how to be involved in design and development from the top down (Figure 1).

This tutorial is intended to be an orientation to the typical way products are developed in many original equipment manufacturing (OEM) companies. Specifics of the process will vary among companies, but, in general, the flow from top to bottom will be similar to what is presented here.

The Process of Top-Down Design

Although the development of a new product may be a familiar working environment for a senior engineer or manager, new hires may not have a clear vision of the overall pro-

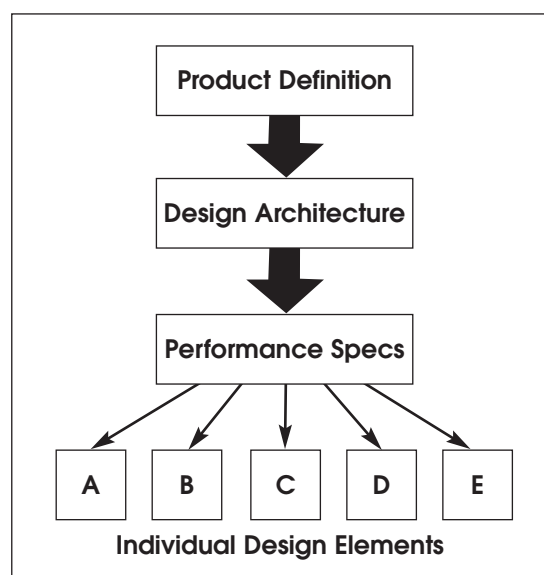


Figure 1 · A simplified product design flow. Past generations of engineers always started at the bottom and worked their way upward in the development process as they gained experience. But now, new engineers increasingly find themselves expected to contribute from the top-down.

cess. College courses establish fundamental technical concepts, and laboratory projects tend to represent the kind of individual pieces that previous generations of engineers began their careers working on. At best, an advanced project or a work internship will provide some insight into the “big picture.”

Actually, a picture is the best way to show the process. Figure 2 presents a detailed version of the design work flow, noting the nature of each step, plus the feedback mechanisms that are part of that process.

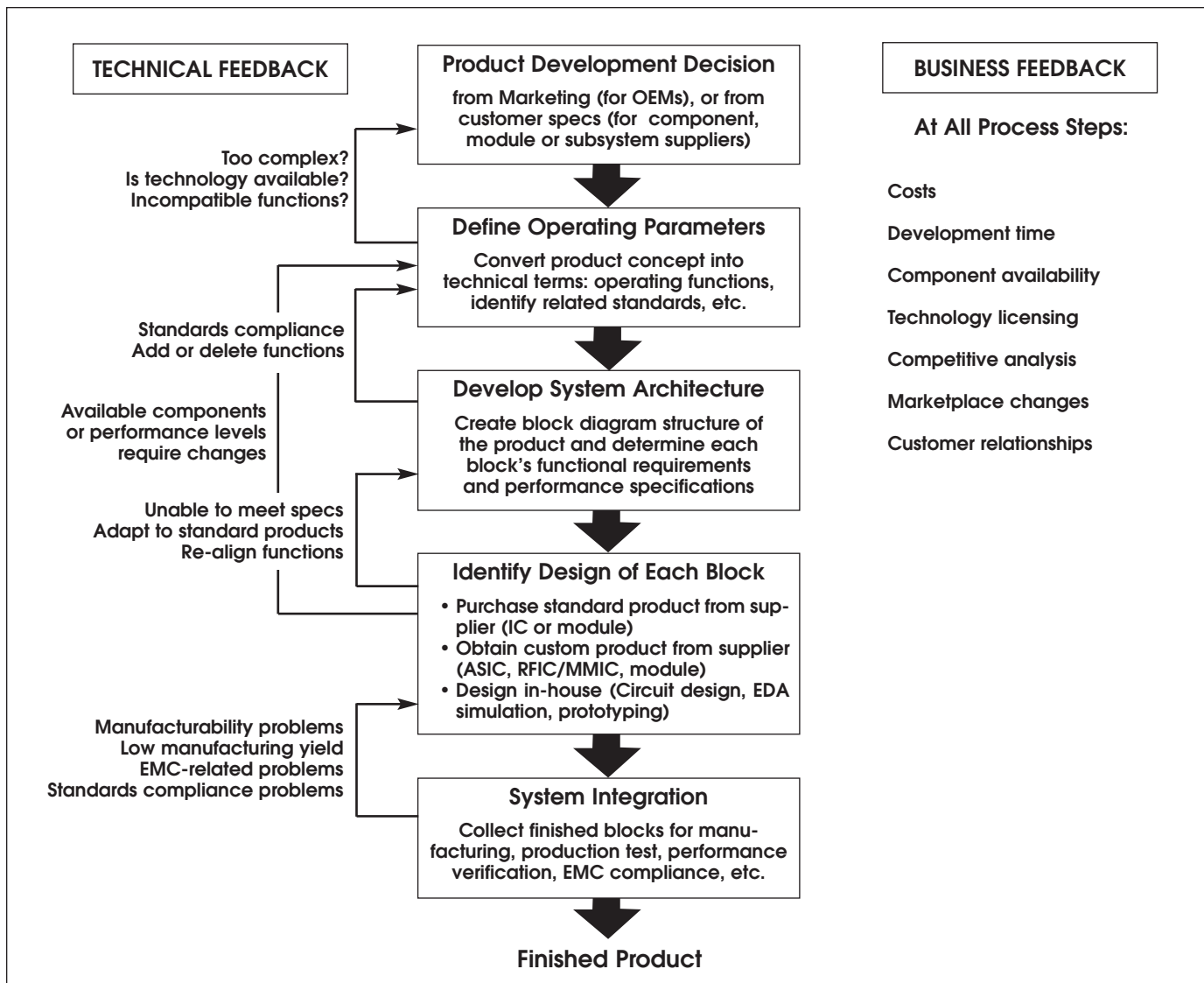


Figure 2 · Detailed product design flow, listing the typical design tasks for each step. “Feedback loops” for making corrections to the process can be either technical or business related.

Some of the most significant issues that arise during the development process are business related, as noted in the feedback list on the right side. The often-quoted issues of cost and time-to-market can have a big effect in a consumer or commercial product. These may be less of a factor in some high-end applications where performance is paramount.

Some of the technical issues will not be accessible to a new engineer until a certain level of experience is acquired. These include design-for-manufacturability, design-for-test,

and EMC compliance.

Working with vendors is also part of the process that is typically undertaken by more experienced engineers. However, this is an area where a beginner should pay close attention, because vendors play an ever-increasing role in product design and development. Not only are key components and modules obtained from specialized suppliers, but manufacturing and test services may be provided by a contract manufacturing company, possibly half-way around the world!

Summary

Growth in wireless and other high frequency technologies, along with changes in the structure of the component supply chain, has resulted in a new set of responsibilities (and employer expectations) for new engineers. With this brief introduction, we hope that new engineers can begin learning more about the overall process of product development. Understanding technology is essential, but so is understanding the development processes that bring that technology to the marketplace.