

# Preface

It is said that good users are essential to the birth of good software, because it is the discerning users who help foster software quality. This book discusses the uses of 3D data mainly in the Japanese manufacturing industry. Originally, 3D CAD, CAM, and CAE data was used exclusively for product design. However, in recent years, the Japanese manufacturing industry has used 3D data to revolutionize manufacturing processes. By using lightweight 3D formats such as XVL, Lattice Technology's eXtensible Virtual world description Language, Japanese manufacturers have improved production and laid the groundwork for innovative new methods of corporate communication.

This book discusses how leading Japanese manufacturers use 3D data in downstream processes, how the IT infrastructure required for this has been built, and some of the trial and error behind these developments. Each of the companies introduced as case studies are leaders in Japanese industry. It should be particularly interesting to European and American manufacturers to learn how their counterparts in Japan make use of IT to gain competitive strength. In fact, European and American manufacturers are starting to use 3D in downstream processes; this book includes examples from three leading manufacturers. It is interesting to note that the software described in this book, which supports manufacturing, a forte of Japan, was also developed in Japan, demonstrating that outstanding software is indeed nurtured by outstanding users.

We sometimes hear people talk about the CRIC cycle, which stands for crisis, response, improvement, and complacency. When faced with a crisis, people respond and try to fix the problem. The conditions improve, and then complacency sets in. But what happens if the solution is a "quick fix" that does not solve the underlying problem? People are complacent, but the risk remains – a trap we are all apt to fall into.

The CRIC cycle can sometimes be seen in the manufacturing industry. Manufacturers constantly strive to enhance quality, cut costs, and shorten delivery times. 3D CAD/CAM/CAE has been embraced as a solution to these challenges.

In the 1990s, Boeing started using 3D CAD to design its 777 family of aircraft. This endeavor, which involved intense collaboration with partner companies, demonstrated clearly the advantages of concurrent engineering using 3D design.

At the same time, China was seen to rapidly adopt 3D design, skipping the 2D CAD drawing step that other nations had gone through. Japanese industry experienced a sense of crisis and rushed to start using 3D CAD as well. This was how applications of 3D design in Japan started to shift into full swing. It is now expected that Japanese manufacturers will be able to innovate their production processes using the 3D CAD data that has accumulated in design departments. However, in reality, many companies do not seem to be fully utilizing the 3D CAD software which they have procured. In addition, many companies that have embraced 3D design are using 3D data only for checking simple 3D shapes and drawing illustrations very limited applications. It looks like these companies have fallen into the trap of the CRIC cycle. It is said that if the path from crisis to complacency is long, the path that follows is also long. This means that if the cycle prolongs, it becomes difficult to break away from the crisis. These companies therefore need to ask if they are content to just have installed CAD, or to just be using the 3D data for limited purposes, and if the improvement measures they have implemented are not simply quick fix solutions.

Adoption of 3D CAD incurs huge costs for procuring and installing expensive hardware and software, training costs for designers and engineers, and costs for changing business processes. However, often the 3D CAD data generated at such high costs is used only in design and manufacturing, which make up less than 10% of the whole IT domain. The other 90% sees no benefit from this data. Often this is blamed on the large size and complexity of 3D data which makes it difficult to use. However, things are changing with the emergence of lightweight 3D data formats and viewers in recent years, which is increasing the use of 3D data not only inside the company but also outside. This is a natural development because 3D data can be understood intuitively and is an optimum tool for communication. Even Microsoft Windows Vista is equipped with a 3D viewer function, which is expected to increase the visibility and importance of 3D data.

This book introduces methods of using 3D data to enhance competitive strength in manufacturing. Chapter 1 explains the current situation of 3D design in Japan, a source of competitive strength of the Japanese manufacturing industry. Chapter 2 describes the background of lightweight 3D data. Chapter 3 introduces the pioneering case study of SONY which describes how to build an information infrastructure for 3D data. Chapter 4 discusses the advantages of using general lightweight 3D data, and Chapters 5–13 are case studies of leading manufacturers that have innovated business processes using 3D data. The lessons learned from their efforts are summarized in Chapter 14, and the lightweight 3D tools that these companies used are explained in the two appendices.

This book hopes to capture the essence of using 3D by examining leading edge efforts in 3D data applications. Though 3D can be beneficial for limited applications, such an approach fails to capitalize on the benefits of 3D data. Only by standardizing 3D use across the enterprise can companies fully realize the value of 3D data and break the CRIC cycle.

The use of lightweight 3D data is an attempt to incorporate IT into manufacturing technologies. The goal of the use of 3D data is to eliminate all unnecessary

work of designers and manufacturing staff so that they can concentrate on innovative work. In addition, by sharing knowledge from design and manufacturing with downstream departments, quality and productivity can be enhanced throughout the company. By taking readers through 3D data uses by pioneering companies, this book hopes to show how IT can be used to improve manufacturing not just in Japan, but all over the world.

3D Manufacturing Innovation  
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