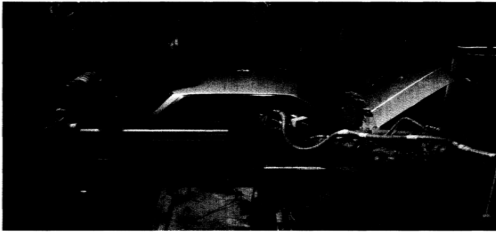


# Concurrent Engineering in Construction Projects (Spon Research)

Toyota's Principles of Set-Based Concurrent Engineering  
Darward K. Sobek II, Allen C. Ward, Jeffrey K. Liker  
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## Toyota's Principles of Set-Based Concurrent Engineering

Darward K. Sobek II • Allen C. Ward • Jeffrey K. Liker



*How Toyota's product design and development process helps find the best solutions and develop successful products.*

Darward K. Sobek II is assistant professor in mechanical and industrial engineering, Montana State University. Allen C. Ward is president of Ward Synthesis, Inc. Jeffrey K. Liker is an associate professor in industrial and operations engineering, University of Michigan.

Toyota Motor Corporation is an industry leader in product development lead time while using fewer engineers than its U.S. competitors. It has also shown remarkable consistency in market share growth and profit per vehicle, which led to cash reserves of \$21 billion, exceeding those of the "Big Three" automakers combined.<sup>1</sup> The Toyota Production System (TPS), dubbed "lean manufacturing," has been critical in these accomplishments,<sup>2</sup> but we believe that Toyota's product design and development system is also an important contributor.<sup>3</sup>

While Taiichi Ohno and others have meticulously described the TPS, the

Toyota development system has not been well documented.<sup>4</sup> Indeed, Toyota does not use many of the practices often considered critical to successful concurrent engineering and associated with Japanese manufacturers. Its development teams are not colocated. Personnel, with the exception of the chief engineer and his staff, are not dedicated to one vehicle program. Cross-functional job rotation is unusual for the first ten to twenty years of an engineer's career. Engineering and test functions rarely use quality function deployment (QFD) and Taguchi methods. Toyota excels at value engineering (VE) and value analysis (VA), yet Toyota engineers say they do not use any of the text-

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