SIMULTANEOUS ENGINEERING for NEW PRODUCT DEVELOPMENT

Manufacturing Applications

JACK A. RIBBENS

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FOREWORD

As a Chinese philosopher once said, "May you live in interesting times." In fact, it is clear that today we are living in interesting times, very interesting times, and challenging as well. Certainly, this notion applies to manufacturing and the product development process that underlies manufactured products. While my expertise is primarily focused on the automotive industry, it is evident that much of what we are witnessing in this industry applies to other manufacturing industries as well. At the most fundamental level, there are remarkable similarities when we consider such factors as these:

- Exploding knowledge, including technology
- Dissolving global boundaries and the acceleration of globalization as companies develop globally integrated organizations
- More demanding customers for all goods and services
- Changing industry structure, including mergers and acquisitions, and a new order of the manufacturer/supplier relationship, as suppliers take increased responsibility for the design of parts, modules, and systems
- Simultaneous engineering, which, at its most rudimentary level, brings product engineering and manufacturing together
- A profound and rapidly growing role for information technology in all of its forms
- Intensifying competition
- Human resource challenges as all of industry becomes more skill dependent, even as retirements accelerate
- Time pressures that demand more, better, yet faster results

- Dynamic leadership committed to effectively managing change and serving as coach of the team

It is in this context that product development is taking center stage in entire manufacturing industries and within individual companies. Never before have we seen such great emphasis on, and need for, effective product development processes. It is also clear that product development, in the current era, is far more than sketch, engineer, and build. Today, it is a time-driven, knowledge-based process that involves every aspect of the enterprise from market assessment and initial conceptualization to the selling process and tracking throughout the full product life cycle. It should be a highly integrated and well-defined process that accords proper attention to every element. It can no longer be an ad hoc process, but rather a process involving very specific steps and methods. This does not mean that it need be highly rigid or that there is only one "right" process. In fact, there are many effective product development solutions to the same problem, but all the bases must be touched. In a given organization, there is no longer room for freelance product development; it must adhere to the company's specific process.

Jack Ribbens has written an excellent book on product development with specific emphasis on the automotive, aerospace, electronic, and defense industries. It is generally applicable, however, to any manufactured product. The essential rules and methods remain the same. Jack has identified the key steps in the product development process and has applied them to specific industrial cases. While he addresses specific industries and products, he also creates a broader context for the overall process as well.

This is certainly a book for young, inexperienced engineers, designers, and technicians; it could readily be used in colleges, universities, and community colleges, as well as serving as a training guide in industrial organizations. It also has application for experienced practitioners, particularly when we consider the massive level of retraining being done with existing employees in response to a fast-changing competitive environment. Finally, I believe *Simultaneous Engineering for New Product Development: Manufacturing Applications* certainly has considerable value from a remedial or updating viewpoint. In general, it could help bring an organization's thinking back onto the proper track.

Today, there is no room for multiple processes and an ad hoc methodology within any given organization. It is absolutely necessary to have a common process, although as noted earlier, this can differ in detail rather significantly from one organization to another. Certainly, this book can as-

sist in developing a robust process that is a fit with both the culture of the organization and the rapidly evolving new world.

Clearly, technology is having a profound and growing impact on the product development process. Math-based simulation tools are promising to significantly reduce the time and cost of many facets of the process, from the initial styling and conceptualization phases through engineering (involving the use of virtual prototypes) and manufacturing. Furthermore, information technology tools are becoming increasingly critical to the communication and coordination of the total process.

For those of us with an engineering background, the example problems common to any engineering text are well presented by the case studies in Jack Ribbens's book. These are very helpful in reducing the abstraction of the process. Ultimately, product development is not an exercise in creating an imaginary or virtual product. It must be aimed at developing a real product that people and organizations want to buy at an affordable price. I am enthusiastic about this book, and believe it will be of considerable value to students and practitioners alike.

DAVID E. COLE

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PREFACE

I have been interested in Simultaneous Engineering for the last 20 years, when I worked for one of the big three automobile companies in the United States. I was in one of the engineering staff groups assigned to monitor important design activities for key parameters, including weights, warranty expense, product cost planning, prototype development, among others. The staff would meet every day for several hours on a certain topic, with the appropriate release group. Monday was cost reduction, Tuesday was weights, Wednesday warranty reduction, Thursday standardization and simplification, and so on. New engineering proposals were debated, product-change notices were written, and all manner of business was conducted in these interminable meetings. At the end of the week, the staff had to report to senior management the status of all the programs and the variances to target for weights, costs, and so forth. However, it was all guesswork because, while everyone agreed that the variables being debated were highly interactive, no one had sufficient information or resources to accurately predict the joint outcomes for all of the programs and changes in process. I began to think that a prediction model would be a worthwhile endeavor for study, which I began as part of my MBA program (albeit informally) but never finished.

Later, after I began working in the insurance industry, I had more opportunities to continue the process as we started reviewing new vehicle programs for damageability and repairability problems. It became obvious during our discussions with automotive engineers that the interactivity between design variables was extremely complex and occurred only infrequently with much priority. When an interaction potential was raised—such as the mass and manufacturing complexity implications of providing factory seams adjacent to crush zones—for ease of partial replacement, there was usually an uncomfortable silence before they tried to redirect the

discussion back to the repairability of plastic bumper covers and similar components.

That was then. Now, 20 years later, auto manufacturers have almost entirely computerized their new product design and engineering processes, utilizing programs such as Catia, and others. However, the basic issue remains: many engineers and designers do not have the time or experience to get involved in functions outside of their immediate area, unless specifically required for interface development, for mating part tolerances, clearances for assembly or system compatibility. It is rightfully senior management's reponsibility to insure that all program parameters are being met or exceeded. However, I believe that designers, engineers, and technicians can contribute more to their companies and careers if they have a heightened awareness of the potential interactions between design parameters and how theoretical solutions can provide practical solutions by thinking through the problems that transcend their individual engineering assignments. To this end, the book is hereby dedicated.

I wanted to recognize the assistance that I have been given over the past few years in doing the research completing this text. Valuable insight and constructive criticism are very important to new writers, and I received a great deal of both along with support from the following:

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CONTENTS