Womack, James, Jones, Daniel, & Roos, Daniel. (1991). *The machine that changed the world*. New York: Harper-Collins: $12.00, (softcover), 323 pp. (ISBN 0-06-097417-6)

Reviewed by Harvey Fred Walker[1]

The automobile industry may appropriately be characterized as having produced machines "that changed the world." While some changes have been positive and some negative, the impact has been truly global in nature. James Womack, Daniel Jones, Daniel Roos, and others at the Massachusetts Institute of Technology (MIT) formed the International Motor Vehicle Program (IMVP) and engaged in a five-year, five-million dollar research project directed at identifying production factors leading to success in the global automobile manufacturing industry. The goal sought by the IMVP was to synthesize success factors, document their effect on organizational operations, and to develop a strategy guiding production of this machine more efficiently. Previous work by the IMVP toward this goal produced, *The Future of the Automobile* (1984), a book devoted to summarizing research on evolving trends and practices in the automobile industry.

The Machine That Changed the World is a well-written book that highlights comparisons and contrasts among automobile manufacturers. The book is written for a general audience interested in the topic of automobile production. Of particular relevance to the technology educator however, is the time frame and scope of the book. A chronological history of global automotive development and manufacture, from the industrial revolution to the present, provides many useful insights to the technology educator. Among the most important of these insights are discussions of the origins and future of manufacturing technology. In addition to high-school, undergraduate, and graduate educational relevance, technology educators would personally benefit from reviewing this material.

The book identifies "lean production" as a technology that is reshaping automobile manufacturing. While lean production may have originated in Japan under the concept of shared destiny, the authors emphasize that it is no longer confined to Japan.

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Lean production, as an emerging technology, is being adopted at varying rates by automobile and other manufacturers of the world. The driving force behind adoption is the need to provide more product variety at less cost with shorter development cycles. The adoption rate of lean techniques, however, differs from organization to organization and from country to country. Particularly noteworthy is that no one country, Japan included, may be characterized as being totally lean.

Lean production strategy synthesized managerial and manufacturing theories used in industry and academia. Primarily, lean production integrated product design, supply, distribution, manufacturing, accounting, marketing, and management under an umbrella of concurrency. Other related topics were identified and discussed in the book, including political, legal, and social concerns. Ironically, many of the theories comprising lean production are currently a part of technology curricula and technology-teacher preparation.

The book suggests that an ideal lean production system consists of all members within the system sharing information and resources in a team-oriented, multi-functional environment. The skills and abilities to share and work in multi-functional teams are key underpinnings and goals of current technology education. The authors discuss how an organization may begin the lengthy process of achieving leanness. The process of achieving leanness could be modeled in technology curricula to increase the effectiveness of student preparation for the realities awaiting them in industry.

In retrospect, *The Machine That Changed the World* provides useful insights into integrated product design, supply, distribution, manufacturing, accounting, marketing, management, and concurrency. The insights are particularly relevant to the technology educator when considering their political, legal, and social ramifications. Technology educators, particularly those responsible for teaching manufacturing concepts, will find this book most useful in updating their understanding of current manufacturing technologies.