

## Reviews

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J.P. Womack, D.T. Jones and D. Roos, *The Machine that Changed the World. The Story of Lean Production*. New York: Harper Perennial, paperback, 1991, 323 pp.

At the very outset, I recommend this book to all those readers who are concerned with the problems of a U.S. decline in manufacturing and with providing possible remedies for the unbalance in U.S. trade. This book is the result of a far-flung project centered at MIT which took \$ 2 million dollars to conclude. It was called the International Motor Vehicle Program (IMVP). The program undertook to study and compare the automobile manufacturers from the entire industrial world. The comparison centered between three major blocks: Japan, the U.S. and Europe. The project funded on-site field studies of the major auto producers.

The book reveals that vast differences between the best and worst facilities. It introduces the concept of *lean production* created by the Japanese according to which the whole enterprise of producing an automobile could be simplified and trimmed to the point that it would be flexible and lean, changes in design and in assembly being made quickly and often. These principles lead to such dramatic improvements in cost and efficiencies that companies wedded to the antiquated mass production techniques cannot begin to compete with those who have adopted lean production techniques.

The following figures illustrate some of these differences:

*Performance.* Productivity (hours/veh): 16.8 for Japanese plants in Japan vs. 36.2 for all plants in Europe; quality (assembly defects/100 vehicles): 5.7 vs. 7.8, resp.; size of repair area (as % of assembly space): 4.1 vs. 14.4, resp.; inventories (days for 8 sample parts): 0.2 vs. 2.0, resp.

*Work Force.* % of work force in teams: 69.3 vs. 0.6, resp.; job rotation (0 = none, 4 frequent): 3.0 vs. 1.9, resp.; suggestions/employee: 61.6 vs. 0.4, resp.; training of new production workers (hours): 380.3 vs. 173.3, resp.; absenteeism: 5.0 vs. 12.1, resp.

The book dramatically demonstrates that lean production is not just a passing 'fad'. It is a design, engineering, production, organization and human resources philosophy that pervades the entire firm, as well as its suppliers, and even consumers. In one graphical comparison, the authors show that the least automated Japanese domestic plant in the sample studied (with 34% of all steps accomplished automatically), which is also the most efficient plant in the world, needs *half* the human effort of one comparably automated European plant and a third the effort of another. In another example, we can learn that the European plant that is the most automated in the world (with 48% of all assembly steps done by automation) required *70 percent more effort to perform* the standard set of assembly tasks on the standard car that is needed by the most efficient plant with only 34 percent automation. It seems that the 'high tech plants that are improperly organized end up adding about as many indirect technical and service workers as they remove unskilled direct workers from manual assembly tasks'. (Our emphasis.)

The following statistics reveal the disparity existing between product development performance between Japanese producers and European ones:

- Average engineering hours per new car (millions): 1.7 vs. 3.1.;
- Average development time per new car (in months): 46.2 vs. 59.9.;
- Number of employees in project team: 485 vs. 904.;
- Number of body types per new car: 2.3 vs. 1.3.;
- Prototype lead time (months) 6.2 vs. 10.9.;
- Return to normal quality after new model (months) 1.4 vs. 12.

Obviously, companies that have mastered lean design take advantage of their strength in the marketplace. They offer a wider variety of products and replace them more frequently than mass production competitors. In every case, the shorter development cycle makes the lean companies more responsive to sudden changes in consumer demand.

When referring to the job of coordinating the supply chain, lean producers have a marked advantage over all others which starts with the design of the parts, the organization of the supply chain and, the relationship between the manufacturers of the finished product and its suppliers. In lean production, the latter are usually larger, more talented, better staffed. They supply components at more frequent intervals than their mass production counterparts, abide by much higher quality standards and at much lower costs. Finally, the lean producer treats the buyer, or owner (you and I) as 'an integral part of the production process'. The elaborate data collection on owner preferences for new vehicles is fed systematically in the development teams for new products and the companies go to extraordinary lengths never to lose an owner once he or she is in the fold.

Knowledge of the differences between lean Japanese and European or U.S. manufacturers of automobiles has been well known for many years. However, what this book shows is that the difference in favor of the philosophy of lean production is not only due to the organization of the factory floor, but is a mind-set that must revolutionize the whole automobile industry and beyond.

This book is a must for those interested in learning why General Motors, and other large companies like it, are probably obsolete and will never

recover. It shows why the Japanese industry is so far ahead with its world wide competitors. However, the book also illustrates that a company like Ford has been successful at changing its ways and, as an example, has built a plant in Mexico which rivals any other in the whole world, Japanese included. Obviously, the European have not read about lean production yet, and cling to old ways.

The authors are emphatic in stating that the auto industry is only an example of lean production. They explain that it is a philosophy which may have started in the auto industry, but which can be adopted by any other. We would recommend this medicine for companies like IBM and Sears which are suffering the effects of clinging to obsolete organizational and production paradigms. It is interesting to note that books by Robert Reich (*The Next American Frontier*, Times Books, 1983) and Ira Magaziner (with R. Reich) (*Minding America's Business*, Vintage, 1982), whose authors hold important roles in the Clinton administration today, already anticipated the outlines of lean production several years ago. Readers may recall them when they read the present offering. They may also want to refer to more recent books such as Robert Reich's *The Work of Nations: Preparing Ourselves for the 21st. Century Capitalism*, (Knopf, 1991) and Lester Thurow's *Head to Head: The Coming Economic Battle Among Japan, Europe and America* (Morrow, 1992&. However, Womack's book on lean production is decidedly much more informative, powerful and incisive.

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