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The Second Century: Reconnecting Customer and Value Chain through Build-to-Order; Moving beyond Mass and Lean Production in the Auto Industry, by Matthias Holweg and Frits K. Pil. Cambridge, MA: MIT Press, 2004. 232 pages. US$ 35.00.

To the casual observer, *The Second Century* appears to be a scholarly study confined to cyclical supply chain issues of the auto industry. Further examination reveals complex lessons in system dynamics. *The Second Century* was not written for individuals who are looking for a quick fix; rather it is intended for strategic planners entrusted with optimizing interdependent, dynamic systems. "Those who believe that volume and efficiency drive profitability have only to look at the industry's current state. Factory efficiency is at an all-time high while industry-wide profitability is poor at best." (p. 67) This summary is typical of the conclusions presented in *The Second Century*.

The Second Century does not address automotive design, portfolio, or platform issues. It does not suggest marketing strategies or tactics. It is not written for project management professionals. It is not a sequel to the 1990s book, *The Machine That Changed the World*. Instead, it addresses systemic views that "may require sacrificing some local optimization to enhance system-wide performance." (p. 3) Thus, it addresses topics such as outsourcing, co-location, and "new entrants" in the context of a system having legacy issues that span a century.

The Second Century contrasts two automotive industry supply chain strategies: forecast-based business models and build-to-order business models. A forecast-based environment uses annualized historic data and projections to create a production plan to build cars with a particular configuration such as a dark green, four-door car with air conditioning and certain other options. It passes thousands of parameters to multiple first-tier and second-tier suppliers to have the required parts available for manufacturing at a specific factory at a specific time. Such a system is rather rigid, but it does produce these dark green cars with great efficiency. A forecast-based system can be characterized as a push system. If the weekly inventory of dark green cars is too great, Manufacturers use a combination of incentives to dispose of the excess inventory. To offset the reduced profit, suppliers receive requests to produce future components at lower prices.

In a *build-to-order business model*, an order triggers all of the parts for the dark green car and schedules a build date when an actual customer requests that exact configuration. This pull approach demands a supply chain that is very flexible. To deliver a specific car to a specific customer in an acceptable amount of time at an acceptable cost, the system (including ordering, logistics, and transportation) must work synergistically. Influences of both strategies are evident at all major car companies. In general, higher priced cars have a greater percentage of deliveries from build-to-order processes.

Those familiar with the "Beer Game" [a logistics game and management simulator developed at MIT in the early 1960s and popularized in business books (Senge, 1990)] or the "bull whip effect" will predict that disparities will arise between supply and demand when there are multiple feedback loops, nonlinearities, and lags in the system. The dealer will not be too surprised when a potential customer arrives requesting a dark green, four door car with air conditioning that this

configuration is not available immediately. This configuration is either sold out (because it is a very popular configuration this month) or it was never ordered (because it was expected to be an unpopular configuration this year).

Although it is a common perception that the disparate systems of dealers, manufacturers, first-tier and second-tier suppliers can be synchronized using e-commerce exchanges, the authors state "Although we believe that IT in theory can certainly enable a build-to-order system at some point, it is more of an inhibitor right now." (p. 106) Legacy issues that have cultural and technological origins prohibit quick-fix solutions.

Matthias Holweg and Fritz Pil strongly imply that forecast-based business models have produced a large inventory (approximately 60 days) that is a sub-optimal mix. (p. 85) To reduce inventory, General Motors provided an average financial incentive of $3855 per car in October of 2002. (p. 90) This reduced the profit from vehicles sold and introduced skewed data into the production forecast, further exacerbating the problem.

Once they specify a configuration and the subassemblies are available, most manufacturers can build a car in about one day. "Because factory efficiency has been the target of so many improvement efforts, it would seem that very little change is required to provide the needed flexibility. But the value grid is complex and the secret of flexible factories, as it turns out, rests not in robots and fancy computer systems but in how the factory manages and organizes its work." (p. 127) The authors prefer the phrase "value grid" instead of the more common phrase "value chain" which implies sequential relationships.

In Chapters 9-15, Holweg and Pil explore the three dimensions of responsiveness: process, product, and volume. These are "prerequisites to implementing any build-to-order system." (p. 211) They cite Dell Computer and Alcoa as companies that are paragons of responsiveness. These chapters suggest exploring specific topics to improve responsiveness. These include ordering patterns, slotting demand, visibility, online sales, workforce organization, compensation, capacity use, and automation.

Because corporate success requires a customer focus, value migrates to companies that satisfy changing customer priorities quickly. A key insight for innovators and developers is that "Companies seem to have forgotten that profitability comes, not from optimizing cost, but from building the right product at the right time." (p. 2)

References

Senge, Peter M (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*, New York: Doubleday Books.

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