Supporting Material is available for this work. For more information, follow the link from the Table of Contents to "Accessing Supporting Material".

Time for a hundred visions and revisions:

A system-dynamics study of the impact of concurrent engineering on supply chain performance

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EXTENDED ABSTRACT

Concurrent engineering is now generally regarded as a fruitful approach to shortening development times in product development. Concurrent engineering leads to earlier feedback and more intense communication between the different stages in product development. But, what is its effect on supply chain performance once the design that has thus been detailed out has to be manufactured? And, vice versa, to what extent dan experiences in manufacturing during production ramp-up influence product development performance?

This paper focuses on these two questions, that both look at the interfaces between product development and supply chain operations. It presents a quantitative system dynamics study of a real-world case from the aerospace industry. In aerospace, product development typically takes many years and costs tens to hundred of millions. Our analysis suggests that both causal links between concurrent product development and supply chain operations can have a major impact on performance in aerospace supply chains.

Firstly, concurrent engineering leads to ealier avaialability of preliminary design specs to manufacturing operations. This then leads to an earlier start of production, based on these preliminary designs. These earlier production starts mitigate the effects of production schedule pressure on production quality. This is because workloads do not rise to extreme levels, as a result of the timely start. In this manner, learning effects and associated productivity gains are achieved earlier. This then leads to a smoother production ramp-up and therefore better delivery performance.

Secondly, when concurrent engineering leads to earlier availability of design info, which leads to earlier production starts, this also has the effect of earlier signalling of design flaws and shortcomings. Most, if not all, designs turn out to suffer from problems from a manufacturability perspective that only become apparent once production processes really become operational. These design flaws that are identified ealier can now be fed back to product development, where they lead to improved designs. The earlier this feedback takes place, the more productive it becomes. In our simulation study, having this feedback from production taking place led to a dramatic improvement in supply chain costs, simply because this led to much higher design quality during production ramp up and associated lower rework and hiring costs.

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