

## Note on the Toyota Production System

### Overview

From the beginning of its car manufacturing business in Japan in the late 1940s, Toyota grew to be the richest, most feared, and most admired manufacturing company in the world. The Toyota Production System (TPS) is the reason why Toyota grew so dramatically. The principles of the TPS are no secret; Toyota has shared them quite openly with academics, customers, suppliers, and even competitors. Yet the TPS has proven to be difficult to imitate, even for companies that, for many years, have tried to do so.

### Historical Origins

Toyota began manufacturing non-military vehicles in Japan after World War II. The Japanese domestic market was small and poor, making it impossible to justify capital investments to match the scale of American carmakers. Toyota wanted to offer a full line of cars and trucks to the market despite the low volume of expected sales. To do this, it was forced to use its equipment and workers more flexibly than U.S. producers.

An important locus of this quest for flexibility was in the sheet metal stamping<sup>i</sup> area. There, Toyota's chief production engineer, Taiichi Ohno, engaged the ingenuity of the workforce to change dies in the stamping presses in a matter of minutes. At the time, it typically took a full day for North American manufacturers to make similar die changes. With die change time so short, it was possible to use a single set of presses to stamp the parts for Toyota's full line of cars and trucks. Quick die changes brought many benefits. For example, press runs could be shorter,<sup>ii</sup> lot sizes could be lower, and inventories could be reduced. The stamping areas could also respond quickly to demand for their parts.

i Sheet metal stamping is a process by which the body of an automobile is stamped out from sheets of steel. Since shapes of various parts of an automobile body differ, stamping these parts requires the use of an appropriate die, (much like a stencil). The die is attached to a machine called a press. The same press could be used to stamp out different shapes by attaching the appropriate die.

ii One run of a press is the time a press operates until the die is changed to produce a different part. The number of units produced in a run is often referred to as the lot size.

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©2013 The William Davidson Institute. This note was developed by Eric Svaan, Lecturer of Technology and Operations, and Ravi Anupindi, Professor of Technology and Operations, at the University of Michigan's Ross School of Business. The note introduces business students to the Toyota Production System (TPS) by briefly covering its historical origins, basic assumptions, principles, key idea, and rules in use. We explain features common in the TPS community of practice and note the growth of that community and the science of Lean Operations. We supply a brief Japanese/English glossary of some words often used with the TPS. Students interested in further study are directed to the resources listed at the end of the note.