

## Japan-oriented Creative Monozukuri (manufacturing and production) with TRIZ

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### Abstract

Industries, such as automobiles, digital electronic appliances, mother machines, have been producing the highest quality products in the world and having the symbolic status of the strong Japan through "monozukuri". Monozukuri itself just means to make something, that is, to manufacture and produce goods. Today "monozukuri" has a broader meaning including development, production, procurement, service and recycle of products in high qualities. Monozukuri has been created and improved by hardworking efforts for many years to get the global competitiveness. The efforts are very sophisticated based on the Japanese tradition to produce very fine products. In the modern industries including automobile manufacturing, these efforts are sometimes called "suriawase", have done through lots of engineers cross companies sitting together. This style of effort is intangible, especially by foreigners. However, it seems to have been the key of the strong monozukuri.

Now, growing needs of globally single market and ecological requirements are major drivers for new products. For example, electrical automobile is a typical emerging product to the near future. It requires less suriawase efforts because it is designed based on the modular architecture, integrates less number of parts which are procured openly and globally. Typical suriawase efforts will be less than now, resulting Japanese products might become weaker rapidly.

Additionally, products with embedded software have the critical problem. Because new products require more software to add new features with it, then embedded software will become large-scaled and very complicated. More software engineers are required because of less productivity of software development and additional efforts, then software supply falls into negative spiral, never coming up to the surface. Modern software development requires very structured approach with strategically reused software components based on modular architecture under the globally shared process on the network, which seems to be a virtually-configured logical software factory. Japanese software used to be delivered derivatively through generations from an original source code. It would become more difficult in case of delivering more large-scale software products.

These issues are very critical to Japanese monozukuri. They should be resolved urgently with the bird-eyed and monozukuri strategically reconstructed to produce very qualified products with embedded software through redesigned products and processes. Requirements for the future monozukuri need to be redefined in global perspectives, including product and software engineering process, shared and collaborative resources with globally and highly qualified people and network, and visible, easier and productive suriawase of technical and management process. Japanese intangible skills to have produced very qualified products will be built into the newly defined tangible processes to make products competitive. TRIZ tools, such as, evolution trends, contradiction matrix, and others, will be used for creating new products and accelerating processes creatively.

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