

A New Style of Research and Development from the EU Perspective

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Abstract

This paper introduces a new style of research and development with a unique process of engineering development based on the EU perspective. Two different fields will be separated in the new style: competition field and non-competition field. The former is a specific area encouraging companies to develop their unique technology as differentiation strategy, and the later stresses collaborations among different companies and organizations for spreading the standardization of common technologies. This new style with two different fields shows us a new direction of the engineering development in various engineering industry. In addition, this paper explains robot technologies in the manufacturing of automotive sector in terms of smart manufacturing concept.

Keywords: competition field, non-competition field, Factory-IoT, collaborative robots

1. Introduction

This paper will cover two aspects of topics. One is the manufacturing (MONOZUKURI) technology including IoT technology. The other is a new style of research and development with a unique process of engineering development based on the EU perspective[1] [4].

With respect to manufacturing technology, in Europe, Smart-Manufacturing is the key word in terms of MONOZUKURI. Compared to Europe, there is similar approach of manufacturing in Japan. This paper describes the DENSO's "Factory-IoT". DENSO Corporation is one of the automotive Tier-1 suppliers.

2. DENSO's "Factory-IoT"

1.1 Roadmap of Production System

DENSO is a manufacturing company mainly for automotive components and systems. DENSO

started using the single automated manufacturing process like a spot machine in the 1950's. After that DENSO expanded automation to the production line unit and then, further expanded to factory unit. Furthermore, DENSO expanded the automation to global unit like a global network.

One of the features of DENSO manufacturing is the in-house development and fabrication of the robot machines since the early 1970's.

Figure 1 represents the roadmap of the DENSO production system.

With respect to automation and robotics, DENSO uses automation technology, mainly in Assembly and Visual Inspection processes and for in-plant logistics by using in-house machines and robots. There is a however, still human-based manufacturing process left for these three fields. DENSO has been working on these fields by using the intelligent technology of robots. One of the

features of this technology is “collaborative robots” which means that two-robots collaborate and co-operate each other. It contributes to working efficiency and quality in the manufacturing plant.

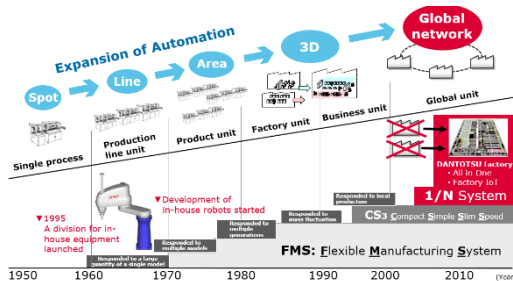


Figure 1 Roadmap of Production System

1.2 Principle of “Factory-IoT”

It is said that IoT technology is a tool for keeping maintenance of stable production in the field of manufacturing (MONOZUKURI). DENSO’s unique point of IoT is that human is involved in this process. By utilizing human skill and knowledge, sustainable growth and continuous evolution can be achieved. This means that both human and machine can provide the optimal solutions thanks to co-creation by human and machine. DENSO pursues the “Factory-IoT” technology for all of plants globally by connecting each plant.

3. EU-Way vs JP Way Development

3.1. Comparison between EU- Way and JP-Way

Figure-2 represents the comparison between EU and JP development ways[2]. This chart summarizes the main features development ways, working styles and business models based on the Automotive sector of Europe and Japan. In this chart, for EU, German development way is used as a typical example. There are significant and remarkable differences in the EU development way compared to that of Japan-Way. In Germany, there is a clearly two fields of development style. One is “Competition Field” and the other is “Non-competition Field” for the engineering development. They co-operate and collaborate among the same industry domain in the base technology field. They establish the common technology field like a standardization and/or regulations. Thanks to this system, they can concentrate on their resources on the development within the unique technology field. Then, they are able to create the

differentiated technology. On the other hand, in Japan, OEMs develop almost all technologies by themselves. In this approach, they are able to create unique technologies, however, recently there are various new technologies to be developed like a CASE fields (Conected, Autonomous Driving, Sharing, Electrification) . Therefore, there are concerns in terms of the lack of resources for the various field of engineering development in the Automotive sector.

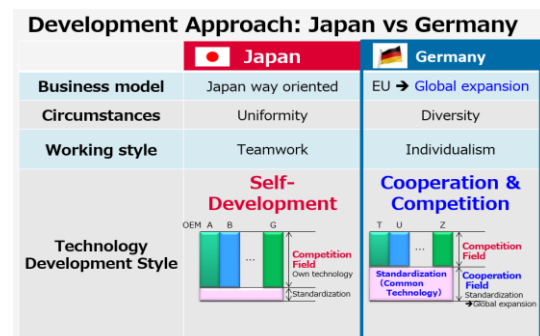


Figure 2 Comparison between EU-Way and JP-Way

3.2. Collaboration Concept between Germany and Japan

There are good points to be learnt from German-Way engineering development. For example, efficient and rational development by using industry standard tool-chains, model-based development, cutting-edge simulation, automated calibration etc. In addition, Germany OEMs cooperates with R&D Engineering Companies for their vehicle and engine development in not only the research phase but also for application engineering area. There are remarkable R&D Engineering Companies in Europe who have sophisticated development tools, testing facilities and high-talented engineering resources and its know-how. In Japan also, there are good points for their engineering development way like teamwork and harmonized development approach with dignity[3].

4. Conclusion

The key point is to respect each other of their engineering development ways, then, reflect and accept the good points into their development ways. Figure 3 represents the concept of collaboration between Europe and Japan. The important point is that both good points to be well-arranged like a fusion. In this case, a new development

way which is a fusion between Europe and Japan could become a global competitive engineering approach. Both parties should respect their engineering development ways and inspire each other in research and development field.



Figure 3 Concept of Collaboration

Author Introduction

Mr. Masato Nakagawa



He graduated the mechanical engineering at Hiroshima University, Japan. After he entered DENSO Corporation, he had been working in Europe consecutive 14 years in Germany, The United Kingdom and the Netherlands in the field of automotive sector. During his stay in Europe, he leans lots of European engineering

development way.

References

1. M. Nakagawa, *26th International AVL Conference Engine 2020: Sparks versus compression ignition in a new environment* (Graz, Austria, September 2014)
2. M. Nakagawa, Dr.-Ing. O. Hermann and Dipl. Ing. Sebastian Visser, *Diesel Powertrain Energy Management via Thermal Management and Electrification* (Detroit SAE April 2017)
3. M. Nakagawa, *DENSO's Contribution for Future Predictive Powertrain Control including Electrification* (Korea, FISITA2016)
4. M. Nakagawa, *Plenary Speech on ICARB2018* (Beppu, Oita, Japan Feb. 2018)