



# Module 14: Digital Transformation and Innovation for Enabling Reconfigurable Production Systems

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# 14.4. Assessment Questionnaire for Reconfigurable Manufacturing Maturity of SMEs



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# Assessment for *Operation performance of manufacturing systems & Resilience*

## Operation performance of manufacturing systems

Consider the average performance of your production system and of the group of competitors that are the direct benchmark for your plant.

How does your current performance compare with that of your main competitor(s)?

- Conformance to product specification
- On time delivery
- Fast delivery
- Flexibility to volume change
- Flexibility to product mix change
- Unit cost of manufacturing

## Resilience

To what extent do you agree with the following statements?

- We are able to cope with changes brought by disruptions.
- We are able to adapt to disruptions easily.
- We are able to provide a quick response to disruptions.
- We are able to maintain high situational awareness at all times.

(Maganha, Silva, and Ferreira 2019)



# Assessment for *Reconfigurability*

## **Modularity**

To what extent do you agree with the following statements?

- The major equipment of our manufacturing system can be easily added to, or removed from, the shop floor.
- Our equipment is made of several functional modules that can be easily added/removed.
- The major equipment of our manufacturing system can be easily reorganised to obtain an adapted configuration to manufacture new products.

## **Integrability**

To what extent do you agree with the following statements?

- We can integrate equipment rapidly and precisely by a set of mechanical, informational, and control interfaces in our production system.
- Our equipment is operated/coordinated by an integrated control system exploited in an open-architecture environment.
- Our manufacturing system allows an easy integration of new equipment and new technologies.
- Our equipment and our control system were designed with interfaces that facilitate the integration of new components.

## **Customisation**

To what extent do you agree with the following statements?

- The location of our equipment on the shop floor was chosen considering the need to produce an entire product family.
- Our manufacturing system's capacity and flexibility (hardware and control system) were designed to match the production needs of a product family.
- Our control system, supported by an open-architecture technology, can be customised to have the exact control functions needed



# Assessment for *Reconfigurability*

## **Adaptability**

To what extent do you agree with the following statements?

- We can easily stop equipment operation and reconfigure its functions to manufacture a new product type.
- We can change quickly from manufacturing/assembling one product to another, if they are from the same family.
- Our manufacturing system allows an easy switch between existing products and can adapt to new/future products.
- Our manufacturing system can easily respond to unexpected equipment failures.
- We can easily add equipment, at any stage of the production process, without interrupting operations for long periods.
- Our throughput can be changed, in a relatively short time, to respond to demand changes.

## **Diagnosability**

- To what extent do you agree with the following statements?
- Our manufacturing system can automatically detect defective products, diagnose their root causes, and reset its parameters to restore the initial situation.
- Our manufacturing system includes inspection resources that allow the detection of quality defects in real time.
- Our manufacturing system uses inspection equipment that can be easily reconfigured for use in different stages of the production process.
- In a start-up phase, we can adjust the manufacturing system's parameters, thus reducing the ramp-up time, because we have mechanisms for the quick diagnosis of problems with quality.
- Our manufacturing system can automatically undertake corrective cause or failures in our production.