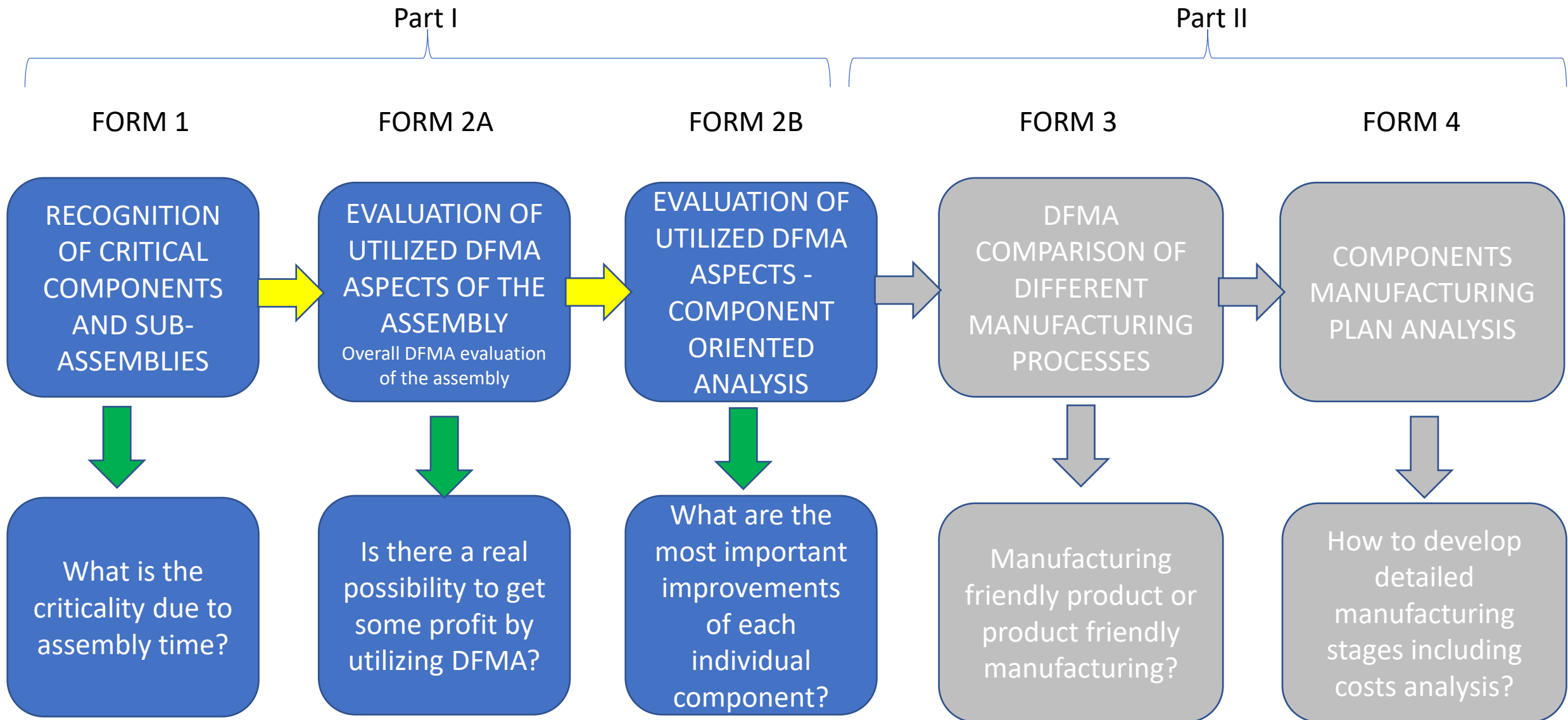


# GUIDELINES FOR UTILIZING DFMA FORMS

Part I

# Overall picture of DFMA forms



# DFMA Form 1: RECOGNITION OF CRITICAL COMPONENTS AND SUB-ASSEMBLIES

Component	Number of components N	Number of critical components N <sub>CR</sub>	Assembly time /component T	Summarized assembly time/ component T <sub>tot</sub> =N×T
Sub-assembly 1 (name: _____)				
1.				
2.				
3.				
4...				
N				
Total number of components:	Σ <sub>N</sub> =			
Total number of critical components:		Σ <sub>N<sub>CR</sub></sub> =		
Total assembly time				Σ <sub>TTOT</sub> =
Total assembly time of critical components	Calculate from above N <sub>CR</sub> ×T and summarize Σ[N <sub>CR</sub> ×T]= Σ <sub>TOTCR</sub>			Σ <sub>TOTCR</sub> =
Nominal effectiveness of assembly work	Divide total assembly time by total number of components Σ <sub>TTOT</sub> /Σ <sub>N</sub>			ASSEMBLY P <sub>nom</sub> =
Practical effectiveness of assembly work	Divide total assembly time by total number of critical components Σ <sub>TTOT</sub> /Σ <sub>N<sub>CR</sub></sub>			ASSEMBLY P <sub>prac</sub> =

# DFMA Form 2A: EVALUATION OF UTILIZED DFMA ASPECTS OF THE ASSEMBLY

(Overall DFMA evaluation of the assembly)







Questions	Answer	Score	Evaluation criteria
1. How many components are included <u>to</u> the assembly?			>10 = <u>- 1 point</u> ≤ 10 = <u>+ 1 point</u>
2. How many modular solutions are included to the assembly?			> 2 = <u>+ 1 point</u> ≤ 2 = <u>- 1 point</u>
3. How many components are used only for joining?			> 2 = <u>- 1 point</u> ≤ 2 = <u>+ 1 point</u>
12. Are the ergonomic aspects of the assembly work taken into consideration?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = <u>+ 1 point</u> NO = <u>- 1 point</u>
11. Is the principle of "product <u>families</u> " applied?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = <u>+ 1 point</u> NO = <u>- 1 point</u>
13. Are the overall accuracy requirements of the assembly balanced with the tolerance requirements of each individual component?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = <u>+ 1 point</u> NO = <u>- 1 point</u>

Tune the evaluation criteria and the grading scale if needed

Skip irrelevant questions by marking N/A (Especially Q11 and Q13)

This form needs to be filled for each important component and for the original and developed ones!

# DFMA Form 2B: EVALUATION OF UTILIZED DFMA ASPECTS - COMPONENT ORIENTED ANALYSIS

<b>Guidelines:</b> Questions 2, 4 and 5 try to minimize, questions 1, 3 and 6 try to maximize			
<b>Questions</b>	<b>Answer</b>	<b>Score</b>	<b>Evaluation criteria</b>
1. How many functions are performed by the component?			$> 2 = + 1$ point $\leq 2 = - 1$ point
2. How many manufacturing stages are required?			$> 1 = - 1$ point $\leq 1 = + 1$ point
3. How many different assembly directions or assembly positions are acceptable?			$\geq 2 = + 1$ point $< 2 = - 1$ point
4. How many pre-treatment stages are required during the manufacturing?			$> 0 = - 1$ point $= 0 = + 1$ point
5. How many post-treatment stages are required during the manufacturing?			$> 0 = - 1$ point $= 0 = + 1$ point
6. How many manufacturing stages can be regarded as modular ones?			$> 2 = + 1$ point $\leq 2 = - 1$ point

Tune the evaluation criteria and the grading scale if needed

This form needs to be filled for each important component and for the original and developed ones!

7. Are the detailed manufacturing process-oriented guidelines obeyed to ensure easy manufacturing?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
8. Is there enough space for tools, jigs and the robot griper? Can the griper catch the component easily?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
9. Is it possible to manufacture the component only by using standardized tools and tooling?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
10. Are proper tooling allowances utilized? How much? _____	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
11. Does the selected material match properly with the selected manufacturing process? Material: _____ Process: _____	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
12. Are general tolerances utilized? Tolerance grade: _____	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
13. Are there any means to compensate the possible (summarized) manufacturing errors? Which one: _____	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
14. Is there an evident risk that the component might tackle with any other component during the assembly?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = - 1 point NO = + 1 point
15. Is parametric design utilized during the design?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
16. Are the ergonomic aspects of the component taken into consideration?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point
17. Are the tolerances and surface requirements of the component balanced with each other?	<input type="checkbox"/> YES <input type="checkbox"/> NO		YES = + 1 point NO = - 1 point

Decide the most probable manufacturing technology (and name it)

AND

Tune the evaluation criteria and the grading scale if needed

AND

Skip irrelevant questions by marking N/A (Especially Q12 Q15 and Q17)

# Reminder...

- You should fill two sets of DFMA forms:
  - The first for the original construction and components
  - The second for the improved construction and components
- The conclusions should be drawn based on the differences found from the numerical results which are presented with the DFMA forms

