FH AACHEN
UNIVERSITY OF APPLIED SCIENCES

AFT Final presentation

- Group 3.2

[Motor Block]

Final Presentation

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By-
Aadithya Ramamurthy (3304090)
Shubham Pawar (3309153)
Eungwang Ryu (3261776)

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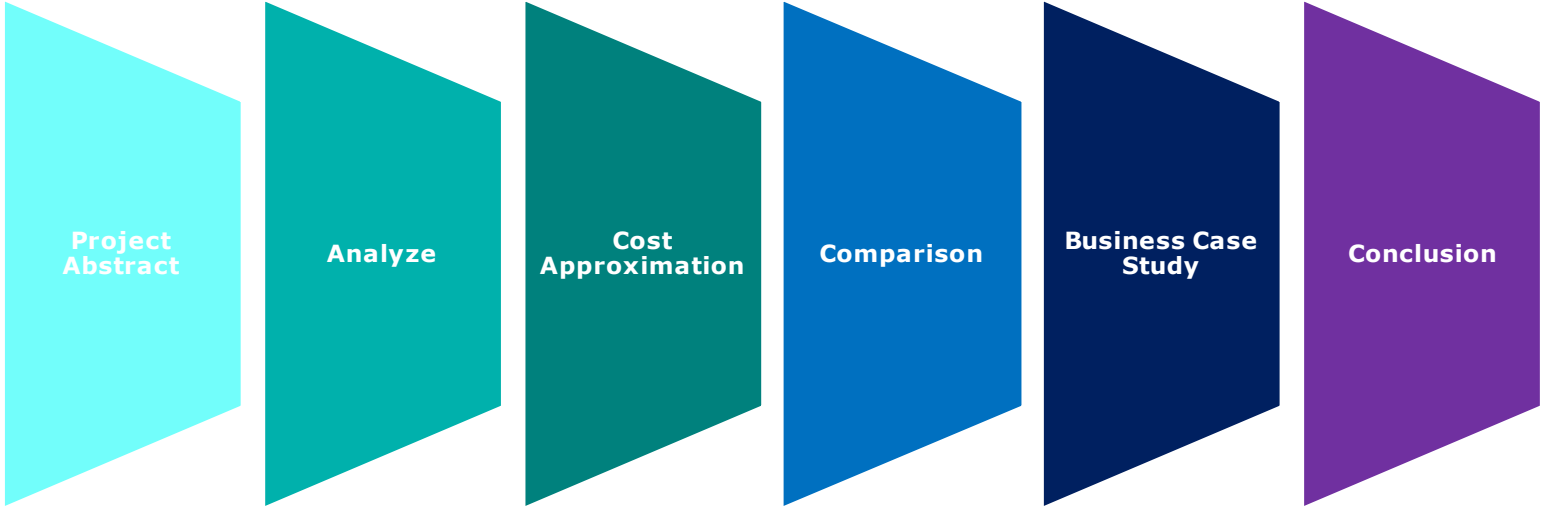
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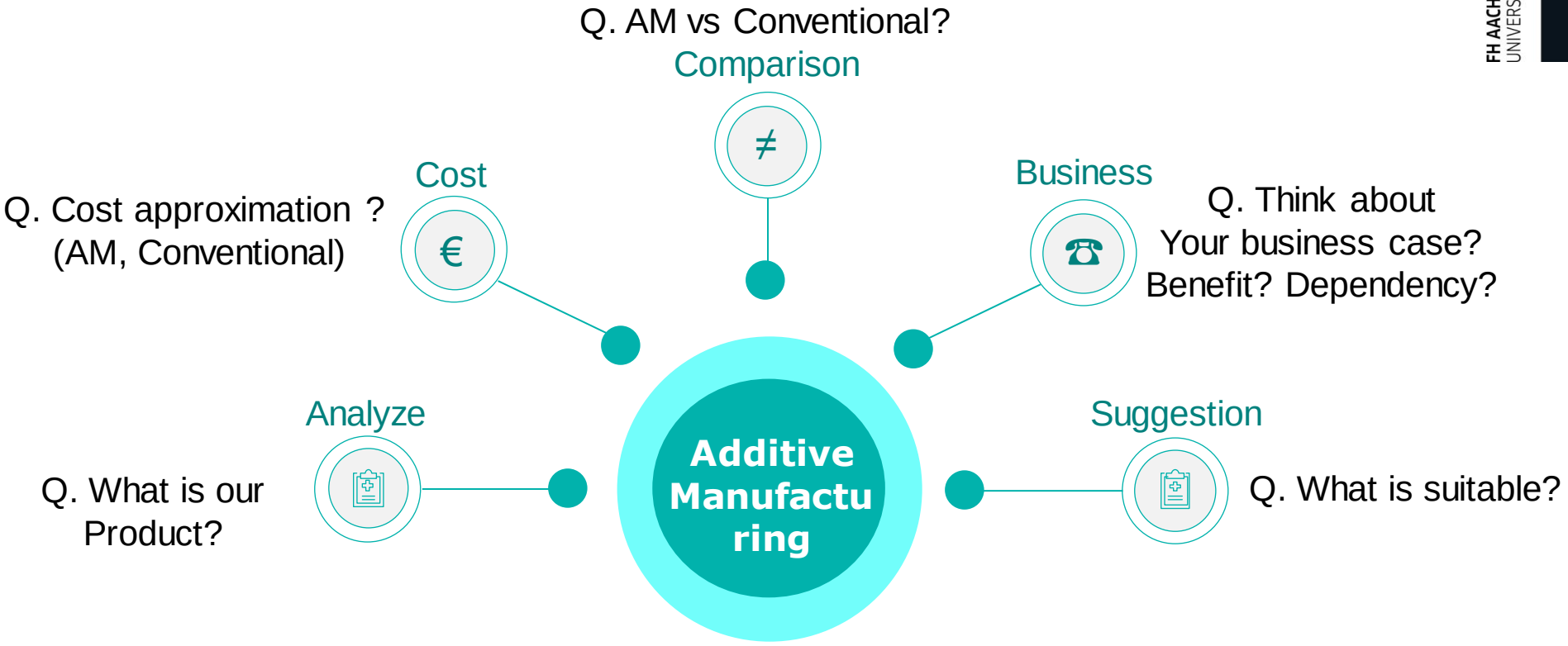
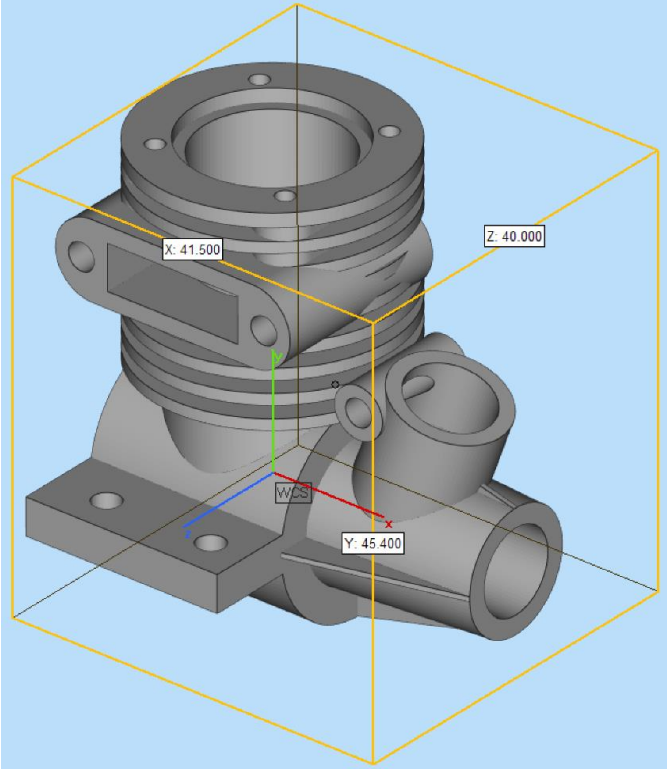
I. Project Abstract



Q. Until which investment should be taken into account?

A. Only for the product

II. Analyze

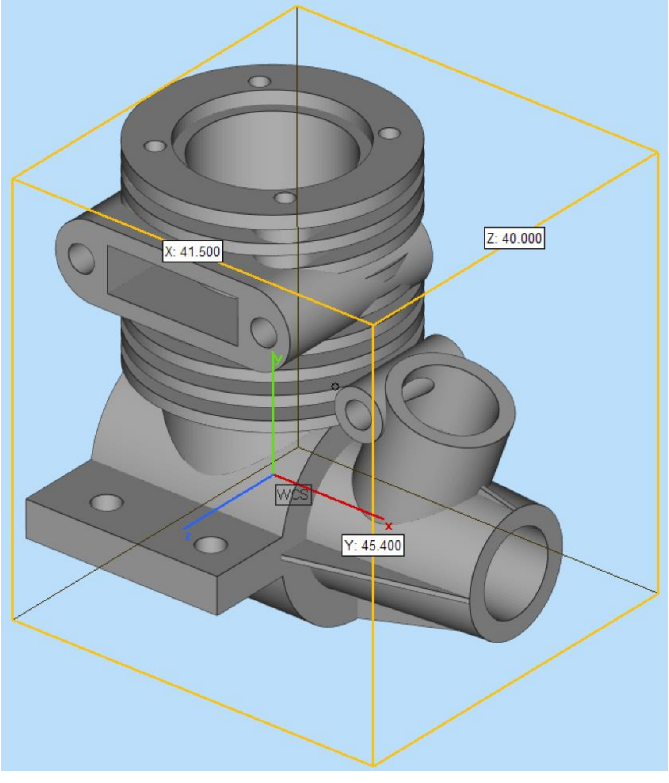


1. Part: Motor Block
2. Dimension
   - 1614.92 [Cm^3] (Sides scaled x5)
3. Material
   - Aluminum alloys

Q. Why aluminum?

1. Creates lighter parts—with more surface finishing options than other die cast alloys.
2. Aluminum can also withstand the highest operating temperatures of all the die cast alloys.
3. Cast aluminum is versatile, corrosion resistant; it retains high dimensional stability with thin walls and can be used in almost any industry.

II. Analyze



4. Lot size : huge (under assumption)

Ex: 4 cylinder ICE engine (VW, 2017)
Tiguan: 724,000
Polo: 716,000
Golf: 974,000
Total: 2,414,000 (Vehicles)
-> Total parts: 9,656,000 (parts, Vehicles x4)

5. Conformity assessment (for AM)

i) Does part fit?
- Yes

ii) Is your part weldable?
- Depend on selection

iii) Can you meet performance requirement?
- Depend on selection

iv) Will your part design print?
- Yes

v) Does your part require post processing?
- Yes

II. Analyze

3D Printer

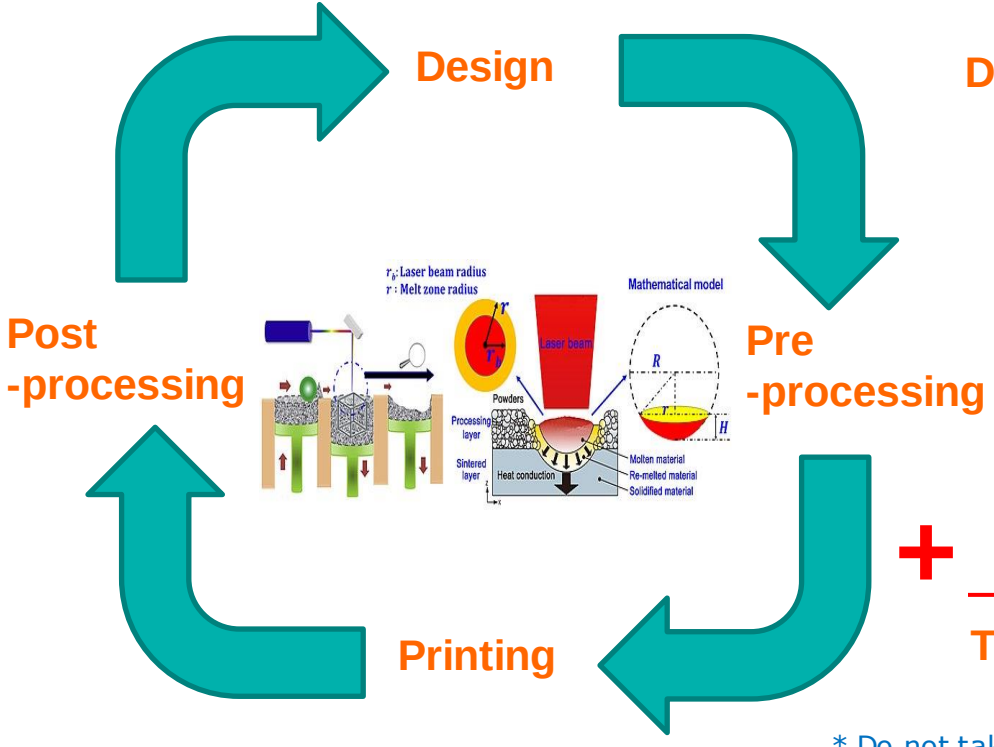
Abbildung 1:Maschine True Print 3000 von der Firma Trumpf (Trumpf, 2021)

Installation volume (cylindrical form)	Ø 300mm x 400mm
Material	welding materials in powder form like stainless steel tool steel, aluminium and different alloys
Layer thickness	20- 150 µm
Laser power	500 W
Beam diameter	80 µm
O_2 concentration	up to 0,01%
Exposure speed	3 m/s
Preheating	up to 200°C
Gas	nitrogen and argon
Power supply	400/460V 32A 50/60Hz
Dimensions	3385 x 1750 x 2070 mm
Mass	4300kg

Gage	0,08 – 0,5mm
Wall thickness	min. 0,5mm
Layer thickness	0,02-0,15mm
Filling Level	100%
Printing speed	800-2100 mm/s
Time factor for applying a contour	0,5s
Time factor for applying a layer	1s
Time factor for heating up and cooling down	0s??

III. Cost Approximation

1. Additive Manufacturing (Selective laser melting)



Design : 0 €

+ Pre-Processing : 0 €

+ Printing : 1146.23 €

- Material Cost: 1116.23
- Building Cost: 30

+ Post-Processing : 80 €

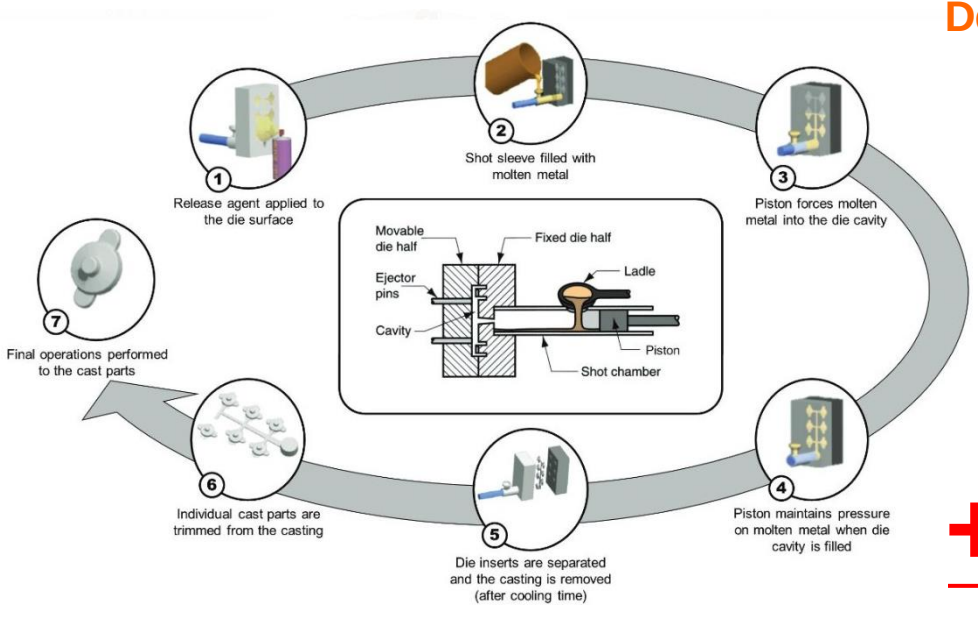
- Machine Op Cost: 60
- Heat treatment: 20

Total Cost : 1226.23 €

* Do not take account the cost for place, factory facility, 3D printer

III. Cost Approximation

2. Conventional (HPDC)



Design : 0 € (+ Mold Cost : 22,500 €)

+ Pre-Processing : 0 €

+ Insert : 8.753€

- Material Cost: 8.753 (A380)

+ Inject & Solidification: 14.64€

- Machine Cost (h)
- Labor Cost (h)
- Cycle Time (s)

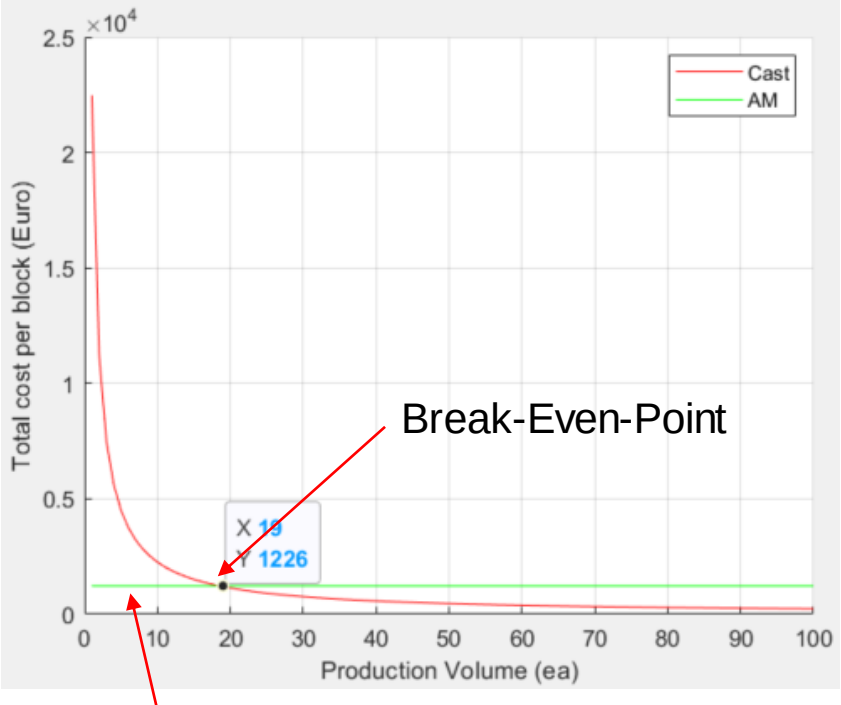
+ Post-Processing : 53.7€

- Heat treatment Cost
- Machine Op Cost (h)
- Labor Cost (h)

Total Cost : 77.09 € (+ 22500 €)

* Do not take account the cost for place, factory facility

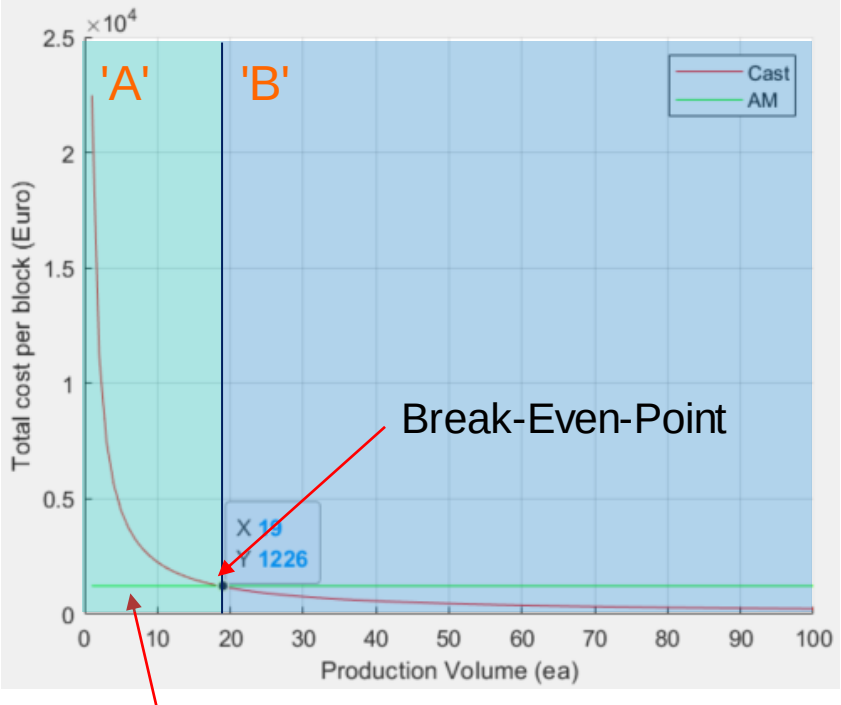
IV. Comparison



Break-Even-Point

Assumption: 3D Printer is always working with project (even for other project)

IV. Comparison



'A' area (Quantity < 19)

- Conventional : Exponentially decreasing price,
  Higher price due to initial investment
- AM : Constant price due to the characteristic,
  Lower initial investment

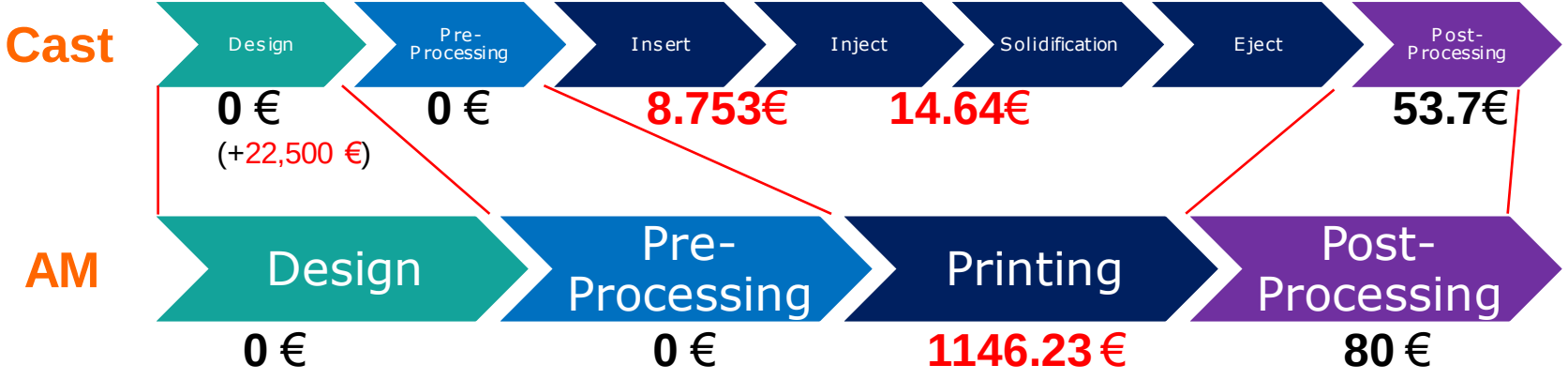
'B' area (Quantity > 19)

- Conventional : Lower price after break-even-point,
  Price converses to certain level
- AM : Constant price due to the characteristic,
  Not economical any more

Assumption: 3D Printer is always working with project
(even for other project)

V. Business Case Study

1. Tendency



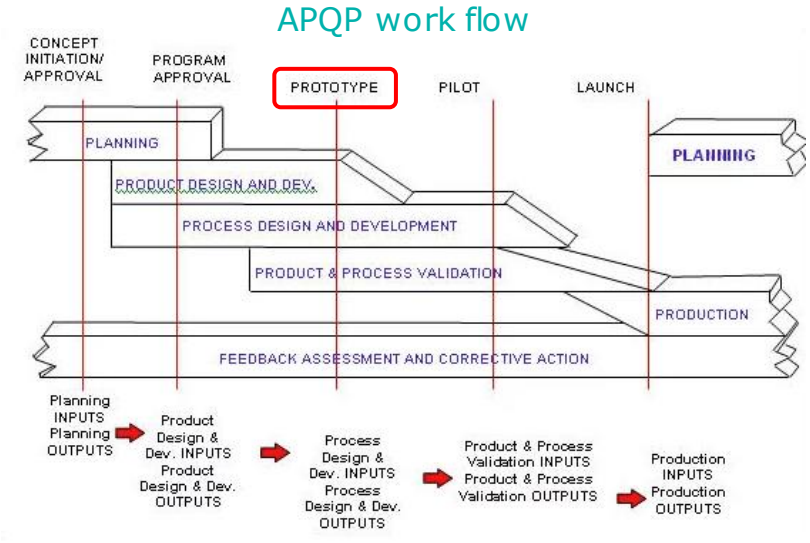
2. Profitability

- Initial Investment: Cast > AM = proper for massive production
- Cost per part: AM < Cast = proper for small lot size production

VI. Conclusion

Q. What components or products might be most suitable for AM based on what you have calculated and found?

A1. Small volume parts for prototyping or design check (e.g. PROTO - APQP)

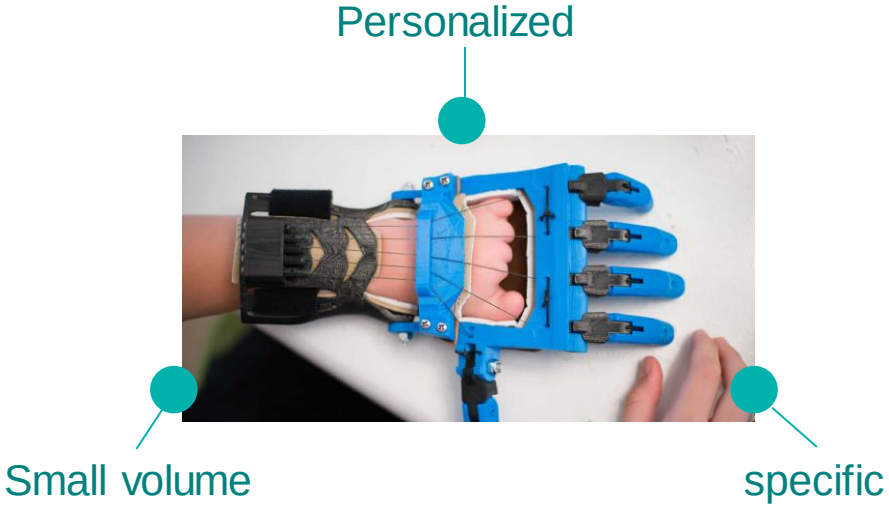


	Proto	P1	P2
Tool	No system tool	System tool	System tool
Worker	No specific worker	-	Line worker
Item	Hand made, modified	Mold	Mold
Lot size	<100	>100	-

VI. Conclusion

Q. What components or products might be most suitable for AM based on what you have calculated and found?

A2. Personalized or specific application with small volume (e.g. 3d printed prosthetics)



THANK YOU!

Questions?