Appendix Writing in a Report

Appendix 1 – Figures and Tables

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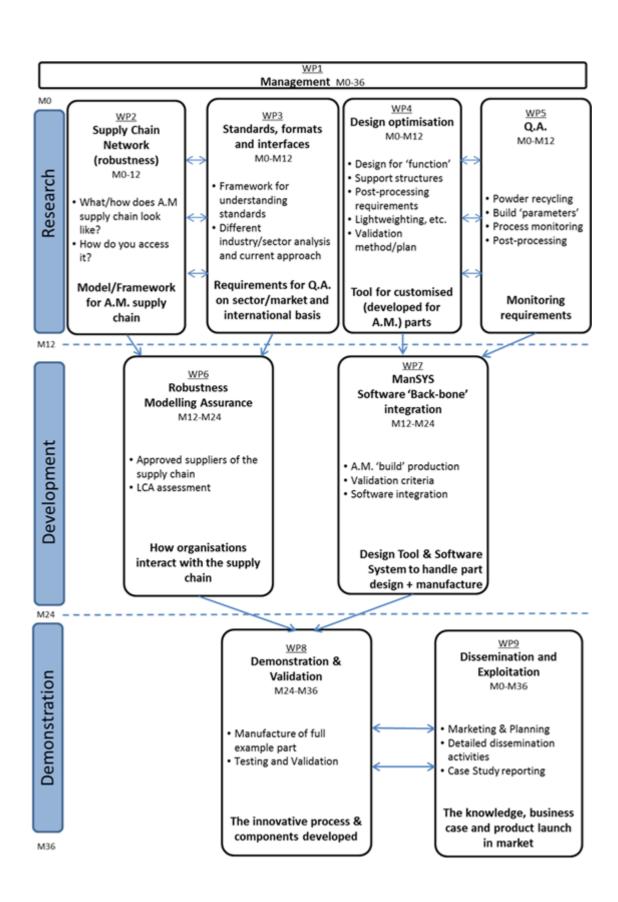


Figure 1 Timing of Work Packages and their components

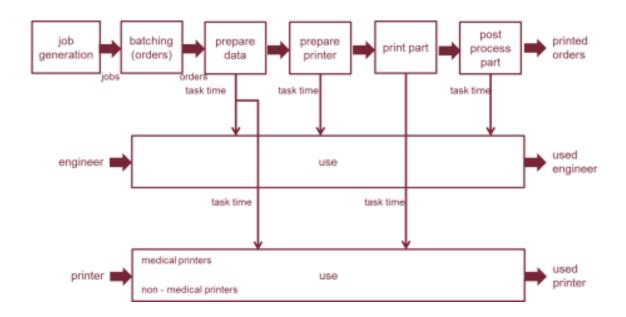


Figure 2: Overview of discrete event simulation process.

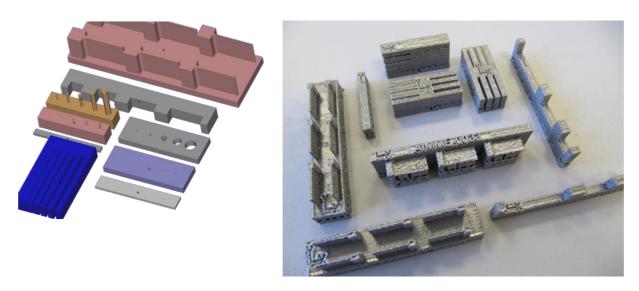


Figure 3: Design file of test artefact (left). Actual manufactured test artefact (right).

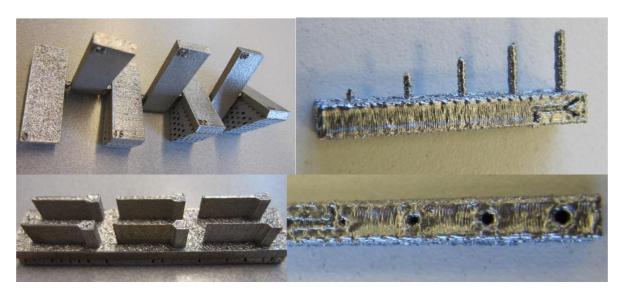


Figure 4: Surface finish, pins, thin walls and holes assessed.

Original part Optimisation • Definition of Definition and geometry (CAD) refinement of

- Definition of load cases and constraints
- Part requirements (fatigue, material behaviour and strength)
- Analysis of original component

Topology

- optimisation parameters: number of iterations, member size constraints, etc.
- Assessment of results and mesh sensitivity study

Part "Re-design"

- Based on original part and STL from topology optimisation
- Use Materialise 3-Matic software
- Regularise, smooth, and replace unwanted aspects
- Re-mesh the surface and add substructures

Final Verification

- Re-mesh the new part
- Analyse under design loads
- Verify adequacy of solution

Figure 5: Topology Optimisation Process-flow (Credit: TWI)

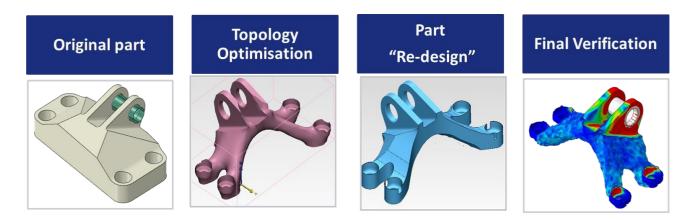


Figure 6: GE engine bracket (Credit:TWI).

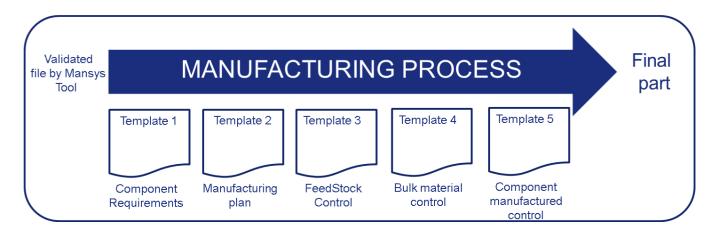


Figure 7: ManSYS Manufacturing quality validation process.

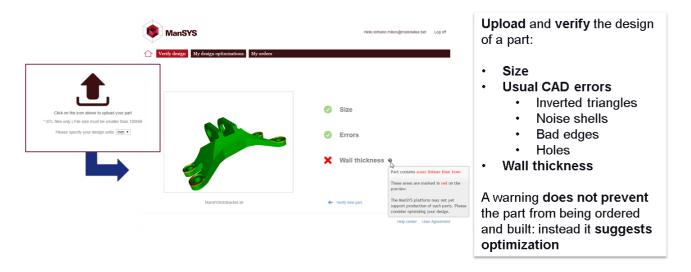


Figure 8: Example of the ManSYS decision making tool analysis.



Figure 9: ManSYS web portal interface.

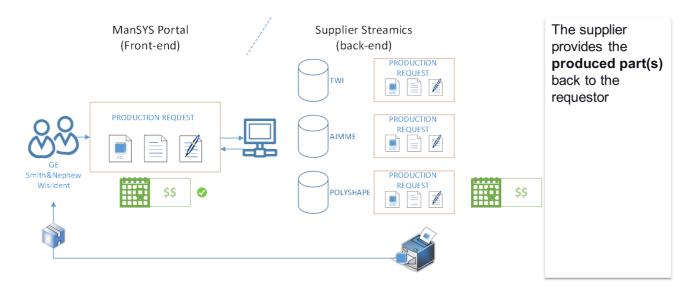


Figure 10: ManSYS Production Requests.

Table 1 list of participants

| Participant no. | Participant organisation name | Participant short name | Country | | Organisation Type |
|-----------------|-------------------------------|------------------------|---------------|----|----------------------|
| 1 | TWI Ltd | TWI | UK | | RTO |
| 2 | Materialise | MAT | Belgium (USA) | | LE |
| 3 | LPW Technologies Ltd | LPW | UK | | SME |
| 4 | BCT GmbH | BCT | Germany | | SME |
| 5 | Polyshape | POL | France | | SME |
| 6 | Berenschot | BER | Netherlands | | LE |
| 7 | TNO | TNO | Netherlands | | RTO |
| 8 | AIMME | AIM | Spain | .0 | RTO |
| 9 | Smith & Nephew | SN | UK (USA) | | LE |
| 10 | Wisildent (& Twocare) | WIS | Italy | | SME |
| 11 | GE | GE | Turkey (USA) | C* | LE |

Table 2: Overview of Demonstrator Results Achieved from ManSYS for each of the Demonstrators.

| | GE | S&N | Wisildent |
|-------------------------------------|---|--|--|
| Optimization Tool Analysis | | 75% weight reduction | |
| Supply Chain Analysis | 86% improvement | in total purchase ordering | g and delivery period |
| Decision Making Tool Analysis | Auto | utomated thin wall detect omated size limitation det art error detection for inv | ection |
| Life Cycle Analysis | 8.3kWh of specific energy consumption for the optimized bracket | 4kWh of specific energy consumption for the optimized nail | 0.4kWh of specific energy consumption for the optimized bridge |
| Business Impact | 75% weight reduction from one bracket, | 90% reduction in manufacturing time | 75% reduction in manufacturing time |

| | equating to \$1,254,000 cost | and 68% less raw material, equating to | |
|---------------------------------|---|--|--------------------------------|
| | savings per year. | 1,060.000€ cost savings annually. | |
| Environmental impact (material) | 0.003% reduction in fuel consumption per bracket. | 240gr less raw material per nail | 75% shorter manufacturing time |