Additive Manufacturing

Section two
International Benchmarking

What is the TVET Model in place that helps raise standards amongst students?

France
Employers are at the heart of the dual system - they take an active role in training the learners.
French educators have an extensive training network around them, including multiple specialist and technical trainers.
They have good access to the latest technology, and in some instances, the companies that employ WorldSkills Competitors have equipped their training schools with the same machines which are used in WorldSkills competitions, like the SLM Printers for example.

How does this country work with Industry to develop their TVET systems?

France
Following a recent international pressure test between the UK and France, it was clear to see the apprenticeship structure was strong in France. The age of apprenticeships started at 15 with the duration sometimes lasting 5 years.
Apprenticeships were run in block durations with students being on site for 2 weeks and at the training centre for 2 weeks at a time, although it did seem very flexible with the training providers working around the best times for release from the employer. In-between training apprentices, the training centre would open up to French government schemes to support unemployment.
The training facility provided a range of Manufacturing Skills like CNC Milling, Turning, Industry 4.0, Welding and Pipe Welding, Manual Handling and Machine operating (Fork Lift & Cranes) & Additive Manufacturing.

What do international Standards of Excellence look like in Additive Manufacturing?

The international standard of excellence for Additive Manufacturing is being able to capture design data (through 3D Scanning) in order for solutions to be designed to the functional needs of the brief. An example could; 3D scanning a part in order to design guided drill holes which fit perfectly on the surface of the scanned mesh.

3D printing allows the user to bring the solution to the here and now. Excellence is being able to produce your solutions in a very short time frame with tight tolerances and to be functional immediately.

Competitors must be able to master Autodesk Fusion 360 CAE software to produce design solutions based on 3D Printing Technology used. A strong understanding on build strategies is required, what supports to be used and where for example.

The competitor must also be able to set up a 3D printer correctly based on materials and technology used (FFF, DLP and SLM).

The competitor is required to generate optimised toolpaths using a range of suitable slicer software's. The competitor may have changed the design to meet the needs of the functionality product.

At the end of the design task, competitors are required to 3D print a physical component in the time limit set.

Example: The following model was given to the competitors who were required to re-design the pipework to reduce 'dead areas' from the drilled channels. And optimise the solution to reduce the mass of the product. Using SLA 3D Printing Technology. Duration 2.5 Hours
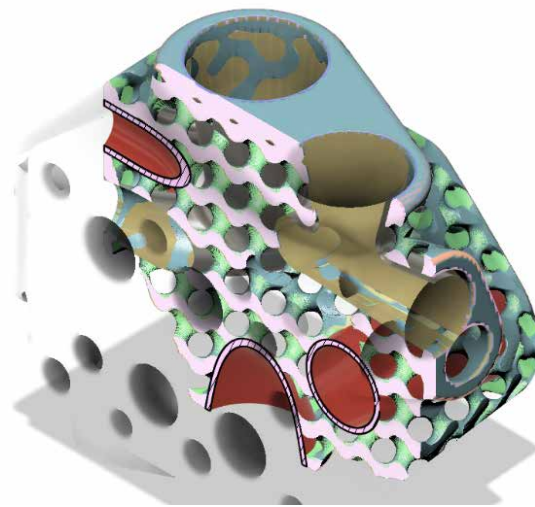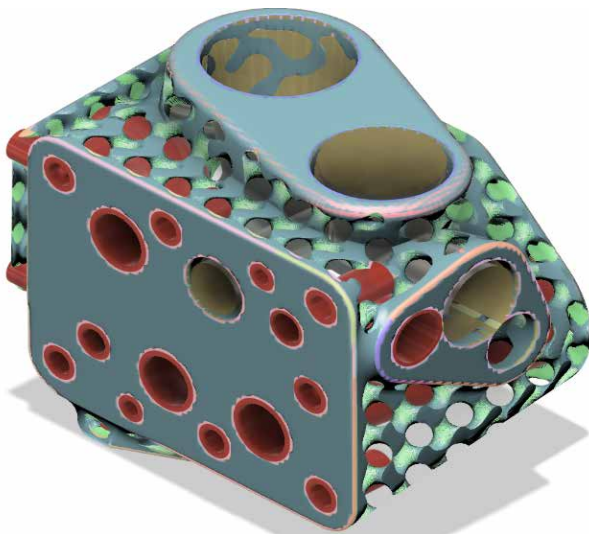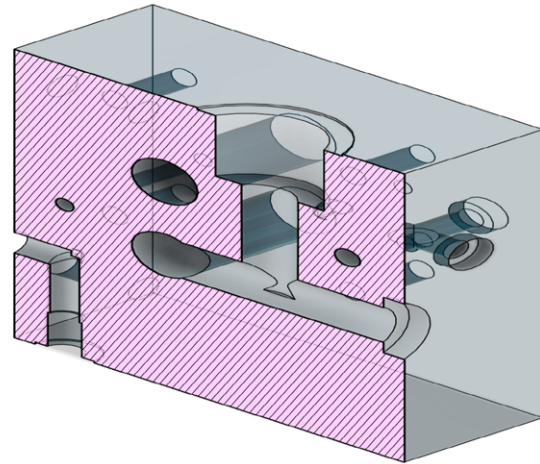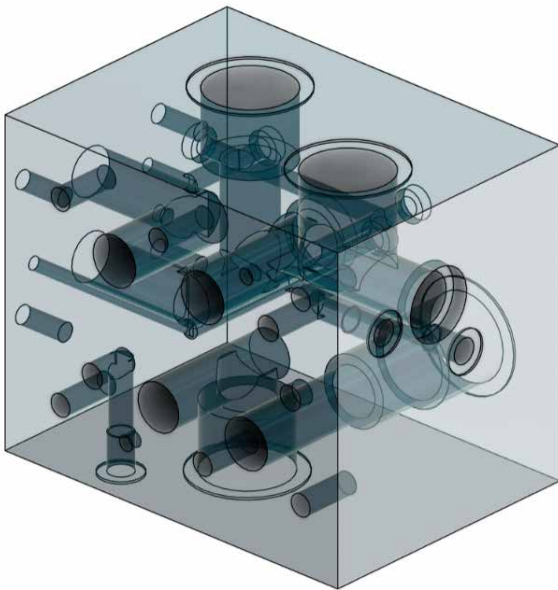
Current key trends, practices and techniques in Additive Manufacturing

- Topology Optimisation – the process of optimising designs to make them or process more efficient.
- The use of Generative Design within software can drastically improve design solutions.
- All design solutions are usually functional parts and are tested on whether they would work or not. Practice making parts that will be required to fit another item or 'clip onto' something so students have experience of thinking about the real life solution when designing their parts.