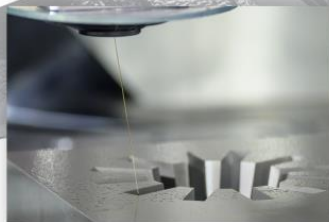
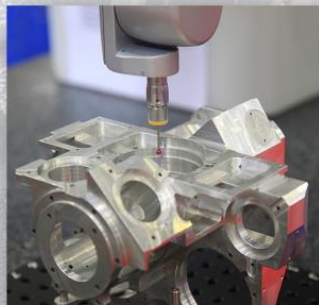


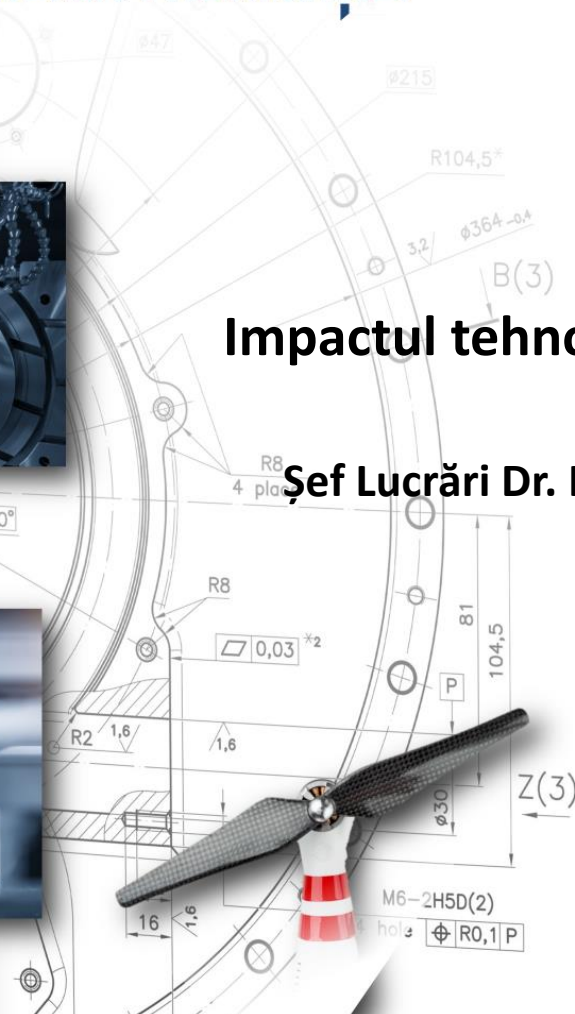


DEPARTAMENTUL INGINERIA FABRICAȚIEI



Impactul tehnologiilor aditive

Șef Lucrări Dr. Ing. Cosmin Cosma



Fabricația din punct de vedere economic

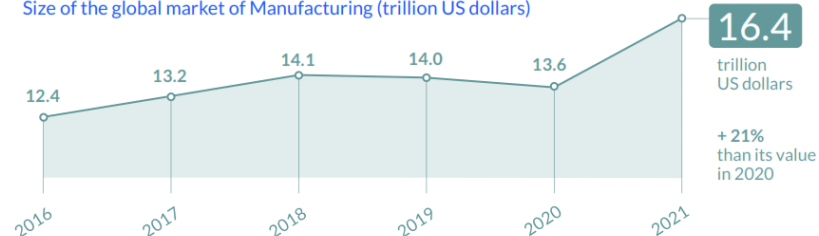
La nivel global, fabricația are o valoare de **16,4 trilioane \$**.

UE are o cotă de **19% din fabricația globală**.

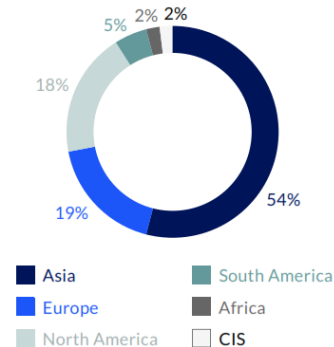
Schimbări majore la nivel global în domeniul fabricației produselor:

- Exdinderea competiției prin globalizare;
- Apariția tehnologiilor avansate, parte Industry 4.0;
- Pandemia COVID și războiul din Ucraina.

Size of the global market of Manufacturing (trillion US dollars)



Size of Manufacturing market by region



How is this market distributed globally?

- In total, 54% of the global Manufacturing market is concentrated in Asia.
- Europe and North America compete for the second position with 19% and 18% respectively.
- Africa, South America, and CIS regions produce – all together – less than 10% of the total amount of products in the Manufacturing market.

Fabricația din punct de vedere economic

Fabricația este un mijloc prin care o națiune **crează** **bunăstare materială**.

În UE, fabricația (manufacturing sector) contribuie cu 15% la produsul intern brut.

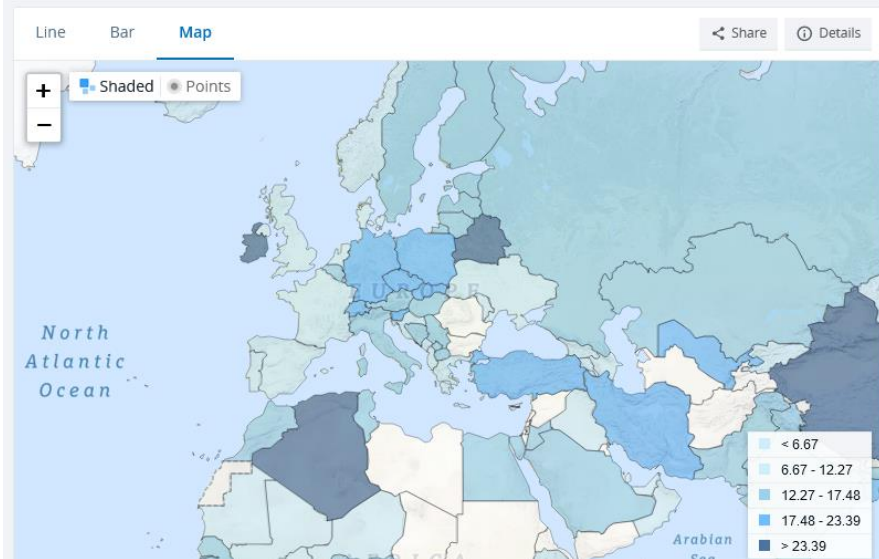
PIB-ul UE (2023) pe sectoare:

- Procese de fabricație **15%**,
- Agricultură 1.8%,
- Construcții 10%,
- Servicii (vânzări, transport) 72%.

Manufacturing, value added (% of GDP) - European Union

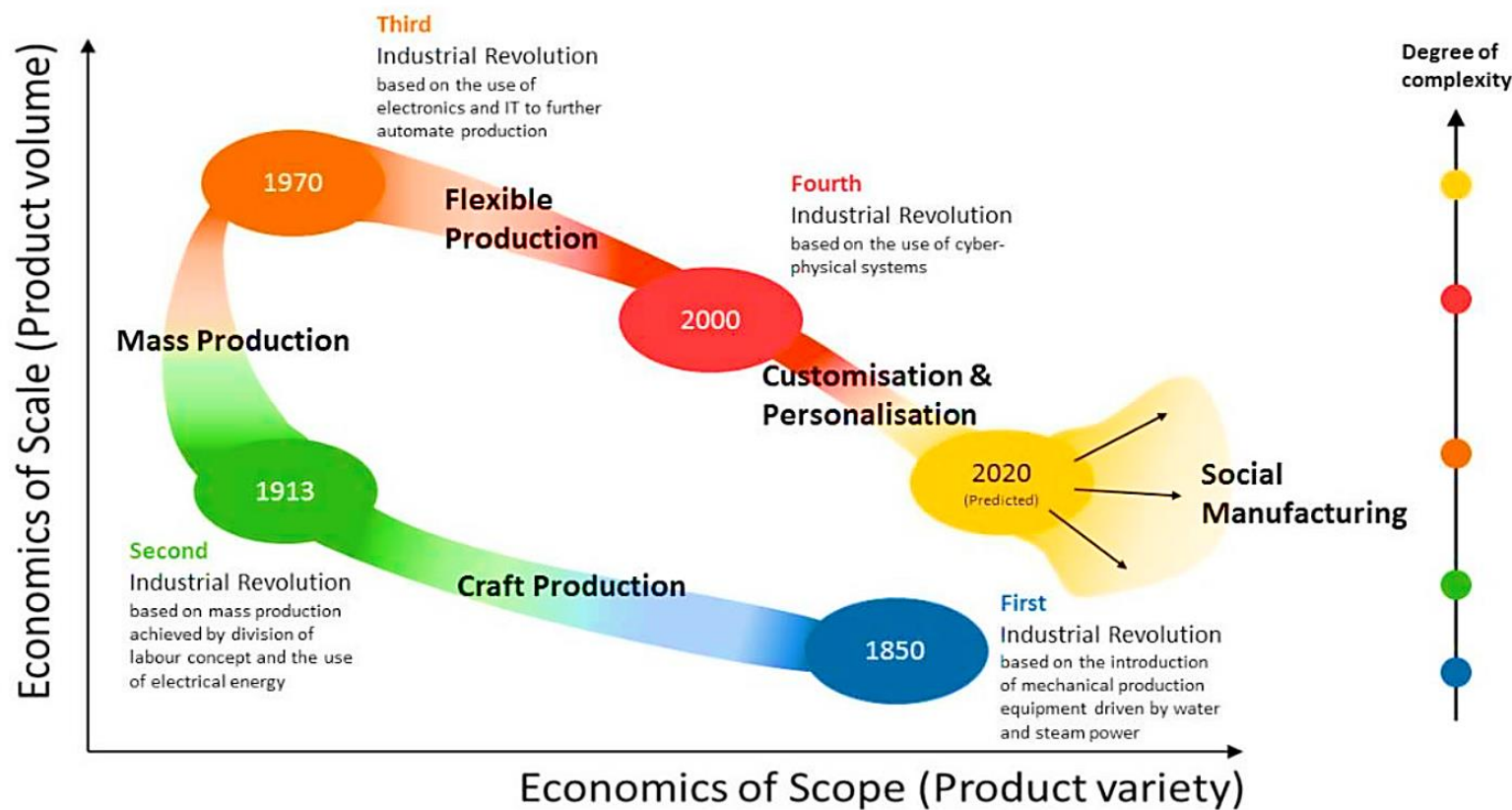
World Bank national accounts data, and OECD National Accounts data files.

License : CC BY-4.0



Sursa: Banca Mondială, 2024.

Evoluția Proceselor de Fabricație



Industry 4.0

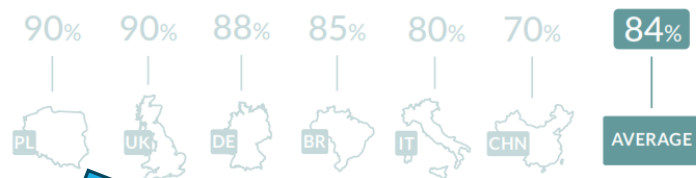
Smart factory

The evolution of technology-led Manufacturing

Digital Transformation is now a priority for most manufacturers—but how much are the different countries investing in it?

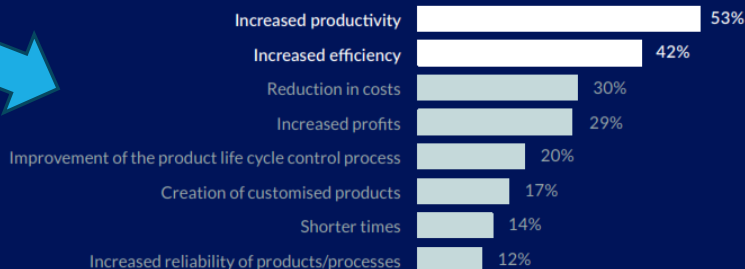
Country comparisons: companies interviewed introducing Industry 4.0 digital technologies

Source: Istituto Piepoli



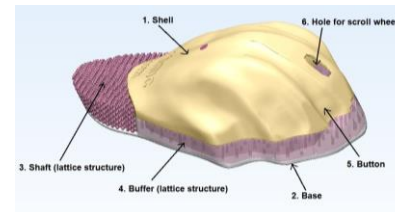
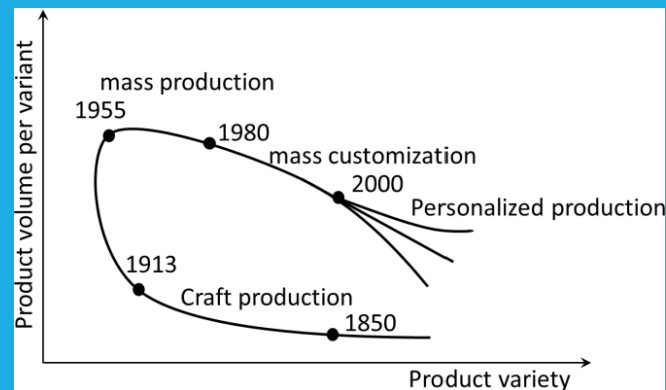
Implementation of Industry 4.0 technologies:

Expected opportunities

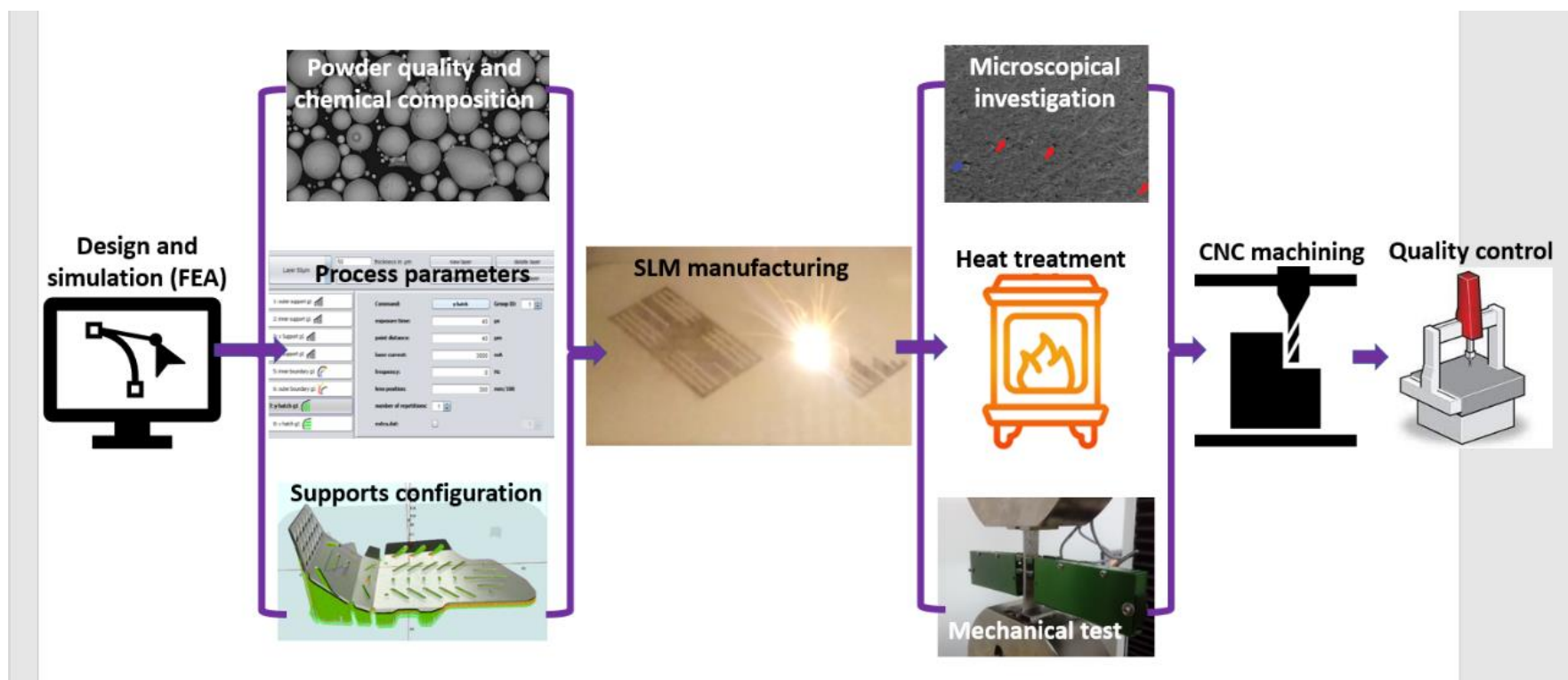


Studiu: Clienți acceptă să plătească cu 25% în plus pentru produse personalizate după nevoile lor (design, funcționalitate).

Rezultat: „Mass customized products”.



Fabricația aditivă (Additive Manufacturing)



National Centre of Rapid Prototyping

Coordonator: Prof. dr. ing. Nicolae Bâlc

Fondator: Prof. dr. ing. Petru Berce

Membri echipă: Conf. dr. ing. Dan Leordean

Conf. dr. ing. Alina Popan

S.I. dr. ing. Cosmin Cosma

Prof. dr. ing. Domnița Frățilă

Conf. dr. ing. Alexandru Popan

Prof. dr. ing. Paul Bere

Conf. dr. ing. Răzvan Păcurar

Conf. dr. ing. Emilia Sabău

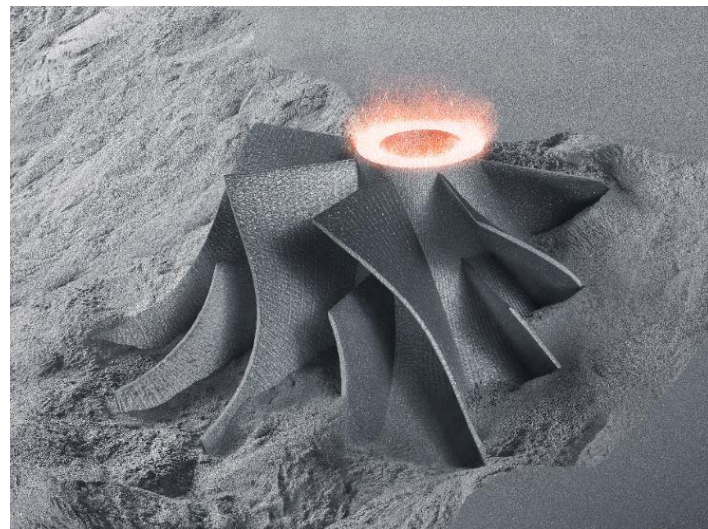
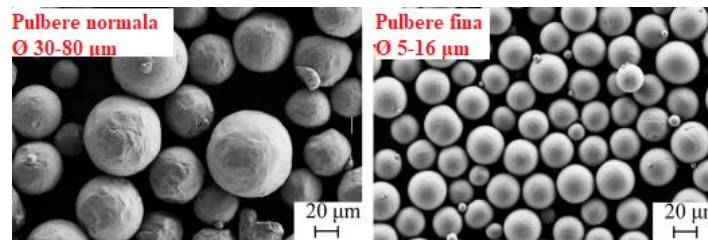
S.I. dr. ing. Horea Chezan

Conf. dr. ing. Cristina Borzan

Conf. dr. ing. Adrian Trif

Conf. dr. ing. Alexandru Cărean

S.I. dr. ing. Vlad Bocăneț



National Centre of Rapid Prototyping

Infrastructura disponibilă:

- SLS: DTM Sinterstation 2000;
- SLM: Realizer SLM 250;
- 3D Printer for PEEK filament: Creatbot PEEK 300;
- 3D Printer for composite materials: MarkForged Two;
- Hybrid 3D Printer (FDM and 5-axes milling): 5AXISMAKER;
- PolyJet printer: Stratasys J35 Pro 3D; 2024 PNRR
- CNC measurement and scanning equipment: PRISMO Navigator 71915;
- Water Jet: OMAX 2626;
- Rapid Metal Casting (Investment casting): Indutherm VC 1000 D;
- CNC turning machine: Doosan Lynx 220;
- CNC machining centre with 3/5 axes: Haas, DMG.

Procesul SLM





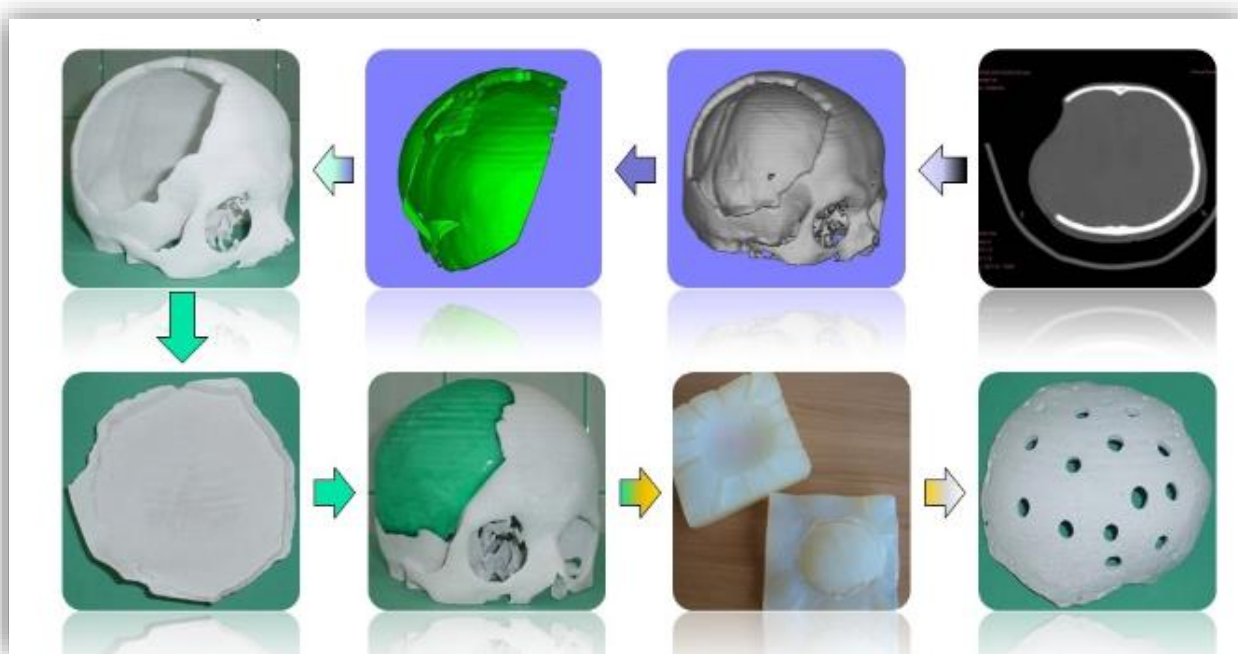
National Centre of Rapid Prototyping

Proiecte de cercetare majore:

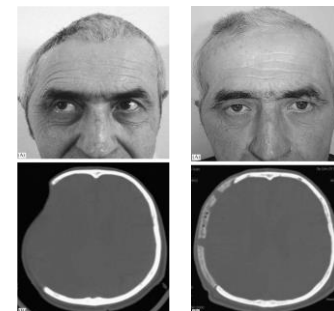
- I. PCCE, “New Biocompatible Materials for customized implants made by SLS and SLM (BIOMAPIM)”, 2010-2013, buget 1.5 mil. €, Coordonator: Prof. dr. ing. Berce.
- II. PCCA, “Implanturi Cranio-Faciale Personalizate obtinute prin prototipare inovativa 3D din materiale compozite ranforsate cu fibra de sticla (PECIFCO)”, 2014-2016, budget 350.000 €, Coordonator: Prof. dr. ing. Bâlc.
- III. TE, “Research regarding customized implants manufacturing by using AM technology from composite materials reinforced with metallic structures”, 2015-2017, budet 143.000 €, Coordonator: Conf. dr. ing. Dan Leordean.
- IV. HORIZON 2020 – AMaTUC, “Boosting the scientific excellence and innovation capacity in additive manufacturing of the Technical University of Cluj-Napoca”, 2016-2018, buget 1 mil. €, 2016-2018, Director: Prof. dr. ing. Bâlc.
- V. Bridge Grant, “Optimizing 3D Printing Process for Customized Dental Applications / Optimizarea Tipăririi 3D pentru Aplicații Dentare Personalizate”, 2016-2018, buget 102.000 €, Director: Prof. dr. ing. Bâlc.
- VI. PCCDI Project: „Implementarea tehnologiilor aditive în fabricarea componentelor complexe si suprasolicitate”, 2018-2020, buget 1 mil. €, Coordonator: Prof. dr. ing. Berce.
- VII. HORIZON 2020 – DiCoMI, “Directional Composites through Manufacturing Innovation”, 2018-2022, buget 1.5 mil. €, Coordonator: Prof. dr. ing. Bâlc.
- VIII. European Space Agency, 3 Research Contracts (over 0.5 mil. €), 2023-2026, Coordonator: Prof. dr. ing. Bâlc.

Rezultate

Tehnologie de fabricație a cranioplastiilor personalizate dezvoltată în Dept. IF

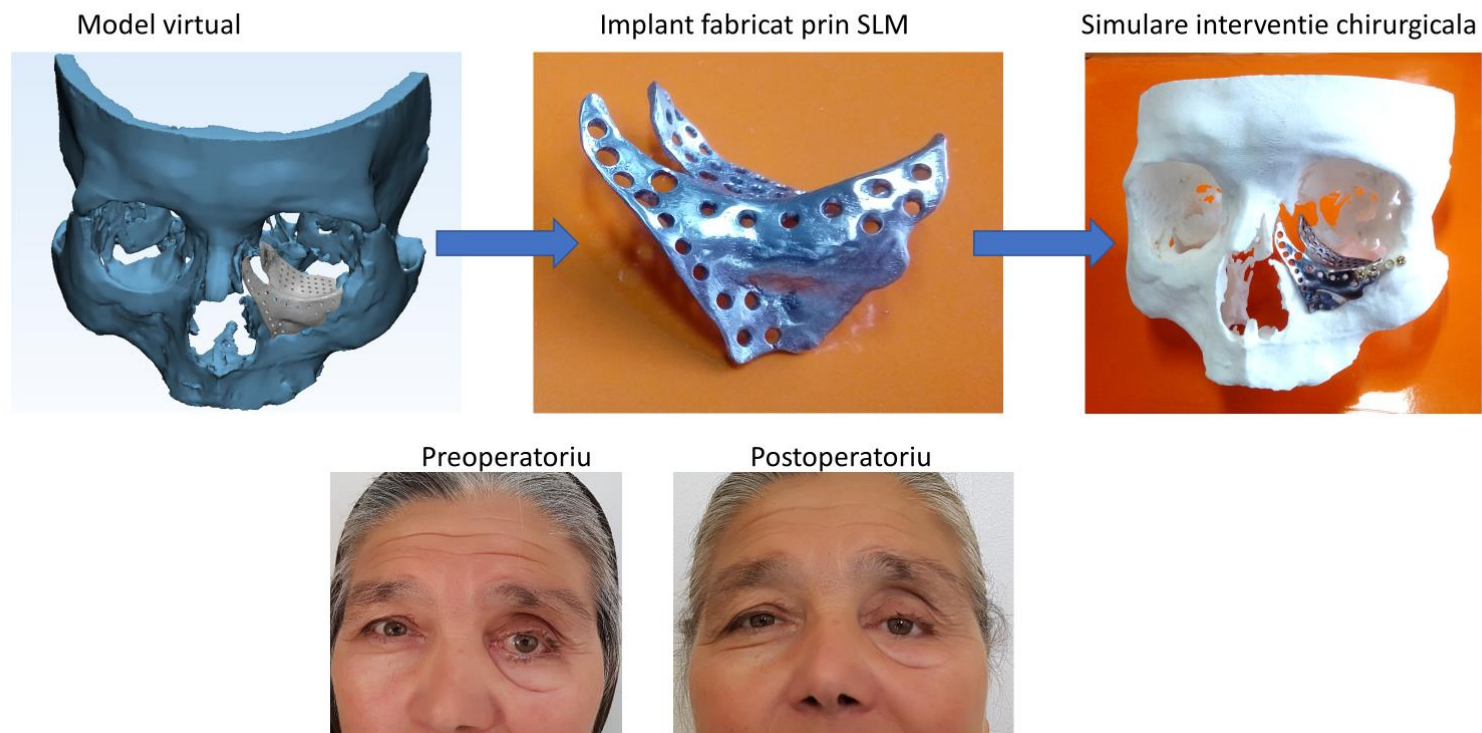


Înainte >> După



Rezultate

Implant facial personalizat fabricat prin SLM din Titan pur



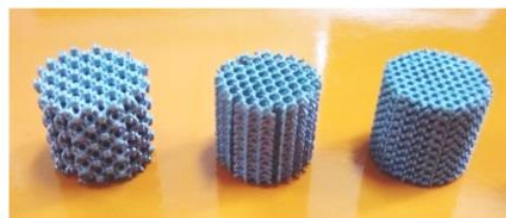
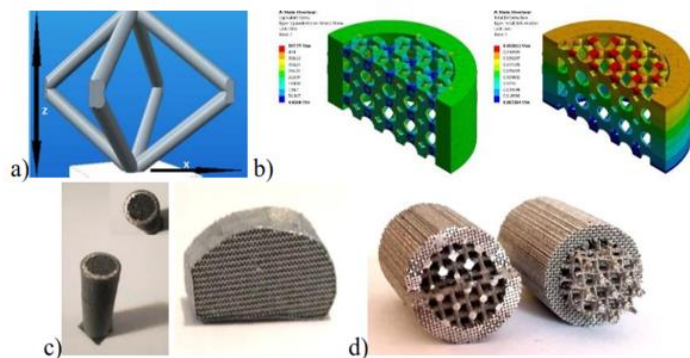
Rezultate

Reconstrucție mandibulară din Titan pur



Rezultate

Medicină regenerativă: Grefe macroporoase



Reconstrucție os zigomatic



Implant dentar

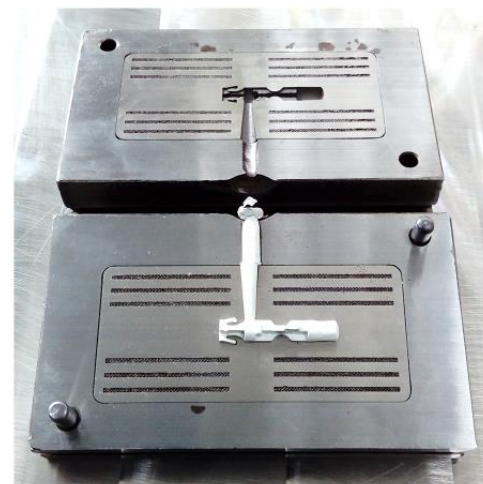
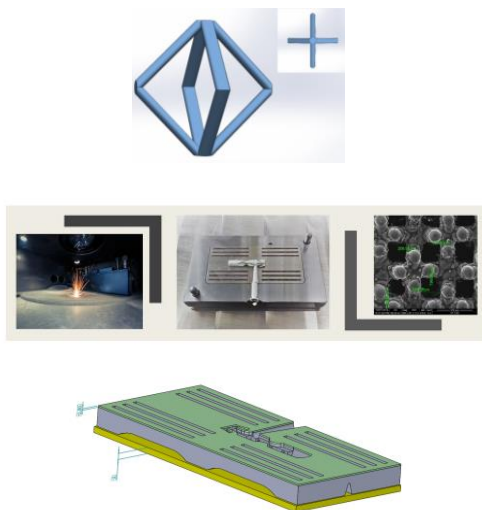


Proteză genunchi componenta tibială



Rezultate

DEDIENNEROUMANIE



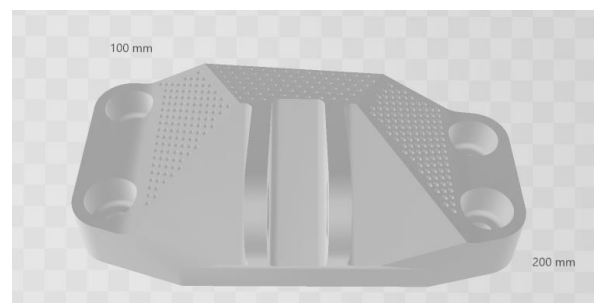
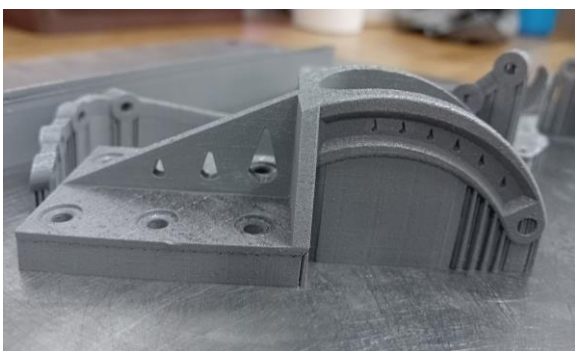
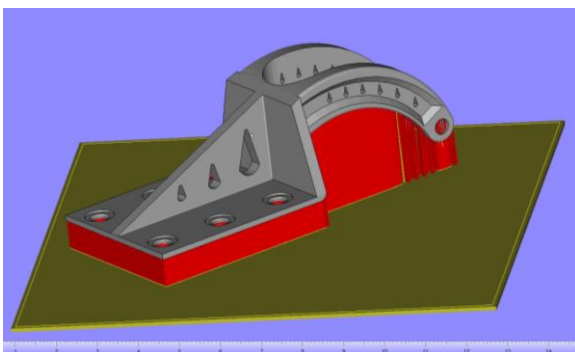
Tehnologia AM, o nouă oportunitate în fabricația de matrițe pentru injectarea maselor plastice

Rezultate

Piese aerospațiale proiectate și fabricate pentru ESA

Material: Pulbere de Ti Gradul 23

Tehnologie de fabricație: Procesul SLM



Laser additive repair of aerospace component using
Selective Laser Melting (SLM) process

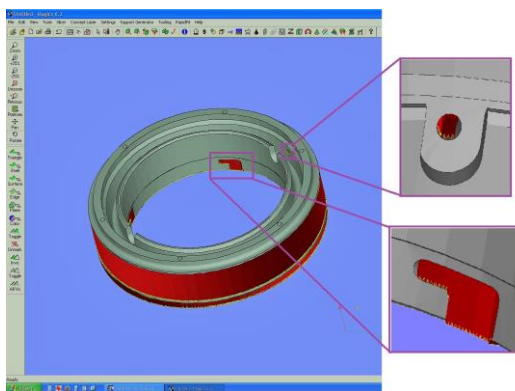


Courtesy of Dr. eng. Cosmin Cosma and Prof. dr. eng. Nicolae Balci

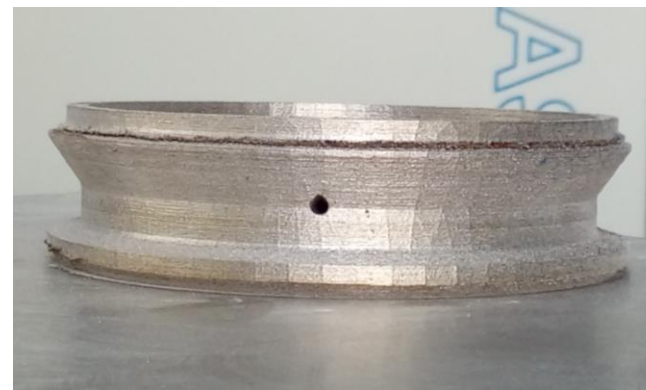
Rezultate



Re-proiectarea unei componente industriale și fabricarea ei prin procesul SLM

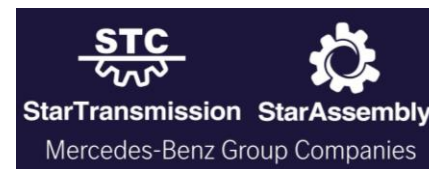


	Initial design	The redesigned features for AM
(a)	 Part profile	 Part profile
(b)	 Channels	 Channels
(c)	 Conventional design	 Raindrop design



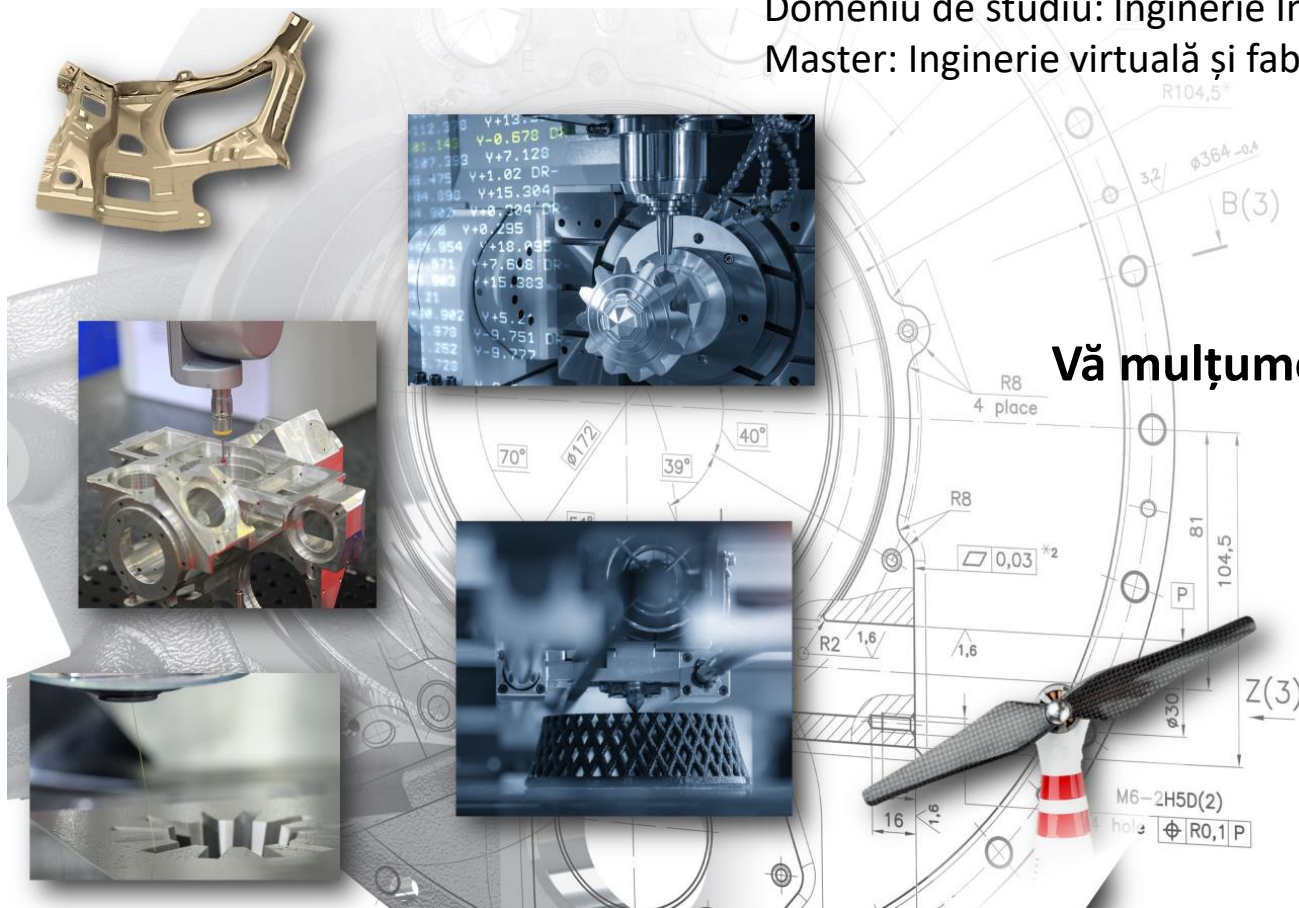


Paterneri din mediul economic



Continuăm împreună

Domeniu de studiu: Inginerie Industrială
Master: Inginerie virtuală și fabricație competitivă



Vă mulțumesc pentru atenție!