WP5 - Best Practice in Commercialisation and Technology Transfer (including Staff Entrepreneurship by way of Spin - Offs)

BI4E

BOOSTING INGENIUM FOR EXCELLENCE

D5.2 WP5 Workshop – Template for Presentations for Catalogue of Innovation Services

Partner University: Medical University of Sofia

Asist. Prof. Todor Bogdanov, Ph.D.

This project has received funding from the European Union's HORIZON-WIDERA-2021-ACCESS-05-01-European Excellence Initiative under Grant Agreement No. 101071321 -BI4E

Introduction

Who undertakes this work presented for your university?

Please indicate who undertakes the TT work for your university?

Asist. Prof. Todor Bogdanov, Ph.D.

How is it funded for your University?

For example by the University or external funding etc?

By the University

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D5.2 Good Practice Case Study # 1

Partner University: MUS – Medical University - Sofia

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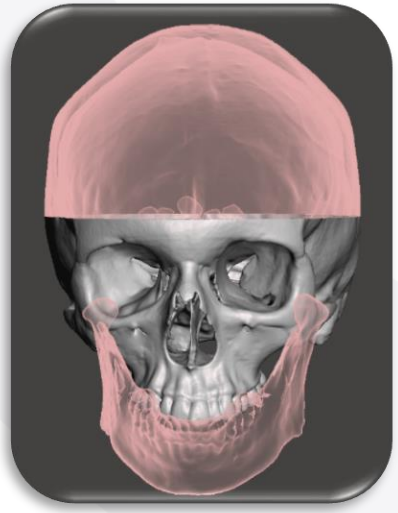
D5.2 Good Practice Case Study #1

Title: From University Lab to Operating Room: The Impact of 3D Printing on Pediatric Neurosurgery



Short summary of the Practice

This case study examines the collaboration between the Medical University of Sofia's 3DLab and the Neurosurgery Clinic at “St. Ivan Rilski” Hospital. The partnership uses 3D printing technology to create patient-specific models for preoperative planning in pediatric craniosynostosis surgeries. The initiative, started in early 2023, has produced over 25 models, demonstrating the growing demand and success of this innovative approach in improving pediatric neurosurgical care.

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Good Practice – Detailed Information

Description of the Practice:

The collaboration between the Medical University (specifically the 3DLab in the Faculty of Medicine) and the Neurosurgery Clinic at "St. Ivan Rilski" University Hospital in Sofia focuses on creating 3D-printed models for preoperative planning of neurosurgical procedures on craniosynostosis in children. Craniosynostosis is the premature fusion of cranial sutures, leading to skull deformation, typically requiring surgical intervention at a young age (usually before the age of one).

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Good Practice - Detailed Information

Description of the Practice:

The collaboration was initiated in early 2023, following the establishment of 3DLab in the summer of 2022. The Medical University of Sofia recognized the need for innovative medical education and clinical practice approaches, aiming to stay at the forefront of medical advancements. Key contextual factors include:

Technological Advancements:

The rapid development of 3D printing technologies and their increasing accessibility have created new opportunities for medical applications, particularly in complex surgical planning.

Clinical Needs:

Pediatric craniosynostosis, a condition characterized by premature fusion of skull sutures, presents significant surgical challenges. Traditional imaging methods and surgical planning techniques often fall short in addressing the intricacies of these cases.

Collaborative Environment:

The partnership between an academic institution and a leading clinical hospital provides a robust framework for integrating research, education, and clinical practice. This collaboration is further supported by the university's strategic focus on fostering innovation and technological transfer through initiatives like the National Plan for Recovery and Resilience.

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Good Practice - Detailed Information

The primary opportunity addressed by the collaboration between the Medical University of Sofia's 3DLab and the Neurosurgery Clinic at St. Ivan Rilski University Hospital is the enhancement of surgical precision and patient outcomes in pediatric craniosynostosis surgeries. By leveraging 3D scaning/printing technology, this partnership aims to:

Improve Surgical Planning:
Create accurate, patient-specific 3D models that allow neurosurgeons to meticulously plan and execute complex surgeries, reducing the risk of errors and improving surgical outcomes

Reduce Radiation Exposure:

Explore the use of surface scanners for generating 3D models from external anatomy, potentially minimizing the radiation exposure for young patients compared to traditional CT scans.

Foster Innovation in Medical Practice:
Introduce and validate advanced technologies such as multi-material 3D printing for bone and skin structures, and develop custom surgical guides to enhance surgical precision and symmetry.

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Good Practice - Detailed Information

Implementation and Achievement of Objectives

The practice reaches its objectives through the following steps:

3D Model Creation: Using CT scans or surface scanning data, 3DLab creates detailed 3D models of the patient's cranial anatomy.

Multilayer Printing: The development includes multilayer printing (bone and skin) and the creation of cutting guides for symmetry in multi-stage operations.

Rapid Turnaround: To meet the tight timeframes (images received after 1:00 PM for surgery planning by 7:30 AM the next day), a second print is initiated as a backup to mitigate hardware failures.

Collaboration and Feedback: Continuous collaboration with neurosurgeons to refine the models and adapt to their needs.

Main Stakeholders and Beneficiaries

- **Stakeholders:**
  - **Medical University and 3DLab:** Provides expertise in 3D modeling and printing.
  - **Neurosurgery Clinic at "St. Ivan Rilski" Hospital:** Uses the models for surgical planning and execution.
  - **Medical Professionals and Students:** Benefit from the enhanced training and planning tools.
- **Beneficiaries:**
  - **Pediatric Patients:** Receive safer and more precise surgical interventions.
  - **Surgeons:** Gain access to accurate models that aid in better surgical outcomes.
  - **Families of Patients:** Experience reduced anxiety with safer, less invasive preoperative procedures.

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Outcomes and Impact

Enhanced Research and Innovation

Development of Advanced 3D Printing Techniques: The university has successfully developed and refined advanced 3D printing techniques, including multilayer printing for bone and skin. This innovation has positioned the university as a medical 3D printing technology leader.

Interdisciplinary Research Opportunities: The collaboration has fostered interdisciplinary research, combining expertise from medical sciences, engineering, and computer sciences, leading to groundbreaking advancements in medical technology.

Strengthened Partnerships and Reputation

Collaboration with Leading Medical Institutions: The successful partnership with "St. Ivan Rilski" Hospital has strengthened the university's ties with leading medical institutions, fostering a collaborative environment for future projects.

Increased Visibility and Prestige: The university's involvement in pioneering projects has elevated its status in the medical and academic communities, attracting attention from potential partners, researchers, and students worldwide.

Improved Patient Outcomes

Contribution to Pediatric Neurosurgery: By providing precise 3D models for surgical planning, the university has directly contributed to improved surgical outcomes for children with craniosynostosis, enhancing its impact on patient care.

Reduction in Radiation Exposure: The development of non-radiative preoperative planning techniques demonstrates the university's commitment to patient safety and innovation in medical practices.

Sustainability and Scalability

Established Protocols and Workflows: The university has developed efficient protocols and workflows for rapid 3D model creation and printing, which can be scaled and adapted for other medical applications.

Foundation for Future Projects: The success of this project lays a strong foundation for future research and development initiatives, encouraging continuous innovation and improvement in medical technologies.

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Lessons learned

Convincing Established Specialists

- **Resistance to New Technology:** Experienced neurosurgeons and medical professionals initially showed reluctance to adopt the new 3D printing technology for surgical planning. There was skepticism about its reliability and efficacy compared to traditional methods.
- **Solution:** Demonstrating the effectiveness and accuracy of the 3D models through successful case studies and continuous engagement helped in gradually winning their trust. The increasing number of successful surgeries and improved outcomes also served as strong evidence of the technology's potential.

Time Constraints

- **Tight Deadlines:** Typically, the results from imaging studies were received after 1:00 PM, and the 3D models needed to be ready by 7:30 AM the following day for surgical planning. This required rapid processing, modeling, and printing within a short time frame.
- **Solution:** Implementing a streamlined workflow and developing a backup printing protocol were crucial. By starting a second print as a contingency, the team ensured that the models were ready on time despite any potential hardware failures.

Collaboration and Communication

- **Coordination Between Teams:** Effective collaboration between the university's 3DLab and the neurosurgery clinic required seamless communication and coordination. Differences in schedules, priorities, and working styles sometimes led to challenges.
- **Solution:** Establishing regular meetings and communication channels facilitated better coordination. Dedicated liaisons were appointed to ensure smooth interaction and timely updates between the teams.

Conclusions and Recommendations

Successful Integration of 3D Printing Technology

The collaboration between the Medical University's 3DLab and the Neurosurgery Clinic at "St. Ivan Rilski" University Hospital has successfully integrated advanced 3D printing technology into the preoperative planning of neurosurgical procedures. This integration has demonstrated significant improvements in surgical precision and patient outcomes, particularly in treating craniosynostosis in children.

Enhanced Patient Safety and Care

The shift from traditional CT imaging to surface scanning for preoperative planning has reduced radiation exposure for young patients. This innovation has contributed to safer medical practices and has set a precedent for non-invasive imaging techniques in pediatric surgery.

Positive Impact on Education and Training

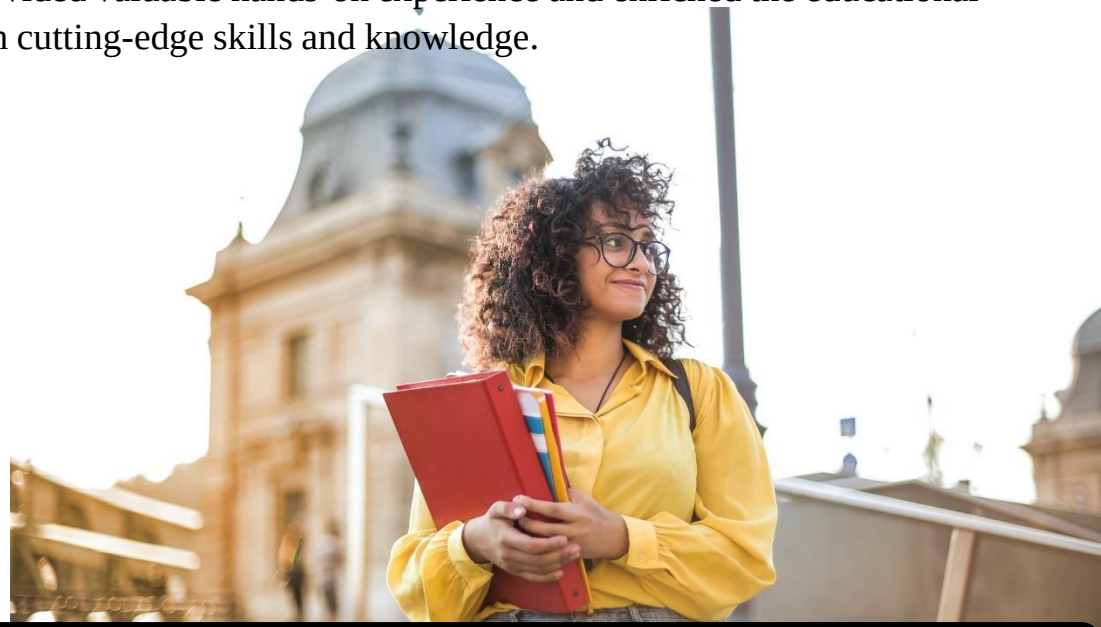
The involvement of medical students and residents in the 3D printing process has provided valuable hands-on experience and enriched the educational curriculum. This practical exposure has equipped future healthcare professionals with cutting-edge skills and knowledge.

Strengthened Institutional Collaboration

The partnership has fostered a strong collaborative environment, leading to interdisciplinary research opportunities and enhanced communication between the university and the hospital. This collaboration has set the stage for future projects and innovations in medical technology.

Overcoming Challenges through Innovation

Despite initial resistance from established specialists and technical challenges, the project has successfully overcome these obstacles through strategic solutions and continuous improvement. The implementation of backup printing protocols and regular maintenance has ensured the reliability and efficiency of the 3D printing.



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Any Additional Information

The next phase of our collaboration holds the potential to extend beyond neurosurgery, encompassing other interventions within the same clinic, branching into orthopedics, and even venturing into open-market services to benefit medicine specialists across diverse specialties.

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D5.2 Good Practice Case Study # 2

Partner University: MUS – Medical University - Sofia

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D5.2 Good Practice Case Study #2

Strategic Research and Innovation at Medical University – Sofia

Short summary of the Practice

In early 2023, Medical University – Sofia launched its Strategic Research and Innovation Development Program, funded by the European Union's NextGenerationEU via the National Recovery and Resilience Plan. The four-year initiative supports the research activities of 20 scientific groups and two international researchers, focusing on key areas like infectious diseases, immunology, and personalized medicine. Aimed at enhancing the university's global recognition, the program fosters innovation, industry collaboration, and scientific excellence.

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Good Practice - Detailed Information

The Strategic Research and Innovation Program at Medical University – Sofia was initiated to enhance the university's research capabilities and international recognition. The program is funded by the National Recovery and Resilience Plan under the "Innovative Bulgaria" component, with a budget of 44 million BGN (22 million EUR) and a duration of four years, ending in June 2026.

The program funds 20 research groups led by esteemed university scholars and two international researchers. This initiative focuses on enhancing the university's research output and fostering innovation through an internal competition for research projects with potential for technological transfer. The program aims to bridge the gap between academic research and practical applications by integrating industry partnerships, promoting economic recovery and transformation through science and innovation.

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Good Practice – Detailed Information

Objectives and Implementation:

The practice aims to:

- Increase the university's publication output and impact.
- Secure new international patents.
- Foster young researchers' involvement in high-impact research.
- Establish strong partnerships with industry.
- Enhance participation in international research networks.

The implementation involves:

- Funding research projects within the strategic areas.
- Organizing internal competitions to identify projects with innovation potential.
- Facilitating collaboration between researchers and industry partners.
- Monitoring and evaluating the progress through specific performance indicators such as publication count, patent applications, and new industry agreements.

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Good Practice - Detailed Information

Beneficiaries:

- **University Researchers and Faculty:** Gain funding and support for their research projects, fostering academic growth and innovation.
- **Students:** Benefit from enhanced research opportunities and exposure to cutting-edge scientific developments.
- **Healthcare Sector:** Gains access to advanced medical research and innovations that can improve healthcare delivery.
- **General Public:** Ultimately benefits from improved healthcare solutions and treatments emerging from the program's research initiatives.

Stakeholders:

- **Medical University – Sofia:** As the primary institution, it oversees the execution of the program and ensures alignment with its strategic goals.
- **European Union:** Provides funding through the NextGenerationEU instrument and NRRP.
- **Bulgarian Government:** Supports the program through the Ministry of Education and Science and the Ministry of Health.
- **Industry Partners:** Collaborate on research projects, contributing to technological transfer and innovation.
- **International Researchers:** Bring global expertise and enhance the program’s research quality.

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Outcomes and Impact

1. Enhanced Research Output: The Strategic Research and Innovation Program aims to significantly increase the university's publication output, both in terms of quantity and impact. Key metrics include the number of publications in high-impact journals, citations, and H-index scores.

2. Technological Transfer and Patents: Through industry partnerships and innovation-focused research projects, the program seeks to facilitate the transfer of research findings into practical applications. Key deliverables include the number of patents filed and commercialized technologies stemming from university research.

3. Academic Reputation and Global Standing: By focusing on strategic research areas and fostering collaboration with international researchers and institutions, the program aims to elevate Medical University – Sofia's global reputation in medical research and innovation. Key impacts include improved rankings, recognition in the academic community, and increased visibility on the international stage.

4. Capacity Building and Talent Development: The program provides funding and support for researchers, including early-career scholars and postgraduate students, to engage in high-impact research projects. Key outcomes include the development of research skills, the nurturing of young talent, and the retention of top researchers within the university.

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Outcomes and Impact

5. Industry Collaboration and Economic Impact: By fostering partnerships with industry stakeholders, the program aims to promote knowledge exchange, technology transfer, and innovation-driven economic growth. Key outcomes include collaborations with industry partners, joint research projects, and contributions to local and national economic development.

6. Contribution to Health Solutions: Through research in strategic areas such as infectious diseases, immunology, and personalized medicine, the program seeks to generate new knowledge and innovations that contribute to improved healthcare outcomes. Key impacts include the development of novel therapies, diagnostic tools, and preventive measures to address pressing health challenges.

7. Alignment with National and EU Priorities: The program aligns with national priorities for research and innovation as outlined in the National Recovery and Resilience Plan (NRRP) and contributes to the European Union's broader objectives for scientific advancement and economic recovery. Key impacts include the fulfillment of strategic objectives outlined in national and EU research agendas.

8. Knowledge Transfer and Dissemination: The program emphasizes the dissemination of research findings through conferences, workshops, and publications, both within the academic community and to broader stakeholders. Key outcomes include increased knowledge dissemination, technology transfer activities, and engagement with policymakers and the public.

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Lessons learned

Strategic Planning and Flexibility:

- **Lesson:** The importance of strategic planning cannot be overstated. However, it's equally crucial to maintain flexibility within the plan to adapt to changing circumstances and emerging opportunities.
- **Implication**: While a well-defined strategy provides direction, being adaptable allows for timely adjustments in response to evolving research priorities, technological advancements, and funding opportunities.

Stakeholder Engagement and Collaboration:

- **Lesson:** Effective stakeholder engagement and collaboration are fundamental to the success of research initiatives.
- **Implication**: Building strong partnerships with academia, industry, healthcare providers, and government agencies fosters synergies, facilitates resource sharing, and accelerates the translation of research findings into tangible outcomes.

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Lessons learned

Continuous Evaluation and Improvement:

- **Lesson:** Regular evaluation and feedback mechanisms are essential for assessing progress and identifying areas for improvement.
- **Implication:** Implementing robust monitoring and evaluation frameworks allows for the timely identification of challenges, successes, and areas needing adjustment, enabling continuous improvement and optimization of research activities.

Capacity Building and Talent Development:

- **Lesson:** Investing in capacity building and talent development is key to nurturing a vibrant research ecosystem.
- **Implication:** Providing training opportunities, mentorship programs, and career development support enhances the skills and expertise of researchers, fostering innovation, and ensuring the sustainability of the research program.

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Conclusions and Recommendations

Strategic Alignment:

The strategic research and innovation program at Medical University – Sofia has demonstrated its ability to align research efforts with institutional goals, fostering a culture of innovation and excellence.

Impactful Collaboration:

Through effective collaboration with diverse stakeholders, including academia, industry, and healthcare providers, the program has generated impactful research outcomes with real-world applications.

Resource Optimization:

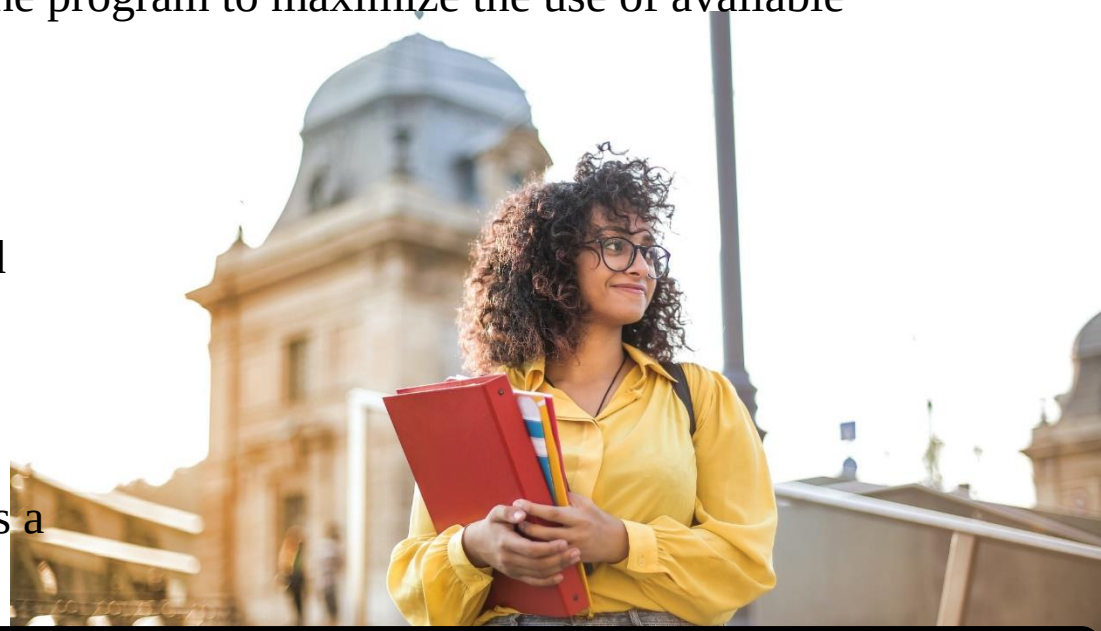
Efficient resource allocation and management practices have enabled the program to maximize the use of available resources, ensuring sustainability and long-term success.

Continuous Improvement:

Embracing a culture of continuous evaluation and improvement has facilitated the program's adaptability to evolving research priorities and emerging opportunities.

Talent Development:

Investments in talent development and capacity building have strengthened the research capabilities of the university, positioning it as a leader in cutting-edge research and innovation.



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