

The project focuses on identifying users' needs and supporting the relations between people through mentoring and consulting activities [1].

The main goal of the SP4CE project is to design innovative common e-learning tools for cooperation between enterprises, students and teachers. The proposed tools are available as ICT solution with WWW interface designed for three main target groups: Coaches, Mentors (Teachers) and Students.

The SP4CE portal is dedicated for companies and young people who want to enter the labour market. The SP4CE portal supports the following actions:

- Coaches from within companies formulate and submit the problem.
- Students situated in different locations choose problem(s), look for a solution and send a short proposal.
- Based on the proposed solutions, mentors (teachers) are allocated to students and they assist the problem solving process within so called Learning Rooms.

In order to achieve a good collaboration between all target groups, they should be trained by using the handbook and guidelines available online.

The handbook prepared for SP4CE users is titled "SP4CE Pedagogical Concept" and covers the following subjects:

- Results and lessons learned from already implemented projects.
- Collaborative learning for creativity and innovation.
- Online mentoring, teaching and coaching.

At the current project stage, the handbook is ready in English and will soon be translated and available in all partners' languages: Greek, Hungarian, Slovak and Polish [2].

II. WHY MOOCS IN SP4CE

The Massive Open Online Courses first appeared in 2008 in Canada and the United States. Since 2012 they became popular and changed the approach to distance learning. European MOOC courses were implemented in 2013 [4].

In SP4CE project the subject about MOOCs appears in the training module "Strengthening competencies with MOOCs". This module contains the definitions, history of development and examples of good practice connected with Massive Open Online Courses. The training materials will be available on the SP4CE project portal in 5 languages. [2]

- There are several reasons the authors propose using MOOCs in the SP4CE project. New knowledge, skills and cooperation allow people to become more valuable employees, working for themselves or for current or future employers.
- Education is not a one-off event but the experience gathered during peoples' life .
- Modern education should be conducted in attractive and inspiring ways.
- MOOCs are free, online and public.
- Learners can work at their own pace, in their spare time.

- The possibility of raising the Moodle skills and to cooperate or exchange experiences with other Moodle users.

Participants in the SP4CE project took part in some Moodle MOOCs courses, such as Moodle MOOC 7, Moodle MOOC 8 and Teaching with Moodle (January 2016 and August 2016). The partners of the SP4CE project took part in 4 Moodle MOOCs. [4] The participants received 10 Certificates of Completion. In Figure 1, an example certificate is shown.



Figure 1. An example certificate got in Teaching with Moodle (January 2016)

Experience gathered by authors during those Moodle MOOCs has been implemented. It was used for purposes as:

- Raising LMS Moodle skills.
- Creating a prototype version of the Learning Rooms.
- Preparation of short training videos relating to Moodle tools and the operation of Learning Rooms.
- Testing and evaluation of Moodle tools by 16 participants from 4 partner countries: Greece, Hungary, Poland and Slovakia.

As a result of taking part in Moodle MOOCs, the first Example Learning Room was created and used for testing and evaluation [4]. The example results of the evaluation of the best tools for communication that can be used in Learning Rooms are shown in Figure 2.

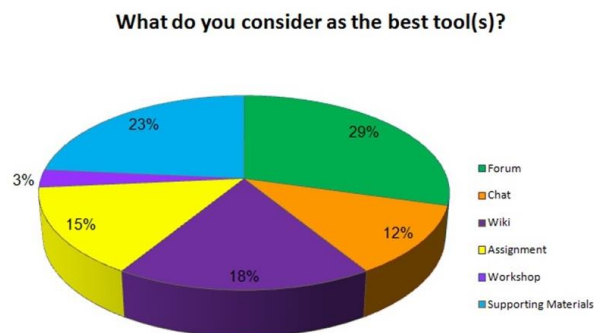


Figure 2. The example result of evaluation



In order to make an international cooperation more effective and efficient, partners decided to train local administrators in order to take over the role of the main administrator while the project is ended. They speak the local language and are responsible for sharing guidelines and teaching materials, users' registration and the verification of Learning Rooms' requests.

The list of Learning Rooms' Administrators is shown in Table I.

TABLE I.
THE LIST OF LEARNING ROOMS' ADMINISTRATORS

| No | Learning Rooms Administrators (Status) | | |
|----|--|-----------------|----------|
| | Name and Surname | Partner | Country |
| 1 | Anna Grabowska (Main) | PRO-MED | Poland |
| 2 | Dana Palova (Local) | TUKE | Slovakia |
| 3 | Olga Anagnostaki (Local) | IDEC | Greece |
| 4 | Gabriela Kengyel (Local) | TREBAG | Hungary |
| 5 | Jacek Zieliński (Local) | PIAP | Poland |
| 6 | Ewa Kozłowska (Local) | PRO-MED PIAP | Poland |

Learning Rooms have been also used for preparing articles and presentations for Polish and international conferences (Fig.3).

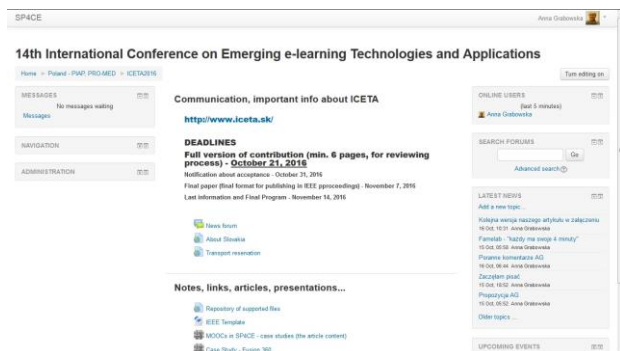


Figure 3. An example Learning Room for ICETA 2016

One of the Learning Rooms is being used for working on a Master's Diploma project. [3] The project concentrates on finding the best tools for collaboration between doctors and engineers (Fig. 4). As a free software solution, Fusion 360 was proposed.

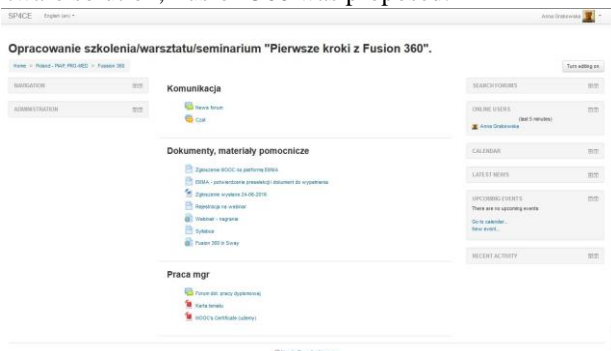


Figure 4. The Learning Room for developing Fusion 360 training/workshop/seminar in EMMA

III. CASE STUDY – FUSION 360

Fusion 360 is a cloud-based CAD/CAM tool for collaborative product development. It is the next-generation industrial and mechanical design tool which is free for students, educators, and academic institutions. Using Fusion 360, students can create designs with easy-to-use software. They can develop their skills in order to become tomorrow's engineers, product designers, and industrial designers. Fusion 360 enables discovery and iteration on product ideas and cooperation within distributed product of team of developers. It combines mechanical design, organic shapes modelling and manufacturing in one comprehensive package. [7].

One of the biggest advantages of Autodesk Fusion 360 is the fact that it is free for start-ups, students, , hobbyists or enthusiasts. What is more, the authors took care in sharing supporting materials and online courses.

As an example of free online education material, the Udemy MOOC titled "Product Design in Autodesk Fusion 360 from idea to prototype" could be mentioned. (Fig. 5). [8]

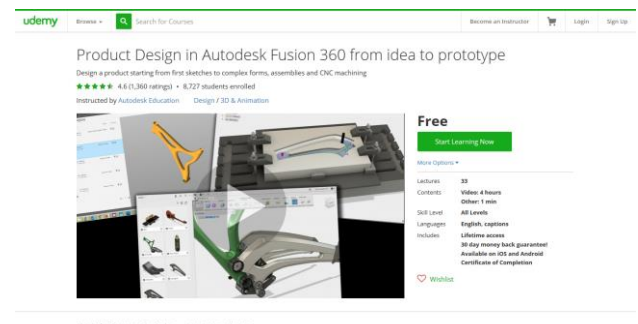


Figure 5. The Udemy Autodesk Fusion 360 MOOC

Participants in the SP4CE project interested in Designing and Engineering took part in this MOOC and created a Learning Room to share the learning materials, their experience and impressions about the MOOC and using Fusion 360. After finishing all the tasks, participants received an official Autodesk Education Certificate of Completion as shown in the Figure 6 [8].



Figure 6. An example certificate awarded in the "Product Design in Autodesk Fusion 360 from idea to prototype" online course

More training tutorials can be found on the Autodesk website. [14]. They are titled "Getting started with Fusion

360" and consist of 12 short tutorial videos, like the one shown in Figure 7. Combined together, they are still under 60 minutes long.

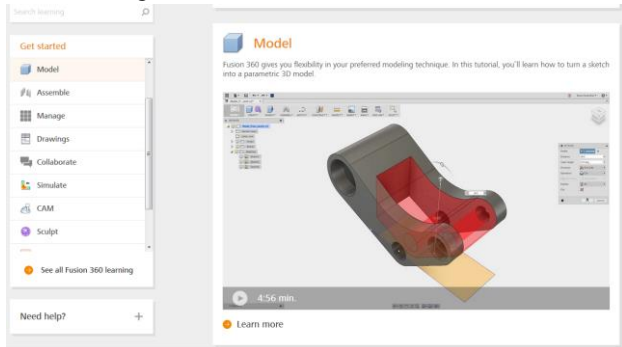


Figure 7. An example of Autodesk "Getting started with Fusion 360" tutorial videos

Learners also have an opportunity to join free live webinars for Autodesk Fusion 360 beginners (Fig. 8). Most of the recordings are also available online to watch at any time. [15]



Figure 8. "Fusion 360 for Beginners" webinar

As a result of this experience, members of the SP4CE project came up with the idea of creating an online course for Gdańsk University of Technology students. The course will be prepared as an offer of the Autodesk Authorized Training Centre (Academic Partner) at Gdańsk University of Technology (Fig. 9) [9].



Figure 9. ACSA PG – Autodesk Academic Partner

The courses will be delivered as a part of Autodesk Fusion 360 DesignNow program [10]. This program helps Autodesk Academic partners in delivering training to their students. It consists of 3 types of training: Fusion 360 DesignNow Webinar, Fusion 360 DesignNow Workshop, Fusion 360 DesignNow Designathon. Each type of training is intended for different objectives regarding duration, content, audience, promotion and components. It should be noted that the DesignNow program is supported by an Autodesk and Connect marketing campaign.

ACSA PG as an Academic Autodesk Partner plans to offer MOOC titled "Introduction to Autodesk Fusion 360" in cooperation with the EMMA platform.

When "Introduction to Autodesk Fusion 360" MOOC is ready (Table II), authors will plan the first tests to be performed by students from the Medical University of Gdańsk.

TABLE II.
THE EXAMPLE DATA FOR EMMA MOOC

| | |
|---|--|
| Name of MOOC | Introduction to Autodesk Fusion 360 |
| Providing Institution | ACSA PG – Autodesk Academic Partner |
| Description (subject, domain, pedagogy, learning outcomes/objectives, outline of lessons if possible, summary syllabus) | Fusion 360 is a cloud-based CAD/CAM tool for collaborative product development. Fusion 360 enables discovery and iteration on product ideas and cooperation within distributed product of team of developers Fusion 360 combines mechanical design, organic shapes modelling and manufacturing in one comprehensive package. In this course students will get the basic knowledge about product design in Autodesk Fusion 360. |
| Duration in Weeks | 1 – 2 week |
| Total participant workload in hours (course + homework) | 8 – 16 hours |
| Course format (levels of interaction, text-based syllabus, pre-recorded videos, live webinars, podcasts, presentations, discussions etc.) | Interactions with limits (e.g. , links to external resources, glossaries, quizzes) Text-based syllabus Pre-recorded videos Screencasts Presentations Discussion Questionnaire |
| Primary Language of Delivery | English |
| Preferred language(s) to be included as a translation and transcription option | Polish |

IV. SUMMARY

The Fusion360 program, by creating projects in the cloud and using the idea of distance communication gives the possibility of interdisciplinary cooperation between medical academic centres and technical institutions (Fig. 10). It will be the new level of diagnostics and medical consultation, conservative and surgical treatment planning, creating new solutions and methods, discussing the use of biocompatible materials etc. Transferring the communication and work to the cloud reduces the time of the project's creation and realization.

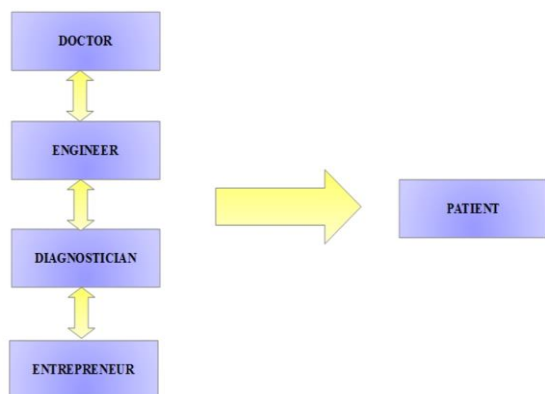


Figure 10. Interdisciplinary collaboration: effect on the development in medicine

An example of one application of a common platform for interdisciplinary communication is some types of complicated reconstructive procedures in the skull. In maxillofacial and oral surgery, the common problem is defects of the bone after trauma (especially the lower wall of the orbit and zygomatic arch). Another difficulty is to reconstruct bone fragment after cancer resection. Most often bone is destroyed due to malignant invasion of squamous cell carcinoma or as a result of the infiltrating tumor growth, for example keratocystic odontogenic tumor (KCOT) and ameloblastoma. Planning in the cloud would involve designing the scope of resection, to create a model reconstituting bone fragment, surgical template and custom implant [11], [12].

The levels of cooperation consist of these steps:

- Diagnosis
- X-ray technician performs examination of multidetector computed tomography (MDCT)
- Radiologist evaluates the examination of MDCT
- Placing the results in the cloud makes it easier for a patient to obtain consultations from doctors in other medical centres
- Pathologist determines final diagnosis after biopsy
- Planning the scope of surgical treatment based on MDCT
- Engineer takes MDCT examination and designs skull with lesion in CAD
- 3D printing or milling with the lesion - the ease of evaluation surgery
- Doctor and engineer are planning a surgical template and custom implant of bone in CAD
- 3D printing or milling surgical template
- 3D printing or milling custom implant
- Sterilization of the surgical template and custom implant
- Surgical procedure
- Postoperative control in MDCT or magnetic resonance imaging

Strategies for treatment of the patient can be created by analyzing the test results. In bone reconstruction, performing it is necessary to analyze MDCT. The

planning forms the basis of the scope of the surgery to be performed and subsequent reconstruction. The engineer can create a 3D project of CAD technology based on radiological imaging studies (Fig. 11 and 12) [13].

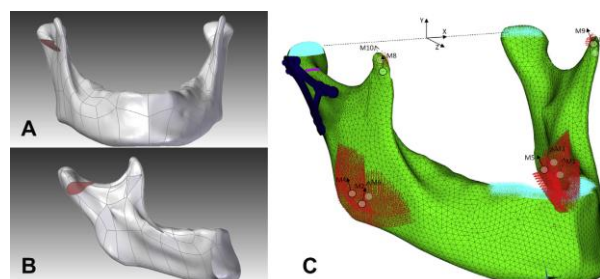


Figure 11. Planning of reconstruction mandible [13]

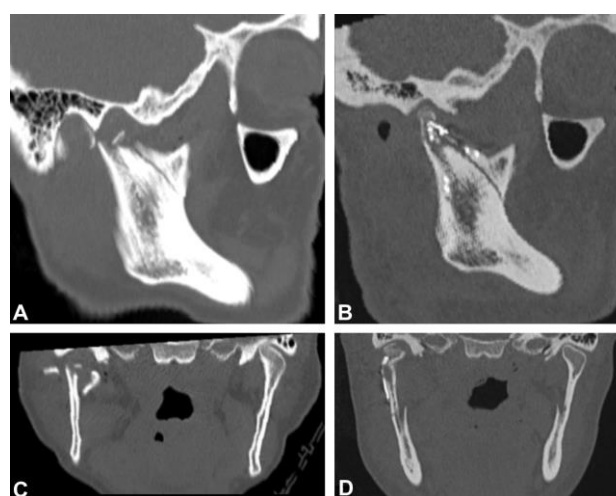


Figure 12. MDCT A, C before surgery, B,D after surgery and reconstruction. A and B sagittal view. C and D coronal view [13]

Design with 3D is used to create a model of the skull using 3D printing technology. The model of the skull enables the operator to determine the range of tumor resection. Then, based on MDCT, a surgical technician designs the surgical template and individual implant in the technology of CAD. Assuming that most people are symmetrical, the designer makes a mirror image of the skull in the sagittal plane and sketch custom implant. The implant will replace bone defect. Then it is printed or milled. The material is selected based on the affected area (mandible - a greater burden than the bottom of the orbit) and must be compatible. The implants are usually made of titanium or polypropylene. The material must be resistant to the sterilization process. During the procedure, the surgeon will be able to perfectly remove the tissue by using surgical template and replace the bone with the custom prosthetic.

Communication between specialists of different disciplines allows for shortening the work process. Constant communication with team members reveals the possibilities and limitations of each medical and technical solution.

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REFERENCES

- [1] A. Grabowska, N. Urbancikova, M. Słowikowski, J. Zieliński, "SP4CE – strategic partnership for creativity and entrepreneurship successor openinn", *Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej*, Gdańsk, vol. 41, pp. 15-21, April 2015. Czaja A., Palova D., Anagnostaki O., Grabowska A., Zieliński J., Kengyel G., "SP4CE portal", <http://sp4ce.eu/>, October 2016.
- [2] A. Grabowska, Palova D., Anagnostaki O., Kozłowska E., Zieliński J., Kengyel G., "SP4CE Learning Rooms", <http://sp4ce.moodle.pl/>, October 2016.
- [3] A. Grabowska, E. Kozłowska. "Moodle MOOCs – przypadki użycia w projekcie SP4CE (Partnerstwo strategiczne na rzecz przedsiębiorczości i kreatywności)", *Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej*, Gdańsk, vol. 48, pp. 29-34, April 2016.
- [4] A. Grabowska, "Basic of Fusion 360 in MoodleCloud", <https://sp4ce.moodlecloud.com/course/view.php?id=6>, October 2016.
- [5] CORDIS, "European Multiple MOOC Aggregator", http://cordis.europa.eu/project/rcn/191824_en.html
- [6] Autodesk Website, <http://www.autodesk.com/products/fusion-360/overview>, October 2016
- [7] UDEMY: "Product Design in Autodesk Fusion 360 from idea to prototype", <https://www.udemy.com/product-design-fusion-360/>, October 2016.
- [8] A. Grabowska, ACSA PG, <http://acsa.pg.gda.pl/>, October 2016.
- [9] Connect/KnowledgePoint, *DesignNow with Fusion 360 Partner Toolkit*, <https://sway.com/Vz3bOHYY2iPMRrgV>, October 2016.
- [10] P. Szymor, M. Kozakiewicz, R. Olszewski, "Accuracy of open-source software segmentation and paper-based printed three-dimensional models", *J Craniomaxillofac Surg.*, vol. 44(2), pp. 202-209, February 2016.
- [11] M. Kozakiewicz, M. Elgalal, P. Loba, P. Komuński, P. Arkuszewski, A. Broniarczyk-Loba, L. Stefańczyk, "Clinical application of 3D pre-bent titanium implants for orbital floor fractures", *J Craniomaxillofac Surg.*, vol, 37(4), pp 229-234, June 2009.
- [12] M. Kozakiewicz, J. Swiniarski, "'A' shape plate for open rigid internal fixation of mandible condyle neck fracture", *J Craniomaxillofac Surg.*, vol. 42(6), pp. 730-707, September 2014.
- [13] Autodesk tutorials: "Get started with Fusion 360", <http://www.autodesk.com/products/fusion-360/learn-training-tutorials>, October 2016.
- [14] Autodesk's webinar "Fusion 360 for Beginners", https://www.youtube.com/watch?v=VbSkwvZyU_0, October 2016.

