Students' attitude towards setting up a 3d printing centre

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Abstract. *The INNO3D project aims to train librarians in the development of 3D printing services for the users of libraries. At Transilvania University, the setting up of a free printing centre for students was proposed. Qualitative research was carried out, regarding students' attitude and their expectations from such a service. The data was collected by an online questionnaire using Survey Monkey. A positive attitude of students regarding the development of this service was proven.*

Keywords: 3D printing, 3D printing centre, statistical research, Romania

Introduction

Public and university libraries inferred that an innovative service provided to users is a 3D printing service. Libraries have the necessary potential to introduce quality 3D printing services (Letnikova, 2017). Pilot projects regarding the development of 3D printing services were presented in literature. The policies adopted, the best practices, and successful elements are described (*A Model for Managing 3D Printing Services in Academic Libraries. | Issues in Science and Technology Librarianship*, n.d.) (Nowlan,

https://doi.org/10.2478/9788395815065-013

2015). 3D technology offers a way to learn about new technologies and using these technologies in the learning process. The appearance of 3D printers in libraries has created lots of opportunities for the process of teaching, learning, and research. Some universities have opened 3D printing centres with access for users. The centres were fitted with 3D printing stations for students, professors, and administrative staff. Training courses were offered (Finley, 2016) (Scalfani & Sahib, 2013). Developing printing centres in university libraries represents an important step but further aspects have to be taken into account, such as policies, environment safety, training, publicity, maintenance and scope of service. Guides regarding the implementation of such a service by academic libraries are offered. (Gonzalez & Bennett, 2014)

Education passes through a rapid evolution, many students use designing services and then, 3D printing services and other web-based instruments in order to validate their ideas more quickly. In other words, with 3D printing people actually have the opportunity to materialize or give life to their ideas. Thus, thanks to the liberalization of mass media, and to the fact that news and information can be presented through varied channels (Reazeanu, 2016, p.7), and taking into account that messages sent through diverse communication channels have the ability to reach diverse types of audiences (Coman et al., 2018, p.41), students now have access to a wide range of information that can help them come up with multiple, creative ideas.

The popularity of online 3D printing services accelerates the process of designing and learning. These services allow a designer to “print” practically in any material, such as plastic materials or metals (Rivera-Chang, 2015). The impact of this new technology and of other new web-based instruments is significant not only in industry but also in the process of teaching.

3D printing opens new opportunities in many fields. Biomedicine is one of the fields in which 3D printing enabled a revolution. Prototyping ideas, customising solutions for patients are just two of the recognised advantages. The National Institute of Health (NIH) Library has launched a 3D printing service after it conducted research regarding users’ preferences. A great interest of users for 3D modelling was proven. It was also highlighted that 3D printers also require significant maintenance and repair. NIH scientists use 3D printing to improve their research and open new ways for solving problems in laboratories.(Walker, 2017)

Information concerning the benefits of these technologies regarding data viewing and archiving practices, as well as a potential users’ database for 3D printing and scanning services happening in a library are presented Groenendyk. The experience of Dalhousie University Libraries in Halifax, Nova Scotia, is depicted. The unique role libraries have in university campuses allows them to function as universal access points for these technologies.(Groenendyk & Gallant, 2013)

Intellectual copyrights have modelled this potential innovation, 3D printing technology and the way in which 3D printing technologies could represent a challenge for the system of intellectual copyrights in the future. The protection of patents seems to have played an important role in the sector of industrial 3D printing. In the new sector of personal 3D printing, the intellectual copyright system has to deal with new challenges. Developers of 3D printing personal services and systems have to deal with the infringement on a large scale by end users, a well-known situation for digital content technologies. At the same time, the expiry of key patents regarding 3D printing has undoubtedly contributed to a flourishing ecosystem of hardware and software for 3D open-source printers.(Bechtold, 2016)

3D printers represent new technology that creates physical objects from digital files. Uses for these printers include printing models, parts, and toys. 3D printers have also

been developed for medical applications, including printed bone, skin and even entire organs. The decrease in the cost of hardware has turned 3D printers into a cheap technology that libraries can offer their customer.(Hoy, 2013)
Within the project 2019-1-IE02-KA103-0006933D Printing Support Services for Innovative Citizens- INNO3D, project ERASMUS + Knowledge Alliance, started in November 2019, the consortium of European partners will provide online courses, toolkits, demonstrative movies, and guides for training librarians to develop 3D printing services for users.
The main objective of this project is developing a complex undergraduate 3D printing program for librarians from Ireland, Romania, Greece, Portugal, Spain, Slovakia and pedagogical approach how to train the users.
Running this project within public and university libraries will also lead to an increase in the number of users in these institutions, but also to the increase in the promotion of these innovative technologies among the citizens (library users). Assimilation of these innovative technologies by librarians leads to the personal development of each and to the diversification of the services offered to users of public and university libraries, increasing the attractiveness of younger generations for such institutions. By default, this will increase the visibility of these institutions, not only locally plan. This project represents an opportunity for not technical students, but who want to carry out various projects specific to their specialties.
We believe that this project is innovative, at least at the level of the libraries in the countries involved (Ireland, Romania, Greece, Spain, Slovakia and Portugal) and can be a model for other countries in the EU or around the world.
The project will empower faculty staff with improved teaching abilities, mentorship capacity and skills in using modern technologies; the newly trained teachers will have a potential influence as peer education at academic level and will also impact on the quality of training of the following generations of different specialist in technical or other domains, particularly regarding their knowledge and abilities in 3D printing and design by partners.
Moreover, taking into consideration the fact that ”labelling and stereotyping are elements that are part of our human nature” (Coman, 2010, p.86), and that often teachers or faculty staff are thought to have poor technological skills, by adopting and developing 3D printing skills such beliefs could be diminished and reduced.
The outcomes obtained during the project lifetime will have impact over the quality of librarian education and will be available for other faculties, library or other educational and information institutions in the partners countries, as well in other countries (at European level, or worldwide) willing to consistently apply partners education in the training of future librarians.

Methodology

At Transilvania University, the setting up of a free printing centre for students was proposed. For the beginning, as objectives of this project, we propose that users come with a 3D model in electronic format, the validity and flawlessness of the model will be checked within the centre, and then the 3D printing will be completed. Research was carried out regarding students’ attitude and their expectations from such a service. An online questionnaire was created using Survey Monkey:
https://www.surveymonkey.com/r/NYPY7FM , link distributed on email.
https://www.surveymonkey.com/r/NCZDNM9 , link distributed on Social Media.

This was distributed to students 246 answers were obtained during December 2019-February 2020, 231 from weblink and 15 from social media.
The responses came from students from Medical Engineering, Mechatronics, Optometry, Digital Media, Industrial management, Medicine specialization. There were 66,94% female and 33,96% male students.

DATA ANALYSES

General perception

The interviewed students have a favourable attitude to creating a 3D printing centre, 88.1% of them said they have a very favourable opinion.

What is your opinion regarding the opening of a 3D printing centre?

Students opinion regarding opening a 3D printing centre was: 0,8 % neutral,10% favourable, 0,4%very unfavourable and 88,1% very favourable

The perception about the originality of this service

Most students consider that this service is innovative, 51.4% said that the service is extremely innovative and 36.2% said it is very innovative.

The intent of using the 3D service

Most students indicated their intent to use such a 3D printing centre, 61.3% said that this service is absolutely desired.

When you think of this service, do you believe it is something you want or you do not want?

Regarding students wish to benefit of this service 5,8% were decided, 0,8% said that it is undesired, 61,3 % absolutely desired, 32,1% probably desired.
Students indicate their intent to recommend this service to friends and acquaintances. On a scale from 0 to 100, where 100 means I will surely recommend this service, the average of scores of students was of M=90.86.

How probable is it you would recommend our new service to a friend or colleague? On a scale from 0 to 100, where 100 means I will surely recommend this service.
Some of the students' proposals regarding the operation of the centre were:

- *Access to the 3D printer must be based on a license, which can be obtained from instructors*
- *Possibility to have a coffee*
- *A study-friendly and attractive environment for the student being a modern place*
- *Selection of several groups of students, each with a different specialization in the use of printers.*
- *As many new things as possible from which students have something to learn and can manage and develop*
- *Future expansion.*
- *Periodic practical studies for students, organized by teachers affiliated to the research field*
- *To be suggested and used in most companies, to gradually replace the traditional ones*
- *Let's work more on the advancing technology, to develop my practical skills*
- *No costs*

— *To create a club where to take introductory and advanced courses in this field*
— *Let's continue to bring what's new*
— *To diversify the range of printable materials*

Expectations of students from new service

	Number of answers
easy access for students (that should not cost or cost very little, opening hours adapted to students, easy to use, personal access)	35
to be used for a didactic purpose for students	23
to be available for students (for various projects)	43
increase in the reputation of the university	10
well-trained staff (who teach students and are serious)	10
to be high quality (quality materials, appropriate resolution, several printing stages, large sizes)	22
Total answers	143

Table no. 1: What expectations do you have from this new service?

Students' answers were centred on six categories of expectations. (Table no. 1) First, students want this centre to be accessible for students, so that they can create various parts for their yearly projects or for Bachelor's/Master's/PhD programmes. Second, students expect that they have an easy access to this printing centre through low costs (or even free of charge), through opening hours adapted to the needs of students and that it can be easily used by them. Also, students consider that this service would be very useful if used in the didactic activity of professors in order to add originality and innovation. And last but not least, students consider that for this service, there should be some responsible persons and available to help students, and service quality should be at a high level (to be able to print at appropriate resolutions, large sizes and there should exist different printing stages).
Final year students (Postgraduate) indicated a higher interest in the 3D printing centre. 65% of them stated that they certainly want this printing centre, as compared to 59.9% of the Bachelor's students who expressed the same interest. Final year students (Postgraduate) would recommend the 3D printing centre to other persons to a greater extent than Bachelor's students. (M=96.92 versus M=89.84)
Students in the field of exact sciences indicated a higher interest in the 3D printing centre than the students in the field of humanities and social sciences. 90.2% of them have stated they have a very favourable opinion of this printing centre, compared to 80.8% of the students from fields of study in humanities and social sciences. Also, 65% of the students in the field of exact sciences said they certainly desire this 3D printing service, while only 51.9% of the students in the field of humanities and social sciences said that. Students in the field of exact sciences would recommend the 3D printing centre to other persons to a greater extent than students in the field of humanities and social sciences. (M=92 versus M=86.96)

Conclusion

Students have a favourable attitude towards the setting up of a 3D printing centre and they consider this centre useful for carrying out various projects they have to do during their university studies. Also, this centre could be an important resource in the didactic

activity of professors, because it would add innovation and students would learn new things.
We noticed a more open attitude towards this centre of students from faculties in the field of exact sciences and engineering, and especially in those who attend a postgraduate programme.

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