

# SCIENTIFIC AND DIDACTIC EQUIPMENT

## NAVOICA – online education space

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**Keywords:** MOOC, NAVOICA, online learning, e-learning, distance learning

### ABSTRACT:

NAVOICA – a system solution providing MOOC (*Massive Open Online Courses*) in Poland. NAVOICA was launched in October 2018 and since then it has been providing free access to both authors and participants in MOOC courses. Over the first 18 months around 6500 users were registered on NAVOICA, meaning that the platform increased the number of participants in MOOC courses five times during the last year.

The authors of the article present NAVOICA after one and a half years of MOOC courses, discuss platform management, quality assurance system, lessons learned and modifications and new functionalities. The content includes experience in figures and indicates the direction in which the offer for courses, which will be published shortly, will be developed.

NAVOICA is the result of a project establishing a cooperative network of universities and other recognised distance learning entities. This is a project carried out by the order of the Ministry of Science and Higher Education.

# NAVOICA – internetowa przestrzeń edukacyjna

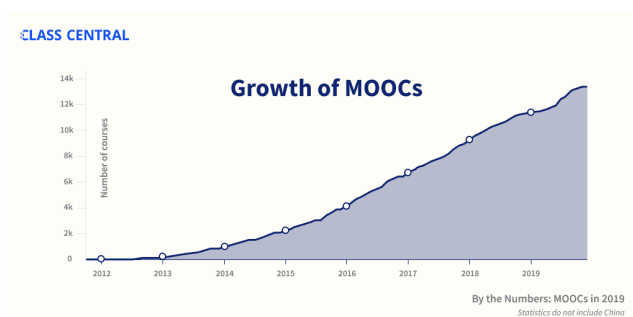
**Słowa kluczowe:** MOOC, NAVOICA, kształcenie online, e-learning, kształcenie zdalne

## STRESZCZENIE:

NAVOICA – to systemowe rozwiązanie oferujące kursy MOOC (z ang. **Massive Open Online Course**) w Polsce. NAVOICA została uruchomiona w październiku 2018 r. i od tego momentu oferuje możliwość bezpłatnego dostępu zarówno dla twórców, jak i uczestników kursów MOOC. Na przestrzeni pierwszych 18 miesięcy na platformie NAVOICA zarejestrowanych zostało około 6500 użytkowników, co oznacza, że platforma pięciokrotnie zwiększyła liczbę uczestników kursów MOOC w ciągu ostatniego roku. Autorzy artykułu przedstawiają platformę NAVOICA po półtora roku realizacji kursów MOOC, omawiają zarządzanie platformą, system zapewnienia jakości, zgromadzone doświadczenie oraz modyfikacje i nowe funkcjonalności. Materiał zawiera zgromadzone doświadczenie w liczbach oraz wskazuje, w jakim kierunku będzie szedł rozwój oferty o kursy, których publikacja odbędzie się już wkrótce. NAVOICA jest efektem projektu tworzącego sieć współpracy uczelni i innych uznanych podmiotów kształcących na odległość. Jest to projekt realizowany na zlecenie Ministerstwa Nauki i Szkolnictwa Wyższego.

## 1. INTRODUCTION

From 2012 until now, the MOOC (**Massive Open Online Course**) platforms have been widely commented and evaluated and have both supporters and opponents. Irrespective of the results of their assessment, there are more than 110 million instructors, 13.500 MOOC courses, more than 900 universities offering MOOC worldwide and the ability to obtain online qualification of the 1st or 2nd level degree studies. The increase of interest and thus the number of courses offered on MOOC platforms are shown in Figure 1.



**Figure 1** The increase in the number of MOOC courses worldwide [1]

When analysing the available and active platforms, it can be noted that most platforms created after 2014 are based on Open edX which still remains the only technology dedicated to create, share and run MOOC courses, available free of charge along with the entire source code on li-

cences allowing for its modification and use. This solution was also used to create a Polish NAVOICA platform offering MOOC courses.

## 2. PROJECT BACKGROUND

The Polish MOOC platform was initiated by the President of Fundacja Młodej Nauki (FMN) which, by conducting research and scientific projects on innovative forms of learning, wanted to develop a system solution in Poland that offers learning available to everyone, regardless of location, specific subject, financial capacity or the current level of knowledge.

FMN disseminated the idea of the MOOC platform in the educational environment through speeches at teaching conferences such as eTEE or Ideatorium, conferences for Chancellors and Deputy Chancellors and at the dedicated event organised by FMN – “Moc MOOCów – czas na polską platformę” (MOOC Power – time for the Polish platform) (Warsaw, 2015). A wide cooperation with the e-learning community was undertaken, such as with Stowarzyszenie E-Learningu Akademickiego and Fundacja Eduprojekt. The above-mentioned activities resulted in the interest of the Ministry of Science and Higher Education which declared the research grant to create Polish solutions, ecosystem, the first courses, and the popularisation of MOOCs in Poland.

When applying for the grant, FMN created an interdisciplinary team of experts in the field of e-learning, learning methodology, production and graphics, web marketing and project management. The positive outcome of the contest allowed the scientific project entitled “Polish MOOC” to be started on 29 January 2018. By decision of the Ministry of Science and Higher Education, the competitive process resulted in the selection of an operator of the Polish MOOC platform – Fundacja Młodej Nauki.

The NAVOICA platform is available at: [www.navoica.pl](http://www.navoica.pl).

### 3. NAVOICA ORGANIZATION

NAVOICA is managed by a substantive operator – Fundacja Młodej Nauki, and a technical operator – Ośrodek Przetwarzania Informacji – Państwowy Instytut Badawczy (National Information Processing Institute). Each operator has specific tasks to provide NAVOICA users with a safe, friendly and online use of the MOOC courses offered by the Polish scientific and cultural institutions.

The tasks of the substantive operator include, but are not limited to:

- maintain the process of assessing the fulfilment of the conditions for the acceptance of courses for publication on NAVOICA;
- collect data necessary to set up the course to be published on the Platform (analysis and processing of the application for publishing the course on the Platform);
- publishing and providing information on the courses currently being conducted;
- making available of the courses in such a manner so that the Participant, upon meeting the technical conditions specified in the terms and conditions of use of the platform, has access to them at the place and time selected by the Participant and is able to register to use the courses;
- the possibility to create and edit MOOC courses;
- handling of queries, reported comments and discrepancies in methodological and substantive terms;
- evaluation of selected courses;
- approve the draft certificates of completion of the course;
- administer User data. The technical operator, however, is responsible for:
  - ensuring and maintaining the ICT environment for the operation of NAVOICA;

- maintaining the operation of NAVOICA (tools for the purposes of the Services provided);
- maintaining NAVOICA in a configuration enabling the course to be published;
- technical support for the tools available on the platform listed in the NAVOICA terms and conditions of use;
- handling technical queries, complaints and reservations;
- managing the registration process and User accounts;
- maintaining databases in configurations obtained by the substantive operator;
- maintaining the MOOC courses in configurations located on the platform.

Ongoing information about the platform, launching new courses, MOOC-related interesting facts and many valuable news concerning the platform and the courses can be found on the social media channels of the project: on Facebook (NAVOICA – Polish MOOC), Instagram or YouTube channel of FMN. In addition, dedicated information for NAVOICA users, teachers and educational institutions interested in using the courses on the platform or publishing their own courses is available on the project website at: [navoica.edu.pl](http://navoica.edu.pl). It contains e.g. a detailed guide on the steps to be taken to successfully publish the course on NAVOICA.

### 4. NAVOICA TECHNOLOGY

As mentioned in the introduction, NAVOICA was based on the Open edX source code which is available entirely at <https://github.com/edx/edx-platform>. Since 2013, this code has been adapted to several dozens of platforms worldwide where thousands of courses have already been launched for millions of users (Shah, 2020). This is a well tested tool available on open licenses with full source code, which enables many IT professionals around the world to work on its modifications, enhancements and extensions every day. The Open edX code is adapted and developed for the conditions of the Polish MOOC project by Ośrodek Przetwarzania Informacji – Państwowy Instytut Badawczy (OPI PIB) in Warsaw together with the NAVOICA team of Fundacja Młodej Nauki (OPI PIB cooperation section). The OPI PIB buildings are provided with the servers on which the platform runs. Under the license, the entire modified NAVOICA source code is publicly availa-

ble and can be found at: <https://github.com/OPI-PIB/navoica-platform>. Architecture and technology adapted to modern Internet (e.g. python or django) ensure high responsiveness of NAVOICA. It is developed and expanded with awareness of the need to protect the personal data of the users and to ensure the reliability of its individual components. NAVOICA has been designed to ensure the scalability of the courses. This means that the same courses can be provided both for a group of several persons and for 100,000 participants. This feature distinguishes the MOOC courses from typical e-learning courses published e.g. on Moodle. NAVOICA consists of three interconnected systems. The user has access to the LMS system which allows both for participation in the courses and running them. The course creators have access to two additional tools: Studio and Insights. Studio is used to prepare, complete, and edit the course. Insights, in turn, is a powerful analytical tool to see how the users have completed the course. This tool has not yet been deployed on the platform. The section is planned to be implemented until the end of the third quarter of 2020.

## 5. COURSE STRUCTURE

Open edX imposes a specific breakdown of the structure of each MOOC course by its own architecture. The content of the entire course must be divided as follows:

- the entire course consists of sections; these are the elements of the course which are usually made available on a weekly basis;
- each section consists of subsections;
- each lesson is composed of units;
- each unit is composed of components.

A component is the smallest element of the course. Examples of components:

- an HTML component containing text and illustrations;
- a Film component used to share videos with transcription;
- an Exercise component dedicated to create tasks for the course participants.

Adding a component to the course is analogous to adding a single activity or resource on Moodle.

## 6. CREATING A NAVOICA COURSE FROM CREATOR PERSPECTIVE

The Moodle system remains the most popular Learning Management System (LMS) platform used by universities in Poland, although it should be noted that other systems such as Ilias and Blacboard are gaining popularity as well. Due to its common access, a certain default standard has been to create a course in the so-called *What You See Is What You Get* (WYSIWYG) approach, which means that the course view in edit mode is identical to the participant's course view. Open edX, and thus NAVOICA, are based on another assumption. The content is uploaded to the platform, and the structure of the course, its organisation and configuration takes place from a separate section, the so-called Studio. The Studio course view shown in Figure 2 is different from the participant course view from the LMS shown in Figure 3.

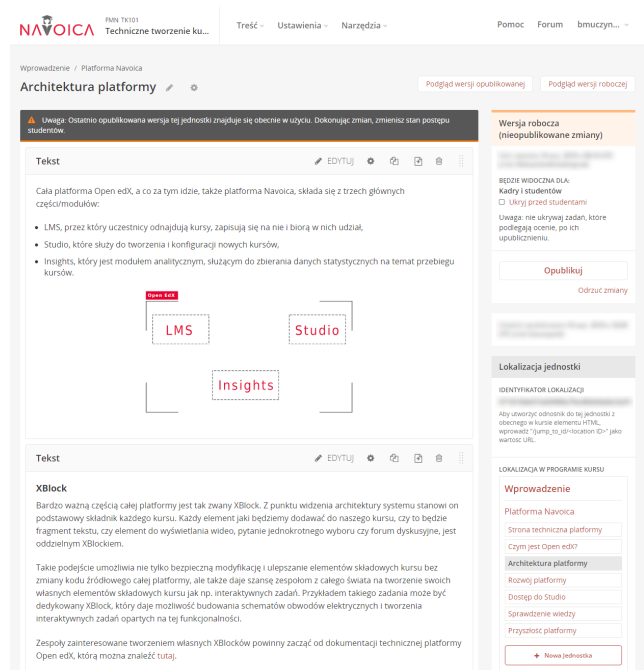
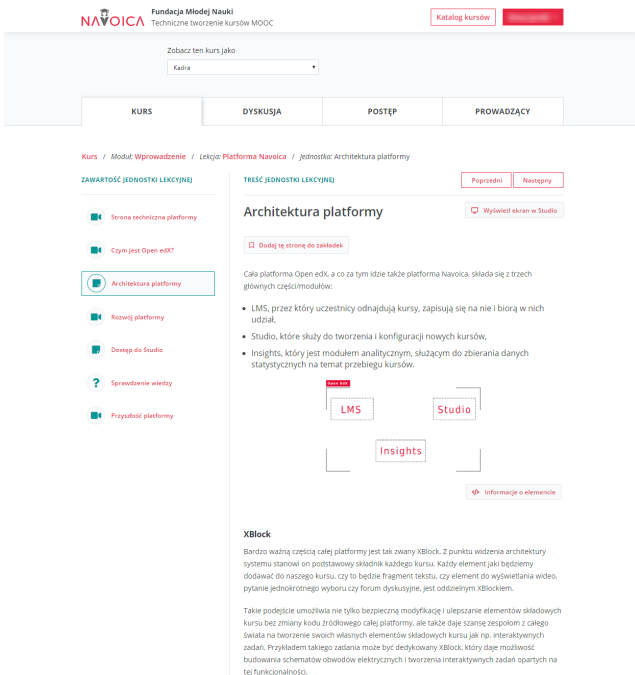
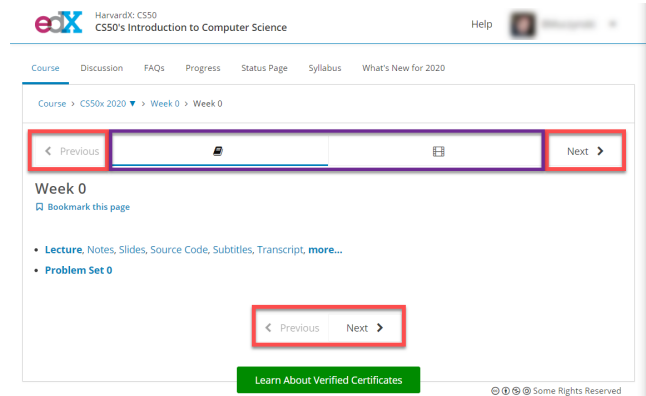


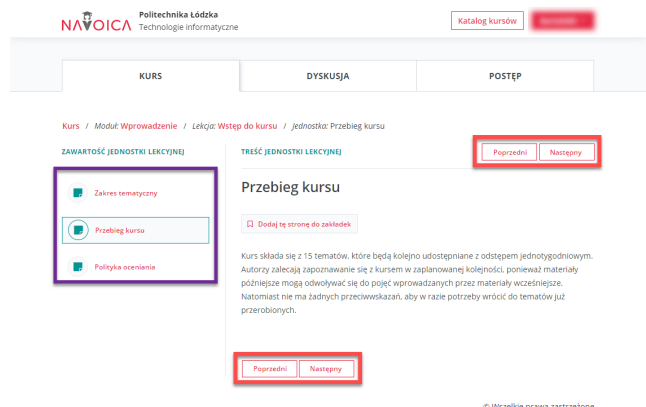
Figure 2 NAVOICA course view from Studio (course author's view)



**Figure 3** NAVOICA course view from LMS (course author's view)



**Figure 4** Default view of the course on edX.org. The navigation buttons are highlighted in red, and units within the lesson are marked in purple



**Figure 5** Default view of the course on NAVOICA. The navigation buttons are highlighted in red, and units within the lesson are marked in purple

Independent studies have shown that the structure of the course on the edX platform is assessed as good with indications towards its improvement (Tsironis et al., 2016). Similar conclusions have been drawn for the forum system integrated with the platform (Ntourmas et al., 2019). Regardless of the available literature, the team from OPI PIB conducted dedicated utility studies on the basis of which a completely new system was designed and implemented in the course view. The most significant changes pertain to the location of the navigation buttons and the identification of units within lessons. In the edX (Open edX) default view, the lesson units are identified by one of the three symbols representing movies, texts or tasks. They are visible in the form of a horizontal bar between the two “Previous” and “Next” navigation buttons (Fig. 4). From the participant’s perspective, the amount of material within the current lesson and the activities provided for it are visible. The disadvantage of such a system is the lack of visibility of the names of individual units, which may hinder the return to a specific place in the lesson. Such a solution also requires that the number of units within a lesson be limited by the width of the screen where the course is displayed.

The studies showed that the change of the view has positively influenced the experience of the users in navigating through the course and improved the readability of pages in the course.

## 7. COURSE LABEL VIEW

The course label is the first element of the course that a platform user is in contact with. This is the place where the author should approximate e.g. the subject of the course, which is one of the key factors determining whether the platform user will participate in a given course (Belanger & Thornton, 2013).

The overall layout of the label on NAVOICA (Figure 7) was slightly modified with respect to the layout maintained on the edX platform (Figure 6). The course author has full freedom to design and lay out the content in the “Course description” area where information such as course subject scope, course purpose, authors, Frequently Asked Questions and prerequisites should be presented.

Figure 6 Example course label on edX.org

Figure 8 Comparison of course information label on NAVOICA (left) and on edX.org (right)

In view of the possibility of using the courses on NAVOICA in lifelong learning, an information label was expanded to clearly present information on the duration of the course, the time of opening of registration and the estimated hourly workload (Figure 8).

## 8. NAVOICA FROM THE COURSE AUTHORS' PERSPECTIVE (QUALITY ASSURANCE OF PLATFORM COURSES)

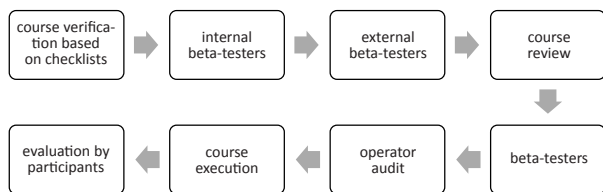
Platform operators, Polish MOOC project executors and project partners put a great emphasis on the quality of the courses. Courses with high substantive, methodological and technical level will allow for professional improvement of the level of knowledge, skills and competences of the platform users.

As part of the research grant implemented for the Ministry of Science and Higher Education, the substantive operator set up two advisory bodies: the Panel of Experts on the Quality of MOOC Courses and the Panel of Experts on Recognition and Accreditation. Both panels have developed guidelines and procedures that the operator has described in the form of procedures for managing particular areas:

- publishing of the course on the platform;
- restarting the course;
- course evaluation;
- certificates;
- course reviews.

The article details the course evaluation process in Figure 9.

Figure 7 Example course label on Navoica.pl



**Figure 9** Evaluation process of MOOC courses on NAVOICA

The course evaluation is multi-stage and involves both internal and external stakeholders. The first recommended step of the substantive operator is to verify the course based on the control sheets available in the “Guidelines for course authors”. The guidelines can be downloaded from the project website ([navoica.edu.pl](http://navoica.edu.pl)). The sheets will allow for verification if the necessary elements have been included and whether it is worth adding or skipping some elements to maintain the course quality.

Subsequent step is the call for cooperation of the so-called beta-testers whom the creator can add from the dashboard. Beta-testers can analyse the course based on own experience, noting what is unclear to them and too difficult or too easy. They also test all challenges and evaluate the course pace and communication. Therefore, all comments and observations should be collected in writing and discussed, and any technical defects should be corrected. It is also worth ensuring that the group of testers is as representative as possible.

The next step is to hand over the course to a group of external testers: individuals who did not face the course even by talking with us, they see it for the first time and form their own opinion on its scope, content and activity management, pace of work, schedule, method of assessment and motivation to continue the course. The collected feedback should also be analysed and implemented in the course. It is important that the group of testers is as representative as possible.

The next step, which is a formal requirement for publishing the course on the platform, is a review in three areas: substantive, methodological and technical, by two independent reviewers in each of the indicated areas. It is important that the reviewer is a hands-on in the area under review and that the reviewer identifies those elements which, without improvement, cannot be accepted for publication and those which are secondary and aesthetic. The review and critical comments are to ensure the lack of *fake news*,

obsolete content, non-ethical approach or a low level of content exposure from the technical perspective. They should be treated as support and not as an unpleasant necessity.

After making reviewer comments, the course should be re-tested by beta-testers. This will allow for verification that the course has improved quality and all sections implemented work properly.

The next step of the course verification is the audits of the substantive and technical operators who review the course by analysing the course publishing application, the comprehensiveness of the MOOC prepared, all settings and the areas under review. Audits may block the publication of the course until the indicated amendments are made.

After successful audits, the course is transferred NAVOICA and made available to its users. Through an embedded evaluation survey, the participants evaluate the course, and a summary of the course comments is communicated to the course author and the substantive operator. The results of the surveys are carefully analysed and the course is subject to possible modifications.

The above-described method of the quality assurance system has changed since the beginning of the platform and will certainly continue to develop under the influence of expert’s and platform users’ comments.

## 9. NAVOICA NOW AND IN THE NEAR FUTURE (NAVOICA COURSES IN FIGURES)

In October 2018, 4 MOOC courses were published during the official launch of the platform:

- “Strategic management” conducted by dr Krzysztof Wojewodzic;
- “IT technologies” conducted by Łódź University of Technology;
- “Signal transmission techniques” conducted by the Warsaw University of Technology; and
- “Technical development of courses” conducted by Fundacja Młodej Nauki.

In the first quarter of 2019, another course entitled “Unified Anti-plagiarism System” operated by OPI PIB was created.

The aforementioned courses ended their first editions in the second quarter of 2019 and the list of the numbers of participants is presented in Table 1.

**Table 1** List of number of participants in NAVOICA courses

Item	Course name	Number of users of the first edition	Number of participants of the second edition *
1	Strategic management	262	352
2	IT technologies	184	411
3	Signal transmission techniques	95	14
4	Unified Anti-plagiarism System	149*	-
5	Technical creation of courses	260	366

\* as for March 2020

NAVOICA was used in October 2019 to implement the #AIchallenge organised by the Digital Poland Foundation. It was intended to train and encourage 1% of Poles to participate in the course concerning the basis of AI. The course was prepared by OPI PIB. 2374 participants have attended the course to date.

The aforementioned courses were performed in the participant's own schedule. This means that the NAVOICA user decided on its own when he/she would execute each section of the course. The exception was the course "Signal transmission techniques" which was conducted in accordance with the instructor's schedule. Thus, the sections were made available to the participants within the time frame planned by PhD, Eng Krzysztof Madziar. The total number of users on NAVOICA at the date of development of this article was approximately 6500.

Comparing the Table 1 data with the number of users on the world's largest platforms in 2019: Coursera (45 mln), edX (25 mln), XuetangX

(24 mln), Udacity (11.5 mln), FutureLearn (10 mln) or Swayam (10 mln) [7], it can be seen that NAVOICA takes the first steps on the Polish education market. These aforementioned platforms make it possible to complete the entire online study programme, ending with the master's degree. The list of increase in the number of courses of this type is presented in Table 2.

**Table 2** List of sample platforms offering MOOC courses ending with the master's degree

Platform name	Number of courses in 2017	Number of courses in 2018	Number of courses in 2019
edX	4	11	16
Coursera	1	9	20
FutureLearn	4	18	23

The MOOC courses available at NAVOICA may be introduced into the study programme, the best example being the course of the Łódź University of Technology which after the completion of the first edition of the MOOC course entitled "IT technologies" introduced it into the study programme for all of its first-year students.

It should be noted that the above-mentioned platforms were able to develop their content for a longer period. The increase in the number of courses for selected foreign platforms is shown in Table 3 (2–4).

NAVOICA does not aspire to achieve comparable results to edX or Coursera. It is far closer to the French FUN platform, both in size and specification. A characteristic feature of the native platform is its free access for universities without the need to pay contributions or set up dedicated consortia. NAVOICA is generally to be available free of charge also for participants. NAVOICA, like FUN, is subsidised from the state budget.

**Table 3** Number of courses offered on selected foreign MOOC platforms

Platform name	2017		2018		2019	
	Number of courses	Number of participants	Number of courses	Number of participants	Number of courses	Number of participants
edX	1820	14 mln	2275	18 mln	2650	25 mln
Coursera	2700	30 mln	3100	37 mln	3800	45 mln
FutureLearn	578	7.1 mln	736	8.7 mln	883	10 mln
FUN	No data	No data	No data	No data	547	6 mln



## 10. PLANNED MOOC COURSES FOR NAVOICA

The National Centre for Research and Development, as an Intermediate Body for Axis III Higher Education for the Economy and Development of the Operational Programme Knowledge Education Development 2014–2020, launched a competition entitled “Kurs na MOOC” (Guide to MOOC) which created financial opportunities for Polish universities to implement their ideas for their own MOOC. The beneficiaries of the competition include universities, universities of technology, academies of physical education, medical academies and other higher education institutions. Tables 4 and 5 list the beneficiaries of the competition which, at the stage of application submission, declared a certain number of courses in Polish and English. Courses prepared in two languages are counted as independent MOOCs. The diversity of the scientific areas used means a diverse portfolio of courses, which will make distance learning using NAVOICA as attractive as on foreign platforms, and the available offer in Polish will remove the language barrier and allow qualifications to be improved by a wider audience.

**Table 4** List of universities preparing MOOC courses within the framework of the NCBiR competition, declaring preparation of more than 4 courses

University	Number of courses
The Białystok University of Technology	21
Tadeusz Kościuszko Krakow University of Technology	18
University of Silesia in Katowice	16
Adam Mickiewicz University in Poznan	10
West Pomeranian Business School in Szczecin	9
Jan Długosz University in Częstochowa	8
Poznań University of Economics and Business	7
Public University of Humanities “Pomerania”	6
UTP University of Science and Technology in Bydgoszcz	6
Higher Legal and Administration School of the Rzeszów School of Higher Education in Rzeszów	6
College of Business and Entrepreneurship in Ostrowiec Świętokrzyski	6
Vistula Finance and Business Academy	5

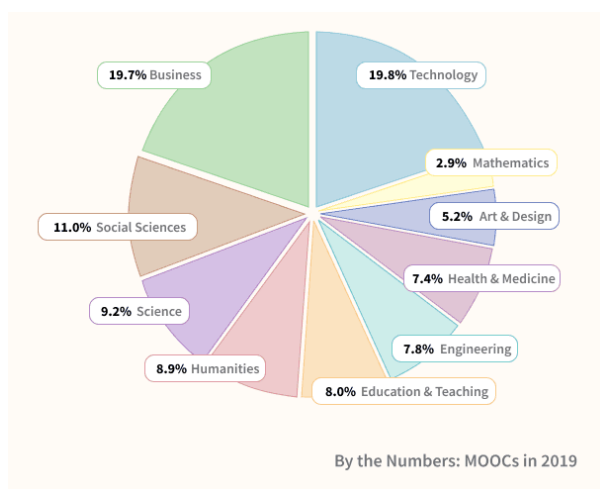
Military Defence Academy	5
WSB Academy	5
Helena Chodkowska University of Technology and Economics	5
University of Business in Wrocław	5
Humanitas University	5
Cardinal Stefan Wyszyński University in Warsaw	4
Wilton State University of Applied Sciences in Legnica	4
Gdańsk University of Technology	4
Pedagogical University of Krakow	4
University of Economy in Bydgoszcz	4
University of Information Technology and Management in Rzeszów	4

**Table 5** List of universities preparing MOOC courses within the framework of the NCBiR competition, declaring preparation of less than 4 courses

University	Number of courses
Kazimierz Pułaski University of Technology and Humanities in Radom	3
University of European Integration	3
Ignatianum Academy in Krakow	2
Częstochowa University of Technology	2
Paweł Włodkowic University College in Płock	2
Szczecin University	2
Jarosław Dąbrowski Military and Technical Academy	2
West Pomerania University of Technology in Szczecin	2
Jagiellonian University	1
Nicolaus Copernicus University in Toruń	1
School of Economics, Law and Medical Sciences	1
The School of Higher Education in Humanities of the Association for Adult Education in Szczecin	1
Katowice School of Technology	1

THE MOOC platforms offer courses with varied subjects, level of proficiency, with or without prerequisites, performed according to own schedule or to the instructor’s schedule, and with a specific own workload. The user will find all the information required to select the appropriate course in the course label. Business and technology subjects were the most popular in the past year. The

most common topics of the courses are shown in Figure 10 (the analysis does not apply to courses on Chinese platforms).



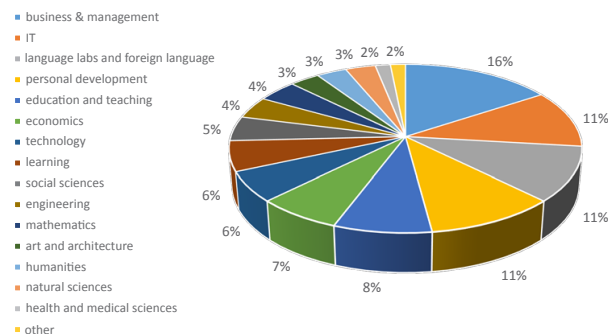
**Figure 10** Topics of the most common courses in 2019 [7]

The authors of the article aggregated the declared subject matter of the beneficiaries of the NCBR competition in 16 categories as presented in Table 6.

**Table 6** Topics of the declared courses of the beneficiaries of the NCBR competition per MOOC

Category	Number of courses	Polish language	Foreign language
business & management	30	27	3
IT	21	20	1
language labs and foreign language courses	20	6	14
personal development	20	20	0
education and teaching	15	13	2
economics	13	12	1
technology	11	10	1
learning	11	11	0
social sciences	9	8	1
engineering	8	7	1
mathematics	8	8	0
art and architecture	6	6	0
humanities	6	6	0
natural sciences	6	6	0
health and medical sciences	3	3	0
other	3	3	0
total	190	166	24

It can therefore be seen that the topics of the broadly defined business and management in Poland will be implemented to the highest extent. IT, language labs and foreign language courses and personal development are the follow-ups. The percentage list of distribution of the declared topics is presented in Figure 11.



**Figure 11** Percentage list of distribution of the declared topics of MOOCs conducted under the NCBR competition

## 11. SUMMARY

NAVOICA is a Polish space for the development of MOOC courses. It is free of charge, reliable, user friendly, safe and online 24/7. This platform creates opportunities for *lifelong learning* and diversification of formal learning. NAVOICA is subject to continuous development and evaluation. The platform partners' offers are extended successively by new education units representing different research areas, providing valuable MOOC courses. NAVOICA is available at: [www.navoica.pl](http://www.navoica.pl).

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