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Discovering the Efficient Path to Every Scientific Research: The New Bulgarian University Library Experience

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Abstract

The paper will present the NBU Library experience in providing services and trainings for scientists and doctoral students at the University. Different stages of research and data lifecycles will be considered. Each service and training was analyzed with special attention to data planning steps, such as data collection, methodology, and data sharing. Special attention will be paid to the storing and sharing data process. NBU library uses different sharing options as follows. 1) Scholar Electronic Repository (SER) of NBU. This disseminates scientific content by providing access to electronic documents as part of the Open Archive Initiative. SER collection is constantly growing and consists of different materials such as articles, monographs, book chapters, images, audio and video recordings. SER provides long-term preservation and distribution of electronic scientific output of the NBU academic staff and post-graduate students. 2) EBSCO Discovery Service. In order to improve the process of distribution of scientific content, the NBU Library partners with EBSCO Information Services. Due to this, all publications uploaded at SER are indexed in the platform of EBSCO Discovery Service. 3) Central and Eastern European Online Library (CEEOL). The NBU became partners with CEEOL, which is the leading supplier of scientific electronic content both from and to countries in Central and East Europe. The agreement between NBU and CEEOL requires a major part of the academic journals in the area of Humanities and Social Sciences published by NBU to be available in electronic form through CEEOL. As a result, new complex service will be established. This will increase the role of the NBU Library in the process of sharing and distributing data in order to make scientific works findable, accessible and successful.

Keywords: Research lifecycle, data lifecycle, RDM, library services, academic libraries.

Introduction

The contemporary development of information and communication technologies not only defines globalization but also contributes to changes in the shape and nature of knowledge sharing and knowledge flows. The influence of these technologies on access to knowledge and education is distinct. Openness is becoming the leading source of innovation in the global digital economy. It is considered fair by national governments, global organizations, international agencies and multinational companies, as well as by leading educational institutions. Furthermore, it is considered a means of promoting scientific development and international cooperation. This new era is characterized by an increase in the volume of data stored electronically in digital form. The amount of digitally stored information today is growing, leading us towards a so-called information boom. Ensuring open access to scientific information is the first step that individual educational institutions must do for the so-called 'Open Science'. New open science models might be in conflict with the traditional perception of extended intellectual property protection. On the other hand, public and non-profit organizations call for alternative approaches to public spreading of knowledge. Scientific publishing is already thoroughly changing in connection with the creation, production and consumption of scientific resources.

In this context, the development of open access to scientific publications with its two strategies - the publication of freely accessible journals and self-archiving - largely characterize this information boom. Yet, is this alone sufficient? As Mary Auckland has noted:

> Libraries will need to respond to this challenge by developing a unique role – in consultation with their institution – for the part they will play in the support of meeting researchers' information and related needs. The research environment is changing, driven not least by the power of technology to transform the way they work. Libraries are largely in uncharted territory, and have the chance to draw a new map of support and services for researchers (Rice, R. and Southall, J., 2016).

Over the last few years, academic libraries' attention has been increasingly concentrated on support for the research process. This contributes to the development of new services accompanying the separate stages of the research and data lifecycle. The introduction of terms such as 'research data management' and 'research data plan' in library practice suggests the deeper involvement of library specialists in the research process and different stages of scientific communication. This close cooperation is beneficial for both sides. It allows librarians to expand and deepen their knowledge in the field of scientific communication and, from this perspective, to be able to offer better services. In addition, the academic staff uses this expertise to improve the quality of research.

Statement of the Case

The New Bulgarian University Library systematically develops a multitude of services to assist faculty during their research. Various themes are offered for group training as well as individual trainings, specified for a subject and formulated by the scientist. In 1999, the NBU Library created a project for electronic publishing of free-access periodicals following the so-called 'golden route'. The project continues to this day with the journals 'Bibliosphere' and 'Legal Journal of New Bulgarian University'. In 2005, the university's institutional archive was launched, following the so-called 'green route' for open access to scientific information in which authors can archive their works independently. The scientific electronic archive (NEA) of New Bulgarian University is the first one created in Bulgaria. Its mission is to be a unified, open electronic space that provides lasting storage and access to the academic achievements of the academic community at the university. Moreover, it implements an institutional policy promoting the free exchange of knowledge. On the basis of this policy, the library team questioned whether the library services and methods of service delivery to the scientists were able to cover all stages of the research and data lifecycles. The team addressed these issues with a varied approach that finally led to the development of a new service type based on research and the data lifecycle.

Methodology

The team analyzed and identified existing services and trainings that should become part of the new integrated service. Then they analyzed and mapped the current library services in the research and data lifecycle, according to Tenopir (2011) and Ketchum (2017). This analysis identified the missing units in the system, assessed the potential for new services and the resources available for their implementation. The team started to develop a new comprehensive service model for scientists from the University, based on the research and data lifecycle.

Findings and Results

In the Stage of Ideas

In this initial phase of exploring and shaping the idea, the library offers the most services - five, as follows: 'Delivery of Items', 'Journal E-mail Alerting Service', 'Librarian Assisted Access to Databases', 'Order of Items', and 'Bibliographic Reference'. Through 'Delivery of Items' faculty receive via e-mail journal articles, newspapers, digests or chapters from a book from The Library Catalogue, as well as catalogues from other libraries, all in PDF format. With the 'Journal E-mail Alerting Service' they receive current alerting

with the table of contents of new issues of journals. 'Librarian Assisted Access to Databases' allows academic staff to ask for assistance if they are not acquainted with the main principles of browsing and searching in different databases. 'Order of items' is necessary for scientific research through the purchase of books and audiovisual materials and subscriptions to periodicals and databases. 'Bibliographic Reference' is a thematic bibliography reference list of literature in the field in which they are interested. It can contain books, articles from periodical publications from The Library Catalogue and catalogues from other libraries. NBU Library owns ready bibliographic references for different fields that researchers can choose from, or they can make their own requests. All services are offered electronically, so that personal contact between the librarian and the scientist may not be made.

At this very early stage, the library also offers the most topics for group training - seven in number. First of all, there are topics related to searching for information in the library catalog. The emphasis is on the possibilities of discovering a variety of full-text content in the catalog, through the theme 'Full-text materials in the library catalogue', as well as the theme 'E-books and e-journals for mobile devices.' Basic guidelines for working with the catalog are only available online via an electronic guide. It is developed through the Lib Guides electronic content management system and is accessible from the library website. It consists of eight themes: general information, icon search, simple search, browse search, field search, additional search criteria, result list, and bibliographic record. The topics cover the theoretical questions of different search methods and examples for independent work. Each of the topics is accompanied by a short training film that illustrates the main points.

The aim of the training in 'Electronic Information Resources' cycle are to present the variety of subscribed electronic information resources and those with trial access, in order to improve the used technique for search and retrieval of bibliographic and full text information. Through the seminar 'Databases by Professional Fields' learners get acquainted with a specific group of resources. On the specifics of topics related to Bulgaria, - such as Bulgarian language, history, folklore, etc. - a special training 'Sources of Bulgarian Language in Databases' is created. Since 2015, the NBU Library, the first in Bulgaria and the only one to this date, uses the 'EBSCO Discovery Service' (EDS). It is important to note that the indexes that can be used by all system customers include metadata for thousands of magazines, millions of books, and more than a hundred million newspaper articles. EDS offers indexing of open access repositories, such as DOAJ, OAISTER, arXiv.org and others. Also, the interface is known from other EBSCO databases. In this connection, the "Federated Search of Library Collections" training has been developed and offered for a third year. As a complex of already discussed trainings, but aimed at PhD students, the training 'Informational Resources to Write a Dissertation' is conducted. At this early stage is also offered the training 'Online Request for Library Services', developed in two versions for teachers and for PhD students. During this seminar, through a presentation, the students receive full information about the nature of library information services, illustrating the

selection process and the decision-making process for each service at each stage of the research process.

With regard to services at this stage, the library has the capacity to implement an interview with the scientist, during which the stage of the scientific career is clarified, including the desired goals for the development of the research, the need for information resources and data, the need to use library services, the need for funding, ideas for publishing and distribution, and preserving the survey, as well as its data. All of these must take into account their scientific field. As a result of the interview, an initial but open action plan will be created to support the scientists at every stage of the research and data lifecycle.

In terms of training, they should be expanded with two new themes related to research data management and the need for a data management plan. A further study of good practices at leading global and European universities is being conducted to develop these trainings. As a result, an adapted version to the conditions in Bulgaria will be added to the library program for the development of information competence.

Finding the Partners

At this stage, the scientist - the generator of the idea - has to make an important decision. Do they need a partner to realize their idea or not? If they are a PhD student who has to write a publication on their own, as is the case in Bulgaria, they obviously do not need a partner. In all other cases, the benefits of an eventual cooperation for quality results must be addressed. The analysis of existing library services and training found that there are no available services at this stage of the research process.

This evaluation of the existing information resources and the professional capacity of the personnel led to the decision to open a new service 'Finding Partners for Scientific Research'. In this training Scopus and InCites could be used as information resources, as well as free resources such as Google Scholar and others. For instance, only Scopus contains information on over 150 institutions worldwide, such as Universite Paris Descartes, KU Leuven - University Hospital Leuven, Universiteit Antwerpen, University of Western Australia, Flanders Interuniversity Institute for Biotechnology and IRCCS Centro San Giovanni di Dio Fatebenefratelli who already have collaborated with the NBU. The library has the opportunity to collaborate with other units of the institution, such as 'Projects Office,' to identify lasting partnerships in the various scientific fields that have been created over the years. The same name as the service will be the training for teachers wishing to independently find scientists or research organizations in order to establish partnerships for the realization of a specific project or research.

In the Stage of Proposal Writing

At this stage the scientist needs to be advised on the requirements of funding institutions and the choices for such research funding. Here, it should be mentioned that funding organizations play a crucial role in influencing scientists to spread their publicly financed work, free of charge, such as in institutional repositories. For example, in order to maximize the use and impact of research, the British Research Councils made a statement on its position regarding access to research results in June 2005. The document addresses the issue of the mandatory deposit of scientific papers funded by the council, which should also be accessible and available for use as soon as possible. As early as 2012, the European Commission in it's Recommendation (2012/417/EU) defines:

(5) Open access policies aim to provide readers with access to peer-reviewed scientific publications and research data free of charge as early as possible in the dissemination process, and enable the use and reuse of scientific research results. Such policies should be implemented taking into account the challenge of intellectual property rights.
(6) Policies on open access to scientific research results should apply to all research that receives public funds. Such policies are expected to improve conditions for conducting research by reducing duplication of efforts and by minimizing the time spent searching for information and accessing it. This will speed up scientific progress and make it easier to cooperate across and beyond the EU. Such policies will also respond to calls within the scientific community for greater access to scientific information.

Specific for Bulgaria is the situation concerning funding projects from the National Science Fund at the Ministry of Education and Science. When applying, the team must provide a description of the work program of the project and a plan for realization and distribution of the results of the scientific project. In addition, the following data is required for each participating scientist

- A name used in publications in a foreign language
- H index (according to Scopus or Web of Science)
- Internet address with a list of scientific publications (ResearcherID, Research gate, etc.)
- Total number of scientific publications
- Of them with an impact factor or an impact rank
- Number of citations in scientific publications
- Number of scientific publications from the last five years
- Of them with an impact factor or an impact rank
- Number of citations of scientific publications in the last five years

Subsequently, the contract signed between the project team and the fund requires a list of scientific publications made in connection with the project,

with an internet link to the publications on the website of the magazine in which they are published and/or publicly available electronic copies of publications. The contract also requires a list of patents made in connection with the project with references to relevant websites and other information related to the project, such as proposals for industrial or other useful applications for the community. In addition, it is recommended that the project results be widely distributed.

There is a special Project Office at the University that advises teams on the requirements of funding institutions and assists them in deciding on the choice of funding for the specific research. In order to offer maximum convenience to the authors, the library modified the existing citation analysis service and now offers a new 'Personal Science Data for Participation in a Project' based on the requirements of the National Science Fund researchers. If the requirements of the funding body vary, the data is prepared according to the specific project requirements. At this stage, the library also offers a review of the plan drawn up in the initial interview, including completing or adjusting the types of data according to their specific requirements, how they will be stored, how they will be published and how they will be distributed to the scientific community. The trainings offered at this stage are 'Methods of Citation Analysis' (in which the authors get acquainted with SCOPUS and Web of Science) and 'Depositing Materials in the NBU Scholar Electronic Repository' (in which authors learn how to build a complete personal archive of publications in the institutional archive). After analyzing their content, the team made the decision that there is no need to add new themes.

In the Stage of Publication

Until recently, the research process was a territory of scientists only. Research is conducted using new technologies and tools, and this leads to gathering entirely new types and large quantities of data. NBU prepares graduates and develops scientific work in the fields of Human Sciences and Humanities, Natural Sciences and Modern Technologies and Arts. In these sections of science and arts research data is increasingly preserved in digital form and distributed across networks. Moreover, this data is being created in a digital form from the onset, although physical forms are still in use. Some research projects are done as a combination of physical and digital data. Furthermore, research projects induce a great amount of data that would be difficult to obtain without the aid of computers to process them. Here is the role of information specialists working in the library of the NBU. These new technologies give the chance to researchers, engineers, and computer scientists in all fields of study to collaborate with each other. More and more, librarians have their expertise in data management and preservation to contribute. Researchers prefer to do their work than to manage and organize the data, and this is where librarians can provide valuable services and support. As librarians move into this field, it is of great importance that they understand its specifics so that they are helpful to researchers. In the initial interview in which the data management plan is

being defined, the types of data the scientist uses and generates during the survey are already defined. The team analyzed the capabilities of the existing institutional repository, which has been maintained and developed by the library for more than 10 years, in order to use it as a tool for managing, storing and disseminating research data. Through this sustainable information structure, the NBU keeps and preserves its intellectual property and provides access to it for the international academic community, which fully corresponds to the mission of the university:

> The mission of New Bulgarian University is to be an autonomous liberal education institution dedicated to the advancement of university education by offering accessible and affordable opportunities for interdisciplinary and specialized education and research of high quality. Bringing its academic potential to the service of society, the University prepares its graduates for the challenges of modern democratic life cultivating critical and creative thinking, sensitivity to cultural difference, and problem-solving.

The NBU's repository is part of the Open Archives Initiative and follows the recommendations of the European University Association (EUA) to promote an institutional policy promoting the free exchange of knowledge. The goals set for this are:

- Building a whole and structured gateway to the scientific product
- Long-term storage of deposited documents and data
- Expanding the impact and promoting the image of the university, both at home and abroad
- Increasing citations of the publications of lecturers and PhD students at the university
- Serving as a means of reporting on the academic activity of lecturers
- Forming a culture of lecturers and PhD students to build a complete scientific archive

The repository is characterized by large linguistic diversity in its documents, for example Bulgarian, English, French, German, Italian, Spanish, Modern Greek and others. Another challenge is the ability to cover the variety of documents produced by scientific or creative activities that can be deposited, such as: an article published in a magazine, volume, or newspaper; a part or chapter of a book; monograph; conference, congress, presentation, report or poster; a whole book; doctoral dissertation or habilitation work; patent; artifact; show, exhibition, etc.; musical composition; performance (musical); image (photography); video; digital sound recording; numerical data; experimental data and analyzes; and training resources like lectures, exercises, tests, etc. The deposit of documents and the completion of metadata are carried out by the authors themselves – either lecturers (full-time and part-time) or doctoral students. In the case of co-authorship, at least one of the authors must be connected with

the university. There is a clear tendency that despite the voluntary nature, the number of deposited documents in the repository is steadily increasing. At the end of 2016, it held 2013 documents, with an average of 211.6 documents being deposited every year. The team that maintains and develops the system consists of a system administrator at the university who maintains, backs up data, and installs new versions of the software. A system librarian maintains user accounts, identifies technical problems, and performs metadata transfer. The bibliographic editor and trainer, on the other hand, maintain uniform standards for indexing documents, communicating with authors, and conducting various trainings.

The team's analysis has shown that the created service has the capability to meet the needs of storing and managing scientific data. The repository manages to cover all types of scientific data generated in scientific research in the social and human sciences and arts, as well as research in the field of Natural Sciences and Modern Technologies. In the case of data that in no way can be described through the metadata schema of the scientific electronic archive, a solution is looked for based on a deposit at the Disciplinary repository, thus linking the two systems. This is how the library will help create a virtual research environment at the university. Moreover, a wide range of licensed software products are supported in the library's computer centers to help analyze scientific data and visualize them from scientists. The team found that it could be expanded in the future, after analyzing the research management plans. In addition, the information for them, published on the web site of the library, can be expanded with data of the application of the software in research.

With regard to the trainings offered, the team found that currently there are no such available. The team proposed the creation of a new training 'Storage, Management and Dissemination of Research Data' to be included in the program for the development of information competence of lecturers and PhD students. It will be based on the existing training 'Depositing Materials in the NBU Scholar Electronic Repository' (where the authors learn how to build a complete personal archive of publications in the institutional archive), but will introduce scientists to the functionality of the Repository for their scientific data, as well as show them how to share data only with their project teams or make them freely available.

In the Stage of Publication

This stage is extremely important for the individual scientists and/or the research team, as well as for the university. It can be planned in the initial interview. Various additions are possible subsequently, due to the requirements of the funding organization, the university itself and others. Through the publication and distribution of scientific research, the individual scientist can cover different evaluation criteria, such as the number of publications in indexed and referenced publications. On the other hand, the country operates with an extremely efficient rating system. The rating system of the higher

education institutions in Bulgaria provides information on 51 accredited higher education institutions offering training in hundreds of specialties, distributed in 52 professional fields. The purpose of the system is to help users of educational services in finding comparative information about higher education institutions. Rankings are made on the basis of the indicators available in the system. Of particular importance to the University's rating is the 'Research' group, in which Scopus and Web of Science data-based indicators are used, such as:

- Indicator 'Index of citation by scientific area (Scopus)'
- Indicator 'Index of citation without auto-citation by scientific area (Scopus)'
- Indicator 'Index of citation by the scientific area (Web of Science)'
- Indicator 'Average citations per document (Scopus)'
- Indicator 'Average citations on a document (Web of Science)'
- Indicator 'Documents, cited at least once (Scopus)'
- Indicator 'Documents, cited at least once (Web of Science)'
- Indicator 'Documents, cited at least once to the student (Scopus)'
- Indicator 'Documents, cited at least once to a student (Web of Science)'
- Indicator 'Articles in the scientific publication (Scopus)'
- Indicator 'The Articles in the scientific publication (Web of Science)'
- Indicator 'Articles in the science of writing off to a student (Scopus)'
- Indicator 'Articles in the scientific publication of a student (Web of Science)'

The analysis of the training services offered at this stage found that several services are offered to individual scientists, as well as to editorial colleges of scientific journals and collections of conferences issued at the university. They are the consulting 'Citation Indexing and Reference Academic Journals', in which the examination takes into account whether the applicant is a separate author or editorial board of a university scientific publication. In consulting a particular study, the goal is to select appropriate periodicals, Scopus and Web of Science, in order to maximize the benefits for individual scientists and universities. In reviewing editorial colleges, emphasis is placed on the number of requirements that their periodicals or conferences should meet, in order to be indexed and referenced in international databases, preferably Scopus and Web of Science. Indeed, the acquisition of further expertise by the library personnel at this stage is needed to develop specialized training for editorial staff related to the specific requirements of Scopus and Web of Science. On the other hand, in order to make the most of the necessity of indexing publications in Bulgarian, which is not an easy task. The library was an initiator of cooperation with one of the leading databases, the Central and Eastern European Online Library (CEEOL). In this way, the New Bulgarian University became a partner of the largest online library of scientific literature in Central and Eastern Europe. CEEOL provides libraries and their patrons worldwide access to scholarly e-journals and e-books in humanities and social sciences from Central

and Eastern Europe. All content in CEEOL either has its origin in Central, Eastern or South-Eastern Europe and/or is considered relevant to the region, its histories, cultures, languages, as well as its political and social problems and discussions for possible solutions. Over 600 publishers supply CEEOL with their high-quality publications. A partnership with CEEOL offers some major benefits. CEEOL is a well-known and recognized brand in the academic world. It puts scientific content where users are and helps to promote university publication within a worldwide readership. CEEOL enables publishers to retain control over the publications. The primary goal is sustainable scholarship and a relationship with all partners at the eye level. The agreement between the two organizations provides for a large portion of the academic journals and periodical collections in the humanities and social sciences issued by the NBU, separate departments and centers to be available in electronic format in the online library. In this way, the university becomes part of a society of over 600 scientific publishers in Europe, distributing their high quality journals and e-books through this platform. CEEOL, on the other hand, helps publishers reach new audiences, thus fostering the scientific achievements of the Eastern European scientific community.

The other services offered at this stage are 'Bibliographical Formatting,' which is intended for authors wishing to bring references in their publication as required by an individual publisher. Here is also the 'Citation Standards' training for those scientists who are willing to deal with the different styles and standards required by different publishers. Along with all these requirements, many authors want to use the institutional repository to make their research freely available. This is in line with the global trend towards open science and the requirements for implementing European projects and projects funded by other organizations that require free access to scientific results. Furthermore, the training 'Depositing Materials in the NBU Scholar Electronic Repository' is offered, which allows authors to independently deal with the deposit of their research. In order to improve the access to individual publications and scientific data of NBU faculty and PhD students for scholars from all over the world, the NBU's scientific electronic archive is indexed in the online union catalog of academic libraries in Bulgaria, created by the National Academic Library and Information System. In addition, the library is a partner of the DART-Europe project in which research libraries and library consortia work together to improve global access to European research theses by automating the transfer of metadata. The latest initiative of the Library in this field is also a partnership with EBSCO Information Services, whose primary goal is to index the publications of the Scientific Electronic Archive (NEA) on the EBSCO Discovery Service platform. Through the system, scientists are given a global view of scientific results and accelerating citation, the ability to overcome isolation, through added language syntax, or translation of the text, adding keywords and additional annotations. The scientific archive is an excellent alternative for those publications that are not indexed and referenced in well-known information systems because information users always prefer free access to the restrictive subscriber-only method. The system is characterized by

great linguistic diversity. In addition to Bulgarian, the text documents are in English, French, German, Italian, Spanish and Greek. Subjects are created according to the disciplines studied in the university as following: Fine and Decorative arts, Architecture, Photography, Theater, Computer science and information technologies, Earth and environmental sciences, Economic and Business Administration, Archaeology, History of ancient world, Middle East And Oriental Studies, Language, Linguistics and Literature, Law, Semiotics, Mass Communications, Medical Informatics, Political Sciences, Cognitive Psychology, Public Administration, Religion, Sociology, Anthropology and Telecommunication. Transformation of structured metadata is accomplished through the OAI-PMH protocol, thus ensuring interoperability between the combined search platform and the NBU's NBU. In this way, the library becomes part of an expanding circle of publishers and organizations generating electronic content that gains greater visibility for the achievements of their authors. Integration provides seamless access to full text documents and encourages the use of unique electronic collections, such as the NBU archive, by scientists and universities around the world that are EBSCO Discovery Service subscribers.

Conclusions

The result of the work of the team that mapped the current library services in the research and data lifecycle found that no services and training were offered at the partner search stage, and no training was offered in the research process phase. The analysis of existing services and training, as well as the established missing units, allowed the team to offer the creation of an additional service and two trainings at the stage of the ideas, and one service and one training at the partner search. At the writing stage, a modification of an existing service is necessary, which will give new meaning. In the stages of the research process and publication of research, a new training is introduced. In short, as a result of the analysis, the library will develop three new services and five new trainings to develop a new complex service model for university researchers based on the research and data lifecycle. The experience of New Bulgarian University shows that such a complex service is needed. From this, scientists and editorial colleges at the university can take advantage of a single fragment of the study at a specific stage of the study. It is the creation of a comprehensive service that can be considered as a bridgehead for opening scientific research and scientific data. This is the way to achieve the main goals of open science to accelerate scientific progress and benefits to society as a whole. This statement is supported by the assertion of Kristiina Hormia-Poutanen, current President of LIBER:

> Research libraries have a role in enabling open science to support increased transparency, better quality research, a higher level of citizen engagement, and accelerating the pace of scientific discovery through the

facilitation of data-driven innovation. Libraries are key players in enabling open science (https://liber2016.org/).

The deployment of a wide range of services provides a significant strategic advantage for the authors of New Bulgarian University, as opposed to scientists from other universities in the country who do not receive such support from their academic libraries. The present study can serve as a good practice and model for developing a set of services for other academic libraries in countries facing the same problems as those at the New Bulgarian University Library. Furthermore, our experience and knowledge can be transferred to other academic institutions from small countries in eastern and southern Europe. It is through this exchange of knowledge that we can take a worthy place in the European and international research and development space.

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