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## **ASPECTS OF CONSUMERS' BEHAVIOR OF ONLINE SCIENTIFIC INFORMATION IN THE ACADEMIC ENVIRONMENT**

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### **Abstract**

Positive and dynamic changes in the information environment have led to changes in consumers' behavior of electronic scientific information. Observations on consumers' behavior of scientific resources have focused on the exclusive use of the online environment or electronic sources since 2010 in University "Politehnica" of Bucharest. Although the University also has Romanian and foreign journals in the traditional format, the study of the consumers' behavior in this paper shows the evolution over time of the types of resources and content acquired, the evolution of connection options to publishing platforms and databases and correlation between accessibility of information access and editorial production of the authors from the University.

### **Keywords**

attitude and behavior, consumer, electronic scientific resource, statistics, academic library

### **JEL Classification**

I.2. 123; D.8. 83

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### **Introduction**

A constant concern of the academic environment is that of extending the opportunities for learning and research by digital culture development. By improving the services of scientific documentation and information resources access, the academic community will assimilate knowledge and skills in an efficient, effective, and ethical way.

Observations on the evolution in consumers' behavior of scientific information resources was focused on monitoring the statistics of the use of scientific resources in electronic format and explaining the behavioral changes considering several specific factors in the academic environment.

Economic, social, political, technological, legislative, or demographic changes have led to the emergence of a new type of consumer of goods and services, in the area of digital scientific information. Before determining the reasons for which the behavior of the information user changes, we must identify who are the ones requesting information for what reasons and what

is the ultimate purpose of using it. In the academic area, considering their contextual role, several types of digital information users are identified as: author, contributor, peer-review, editor, publisher, administrator, reader (teacher, doctoral student, and researcher).

The success of a business activity on the publishers' market is ensured by the understanding of the consumers' feedback in order to know and anticipate the information and documentation needs, through the goods and services offered.

Changing environmental organization face, including in universities, put increasingly more emphasis on information flow within them and in the use or reuse of information resources. New information/research landscapes in academic communities focus on digital information producer/consumer and it could lead to a shift towards enhancing green consumer behavior.

We can identify several factors that may influence the information consumers' behavior in the academic area:

- *External factors:*

- Infrastructure. Technical aspects regarding implementing Information and Communication Technologies (ITCs) and develop digitization activities.

- Market. Evolution of the publishing market, increasing the competition in the delivery of the scientific.

- Needs/ Requests. Evolution of the consumers' information/documentation needs.

- Globalization. Information globalization.

- Legislation. Aspects of European and international legislation regarding the dissemination of the results of scientific research.

- *Internal factors:*

- Organization. Changes in the universities organizational culture.

- Services. Designing new platforms in libraries that will manage all aspects of print and electronic resources. Increasing types of library services.

The **purpose** of this research is to identify the consumers' behavior of scientific literature electronic resources in University "Politehnica" of Bucharest (UPB) and to track its evolution over a period of 10 years. With the creation of the Romanian consortium -Anelis Plus-, access was made possible by subscribing to the resources desired under the conditions of the consortium.

The **objective** of the research in this paper is to conduct a study on the evolution of consumers' behavior of scientific information regarding the use of electronic resources in academic field. Have been highlighted aspects of:

- evolution in time of the types (journals, e-books, data bases, etc.) of the resources and content acquired by University "Politehnica" of Bucharest.

- evolution of connection options to publishing platforms and databases which can provide information on increasing consumers' informational independence.

- correlation between accessibility of information access and editorial production of the authors from the University.

### **Review of the scientific literature. Changing of informational environment and research results dissemination**

Positive and dynamic changes in the information environment have led to changes in consumers' behavior of scientific information. In the context of this article we understand the notion of **behavior** as a relationship between information dissemination (communication) and information searching in Information Retrieval Systems (IRS).

The academic and research communities have a set of common goals, and an already established set of mechanisms for the communication of scientific information. The increased use of websites with scientific content and search engine optimization facilitated the access to information and, at the same time, improved the delivery of publishers' electronic resources. Thus, publishers' websites have become more and more user-friendly and improved by adding

machine-readable metadata. (Scholastica, 2019). Other ways of electronic information and documentation are increased by using e-mail, blogs, social media that involves more contributors. Now, readers are more focused on using free resources to find articles, which is why focusing on Open Access content is essential.

The remote (online) use of resources is done for different purposes depending of the user needs. But the final information receiver is always the reader. They have their own interest in accumulating knowledge. The creators, instead, make efforts to include much referenced information and get personally added value. However, this information must be easy understandable to the consumer (reader). The use of social media as a means of informing and evaluating scholastic resources in previous years has increased in importance. However, it is now recognized that a certain level has been reached where growth is slow.

Generation Z, iGen, or Centennials, the first generation of digital natives which are now in the academic study period, and from which future researchers will come, will change the paradigm of scientific communication and information behavior. They consider Internet access and information as a fundamental right (Francis and Hoeffel, 2019).

Where will the future conduct us? Generation Alpha is prepared to implement a new paradigm in information creating, because "Alphas haven't just grown up with technology — they've been completely immersed in it since birth" (Business Insider Intelligence, 2019).

The iterative processes necessary to ensure the life cycle of scientific information will determine differences in the consumer's information behavior until the consumer-creative dual effect with knowledge is obtained.

The rules of good conduct in the academic and research activity have decisive implications in the activity of communication, publication, scientific dissemination and positively influence the behavior of consumers of information. We can identify some aspects in this regard:

- *involvement in research*. Research is a social process. Information activities avoiding "digital fragmentation" by consulting journals from databases and scientific platforms represent a wish becomes reality. Also, the involvement of the collaborators in the decision-making processes will influence the users' behavior.

- *accepting changes in communication and copyright*. We refer to rights that are transferred to publishers or retain to authors/university. An increased attention is to Open Access content (publish or read) and linkage Open Data.

- *structure of articles published according to international academic writing practices*. The evolution of the organization of the constituent parts of a scientific article has led to a selection with a higher accuracy of the materials of interest. For example, the evolution of papers abstracts to structured abstracts has led to the optimization of the time consumed for accessing the appropriate resource. In this way, the consumer of information will be guided more precisely on the opportunity of accessing the scientific content.

- *academic requirements*. Necessary and mandatory minimum standards for conferring didactic titles in higher education or grades in research-development domain made changes in information consuming. In this respect, peer-reviewed articles became a guarantee of the scientific quality of the content. An important development is recognized in digital institutional repositories building.

- *organizational aspect (consortium)*

Universities libraries become a node in the academic network. Their increasing role is represented by the flexibility in ensuring access to online resources and their management in avoiding redundant storage of information from multiple providers. In this respect, universities, libraries, research institutes or other organizations could be organized in national consortia to assure the access to scientific publications and international databases. In our country Association of Universities, Research and Development Institutes and University Central Libraries from Romania (Anelis Plus) achieves these goals.

## **Proposal for Case Study. The evolution of the use of electronic resources of scientific literature in the UPB between 2010-2019**

### **Requested electronic resources identification**

Access to the scientific information in its various forms ensures the assimilation of high quality knowledge and drives the increase of competitiveness. Access to digital information and the accessibility of the content determine evolution in time of the types of the purchased resources. In this context, the Library of University „Politehnica” of Bucharest adapts its development activities in order to better understand the needs of users and to focus on providing value-added services. For example:

- *access to digital information by developing:*

- Open Access Public Catalogue;
- Virtual collective catalogs (RoLiNest);
- Institutional digital repositories (RomDoc).

- *evolution in time of the resources types and content purchased by Anelis, Anelis*

*Plus, Anelis Plus 2020:*

- Online journals
- E-books
- Bibliographic and bibliometric databases
- Archives of scientific platforms of the most important publishers. Those usage is positively affected when back files are included with a current electronic subscription.

-*accessibility of content (mobile environment and full text access, OA, perpetual access, archives:*

- Abstracting and indexing databases are the first steps in searching information. (Scholastica, 2019)
- Articles full text access by current subscription in Big Deals contracts (journal packages subscription) or perpetual access of subscribed resources
- Open Access resources availability.

### **Evolution in time of statistics on the use of electronic resources**

The study of the evolution in time of accessing scientific resources in electronic format was made according to three criteria:

- statistics by resources submitted
- statistics by months of access
- statistics by years of access

Receiving statistics from the database provider is the default validation.

### **Evolution of the type of content accessed and the access modalities: Internet Protocol address and mobile access**

In the table below, we present the electronic resources (databases, platforms of journals, archives) subscribed by University „Politehnica” of Bucharest between 2010-2019 and the related statistics, (Table no. 1)

The statistics presented were obtained from the Romanian provider, via AnelisPlus, the consortium with which UPB runs an agreement.

The statistical figures count both the number of accesses of the scientific databases made using the University’s ITC infrastructure (Internet Protocol (IP) domains) and the number of authorized mobile connections from devices outside the institution. The mobile access was counted since 2015 until present separately from IP access.

**Table no. 1 Number of hits counted for resources access between 2010-2019**

	Number of hits counted by the electronic resource provider IP address access/mobile access									
	2010	2011	2012	2013	2014	2015	2016	2017	2018*	2019
A	147157	99320	99938	150496	148997	159188 4201	207106 116073	150422 110051	91568 79931	118588 142911
B	19131	17572	15856	59795	15548	17384 555	7705 14493	no data 19888	no data 1390	3206 11989
C	-	-	-	20829 Aug- Dec	27965	31075 1767	46468 23800	2073 Jan- Apr	29034 19397	40492 40621
D	35611	83295	57476	80055	85348	112462 3782	150932 116092	158770 164851	88361 186745	162610 238348
E	-	21994	19413	39134	44469	50253 6237	53697 150465	49168 272390	27774 539822	55858 878391
F	-	8470	7502	7424	-	-	-	-	-	-
G	-	16324	1225	-	-	-	-	-	-	-
H	818	863	702	-	-	-	-	-	-	-
I	2604	2670	3027	-	-	-	-	--	-	-
J	7142	1462	769	5216					12536	10450
<b>Total per year</b>	<b>212463</b>	<b>251970</b>	<b>321702</b>	<b>331263</b>	<b>322327</b>	<b>370362</b> <b>16542</b>	<b>465908</b> <b>420922</b>	<b>360433</b> <b>578203</b>	<b>237623</b> <b>841829</b>	<b>391204</b> <b>1312260</b>
						<b>386904</b>	<b>886830</b>	<b>938636</b>	<b>1079452</b>	<b>1703464</b>

**Legend**

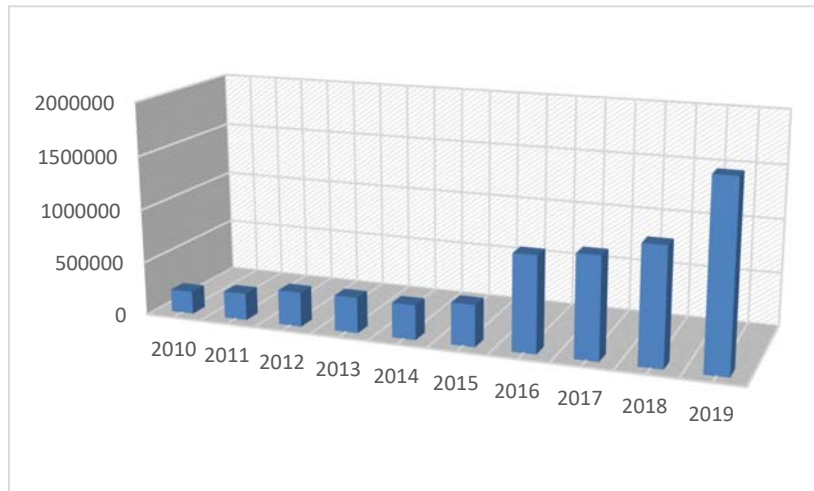
Resource:

A= Elsevier ScienceDirect Freedom Collections; B= Springerlink Journals; C=IEEE/IEL; D=ISI Thomson Reuters (Clarivate Analytics); E=Scopus; F= Wiley; G=ProQuest; H=Emerald; I=AIP, IOP; J= Other resources (Taylor & Francis, Cambridge, Oxford University Press, SciFinder, MatSciNet, Nature, Science, American Association for the Advanced of Science)

\*The period January-April 2018 was not counted by the electronic resources' provider. Access was achieved through a free trial.

Source: data collected from statistics provided by Anelis Plus and processed by the author

A graphical presentation of this statistic reveals a significant increase in the number of hits since 2015, an increase that we can explain on one hand by facilitating the accessibility of information resources, but also by the rules imposed in the research activity regarding the scientific publication, (fig. no. 1).

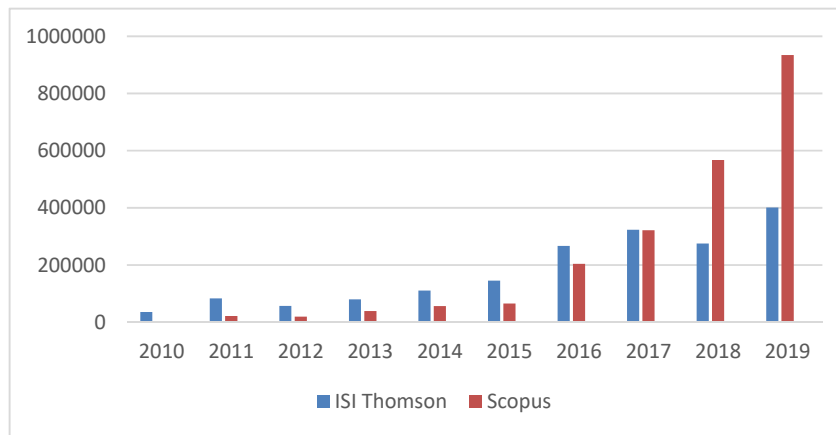


**Fig. no. 1 Statistics of accesses / searches in electronic resources of scientific literature subscribers**

*Source: data collected from statistics provided by Anelis Plus and processed by the author*

The intensification of the use of bibliometric databases can be seen from several angles. First, as a validation of the research activity of the universities and second as a modality to raise the authors visibility in academic or research field.

As it appears from the data collected, until 2016, ISI Thomson (now called Clarivate Analytics) was accessed more frequently, and after 2017 there was a significant flip to Scopus. (fig. no. 2).



**Fig. no. 2 Statistics on the use of the ISI Thomson Reuters and Scopus bibliometric databases**

*Source: data collected from statistics provided by Anelis Plus and processed by the author*

The diversification of the connection possibilities with the content providers has led to a change in the behavior of the information user. Thus, over the years, access from locations other than the University has grown exponentially. (Table no. 2). The significant increase for mobile access was, in 2016, over 45 percent compared to the previous year, continuing steadily.

Unfortunately we cannot quantify the accesses to the Open Access scientific information that were made outside the Big Deal subscription for the users of the University, but this is considered to be significant.

**Table no. 2 The number of accesses to the subscribed resources depending on the type of connection. Percentage of mobile access from all queries**

Access way	2015	2016	2017	2018	2019 partial
IP	370362	465908	360433	237623	391204
AM	16542	420922	578203	841829	1312260
 IP AM	 (2.58%)	 (47.46%)	 (61.60%)	 (77.98%)	 (77.03%)

Source: data collected from statistics provided by Anelis Plus and processed by the author

Another aspect that can contribute to the understanding of the consumer behavior of scientific information in the academic environment is the percentage analysis of the categories of users. From the data provided by the scientific literature database provider (SC E-nformation SRL) for the „user profile”, for the University „Politehnica” of Bucharest, in 2019, the following percentage distribution was obtained:

- teachers 53%
- doctoral students 16%; undergraduate students 16%; postgraduate students 10%
- other categories 5%

These percentages lead us to the conclusion that the awareness of the use of electronic scientific resources and the approach of responsible behavior in the online environment is formed from the first years of study.

**Correlation between the number of accesses of electronic resources and the number of articles published by the University**

As shown in table no. 1, in 2015 and 2016 there was a significant increase in the access of subscribed electronic databases. If we identify the indexed publications of our University in ISI and Scopus, we find that the growth trend has been continuous, without having a significant threshold. However, the year 2015 was the one that marked the change of the hierarchy regarding the number of publications identified in the two databases. Thus, between 2010 and 2014 the works were most indexed in Scopus. After 2015, most publications are indexed in ISI Thomson. (Table no. 3)

**Table no. 3 Number of publications found in ISI Thomson and Scopus**

Resource	2010	2011	2012	2013	2014	2015	2016	2017	2018
ISI Thomson.	1441	1357	1391	1658	1559	2309	2254	2409	1959
Reuters									
Scopus	1747	1632	1861	2003	1802	2144	2025	2233	2015

Source: data collected by author from Scopus and ISI Thomson databases

### **Conclusions**

Academic activity, research and in general the social mechanism of science are based on cooperation and a permanent exchange of knowledge. In this way, the integrative aspect of communication in the relations between creators and consumers of information is identified. Through this social dimension of scientific communication, we can identify the current behavior of the consumer of scientific resources. The capabilities for analyzing and evaluating digital information and documentation resources that determine knowledge creation strategies will be developed. Communication, cooperation, evaluation, and knowledge creation are prevalent in the consumer's information behavior and assimilate through the usual online activities such as searching, browsing, indexing or data mining.

From the data analyzed in the case study, the growing interest of the students for the access to the electronic resources of scientific literature made available through University subscriptions is highlighted.

Thus,

- for the year 2019 the percentage of students who have created an account is identical to that of the doctoral students, which means that the concern for consulting the electronic scientific resources and acquire the research skills is present from the undergraduate.

- promoting and sharing works through open access, open science. Alignment with EC directives

- transition from individual or small research communities' access to knowledge access by consortium through sharing of resources and costs

- the option to create an information environment for independent teaching and research, not conditioned by the ITC infrastructure of universities

- the acquisition of new skills and their integrated application: save searchers, bookmark, citation counting, export references, etc.

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