

## Ways to detect plagiarism in academic research

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*ABSTRACT: Present environment seems to increase scientific production due to the fact that quantity is more important than quality. Therefore, researchers, professors and PhD students are obliged to proceed with the dissemination of individual or collective researches in order to quantify the number of published papers in various journals. As result, we are witnessing a boom of scientific papers, sometimes of dubious quality. In fact the excess number of publications led us think ... How many of these papers are plagiarized and how it can be detected in any research paper? When a paper is considered plagiarized? How can we verify the originality of a research paper? Who can detect plagiarism? Can plagiarism be prevented? In order to respond to these questions we proceeded to a participant observation of specialty research papers registered at the level of higher education institutions within two years. At the same time, we analyzed the flow of information available online about the current trend and associated interpretations in mass media of plagiarism phenomenon. Thus, we will use regional research methods, especially social sciences to analyze the paradigm and to allow discussions on a wide range that goes from complete refusal to validate the paradigm. To be able to formulate answers to the stated questions, we provided a case study on the results of original scientific papers accumulated at an educational institution, taking into account the range and level of education of paper's author.*

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### Research Approach

The motivation for this work is justified by observing the current academic environment where the production of scientific and research papers is growing. At first glance, the increased production of works could be a good thing, but correlated with demands of society and under current laws, where quantity is more important than quality of work, an increasing volume of work creates the premises of the suspicion of originality.

Therefore, we intend to answer to several questions:

When a paper is plagiarized?

How can we verify the originality of a work?

Who can identify plagiarism?

Can plagiarism be combated?

To answer these questions we conducted a participant observation of specialty papers recorded at a higher education institution within two years. At the same time, we analyzed the flow of information available online about the current trend and associated interpretations in the media, to the phenomenon of plagiarism.

We use thus, regional research methods [1], especially social sciences specific methods to analyze the paradigm and favor the discussions on a wide range that goes from complete refusal to validate the paradigm in its entirety.

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To be able to formulate answers to the questions stated, we provide a case study on the results of the originality of the scientific papers accumulated at an educational institution, taking into account the range and level of education of the author.

### **Terminology**

Even if for most research, the concepts related to plagiarism, its effects and inherent consequences are well known, is considered necessary an introspection to clarify some aspects.

Plagiarism as an activity of accomplishment of works plagiarized, it is antisocial and immoral act which involves copying ideas, certain judgments or previous studies, some passages or the integral copy of an intellectual creation works such as literary, artistic or scientific. Plagiarism cannot prescribe, do not expire and does not disappear. The act does not depend on the length of the intellectual creation taken without attribution of the authentic author.

Over the time they were associated with different definitions of plagiarism, but if we consider the fact that the word itself comes from the Latin *plagarius* = thief, it is obvious that none of the definitions will show a positive side of this phenomenon. We exemplify the DEX definition: "Action to plagiarize; plagiarism. Literary work, artistic or scientific of someone else, appropriated (fully or partially) and presented as a personal creation". Therefore the plagiarized paper is obtained by copying, translating, partial or total change of a work of intellectual creation combined with failure to indicate the source of origin, and failure to state the original authors.

Plagiarized work is the written paper, realized and published by a person or a group of people who declare themselves in this way authors, work comprising in full or partly an intellectual creation written, produced and published by another person before [2].

The concept of plagiarism appeared in academic terminology 15-20 years ago, showed by the literature available after 2000 in magazines and specialized websites. "The term plagiarism is the theft of words or ideas beyond the limits of what, in general, would relate to general knowledge baggage" [3]. Another definition says that "plagiarism is someone to take action and present thoughts, writings or other works of a person as its own products" [4], and in the simplest terms plagiarism is "the action of presenting the work of another person as your own achievement" [5]. The term has origin in academic environment, the legal framework assumed as such but only as a reproduction or a violation of copyright. However cases of plagiarism can be identified by the use of both sanctions and legal framework on the basis of specific regulations.

### **Types of Plagiarism**

Even referring to plagiarism can find different types of achievement [2]. With or without intention, assuming some intellectual ideas or creative works may be used several methods:

- Full takeover - it is how the author presents actually "word by word" another work of another author that, obviously, will not mention. Thus plagiarist will assume another's intellectual creation. The most frequent cases relate to plagiarizing scientific work in the same language and work available in the electronic environment.
- Partial takeover - is how the author copied substantial part (chapters, sections) from another work and presents them as original creation. In this case, the original author is omitted. The most common situations of work aimed the plagiarism of online and textbooks available in the library.
- Mixed takeover – is the most common way through which the author copies paragraphs and phrases from different works, mixing them as succession, combining the elements of the same nature from more works without indicating the original sources. In such situations it can be found out all the original works to which the plagiarist author has access, whether electronic or not.

- Copying by retelling – is the way through which the author is using synonyms, similar formulation, punctuation or other words without direct retrieve in the original work. These are the hardest situations to identify and in such situation the most often way of plagiarizing the works is by translation.
- Self – plagiarism – is the way most common for an author which has already its own scientific work as it can retrieve partially or complete text of their previous works, presenting them to us as original works

Beyond these ways of achieving a plagiarism, the author uses also in numerous situations the intentional sources deformation in the plagiarized work to hide the original sources. We could identify in our analysis of data the following:

- Collage - is a combination of several sources to a situation where the entire text is nothing but a collage from different sources without the author's personal contribution even if the author correctly cites the original sources.
- Partial summoning - a way in which the author quotes the source correctly but then often use the same source without mention it as original work.
- Incomplete mention - a way in which the author mentions partially the name of the source, avoiding the inclusion of specific information (year of appearance, publishing house, paper title, volume, page, etc.) that could cause the identification of the original source.
- Incorrect mention - a way in which intentionally the author provides inaccurate information regarding the source quoted, making it impossible to identify and verify

In summary, the ways of using the plagiarism are many and takes many forms, often unidentifiable. We should mention that not always the author which uses another original intellectual creation is bad faith. We accept with empathy that an author omitted without intention the quoting of a work, or that an idea issued by an author has a high degree of similarity with another author who issued previously.

### **Ways of Identifying Plagiarism**

From our perspective the answer to the question in the title of the work is quite extensive and has multiple meanings.

The method of identifying plagiarism, the most commonly used and accepted by most institutions, is the use of specialized computer platforms that allow comparison with other works text of works available online. Identifying plagiarism is different depending on the type of scientific work we are talking about and of course, the field of activity author.

The academic environment is using such platforms available either for free or based on subscription. The most common are:

*Sistemantiplagiat.ro* it is a tool that helps in preventing and combating plagiarism in academia. It was designed to support academic institutions in protecting the originality of the diploma work. System operators appointed by an institution of higher education authorities receive individual accounts which are password protected and available online allowing the communication system;

*DetectarePlagiat.ro* it provides digital plagiarism detection allowing users to check contents for possible textual similarities. DetectarePlagiat.ro services depend and are limited to the accuracy of indexed data provided by the search engines on the World Wide Web. The application benefits from its own algorithms to classify and index web pages and information;

*Anti-Plagiat.info* is an application accessible to all for free that is checking the uniqueness of a text or article found on the Internet. The result is obtained rapidly verifying being visible which

parts of a text or parts of an article are copied and posted on the internet, showing all the source sites from where it was copied the content;

*Copyscape.com* differs from other applications since it does not directly check a text file (doc, pdf, etc.) but it specifies a URL where the text is already loaded. The application has a greater use being approached by searching text via search engines;

*Duplichecker.com* is based on a comparison of the two texts to indicate the level of plagiarism. The text subjected to verification can be applied by copy / paste method or can be loaded from a file. The result of the verification is provided directly to the application page and to better observe the similarities and differences it is used a system of colors;

*Plagiarisma.net* it is a multilingual application as accepting more than 180 languages and is characterized by a connection to a social network account. The application can compare the two texts to notice the differences. Depending on the number of places where information can be found and on the size of copied it is displayed a percentage of originality. The result can be uploaded to a file on your computer or can be stored as a link;

*PlagiarismChecker.com* it is another application used to identify plagiarism by including the text subjected to verification and display results based on sources available in search engines.

*Plagtracker.com* it is an application available on the basis of account subscription and limited for free. It has a relatively simple interface, but moves pretty hard, even for small text and the results can be considered satisfactory;

*PlagTracker.com* it is a useful online plagiarism application available for several categories of users (teachers, students, researchers, etc.). The application is available for free with some limitations on the number of checks and the number of characters in a given period of time.

The main limitations of the platforms for identifying plagiarism are:

- The applications cover only the method that involves taking direct with copy - paste a text from another scientific paper;
- Failure checking the translations from any language, especially the languages that are not in the international information flow;
- Impossibility of association if the text comes from printed works that are not in the online environment;
- Impossibility of checking the electronic books that are not associated with any website

We might say that this could be the answer: identify plagiarism using one or more anti-plagiarism verification platforms. But we notice that these platforms have some limits that lead us to specify other ways to identify plagiarism.

Depending on the type of work plagiarized, experts identified the following categories that may constitute barriers to plagiarism:

- The coordinator / leader is the person responsible for the coordination and evaluation of the work, citations used, bibliographic sources and associated formulations;
- The Expert Committee before which occurs the sustaining of a diploma paper (bachelor, master, doctorate) and which have the chance to read a paper before its actual publication and thus stopping it;
- Quality experts in the institutions which are responsible for checking the quality of scientific work in terms of form or the citation system;
- Scientific Committees of some manifestations who at the time of publication of the paper get in its possession and assesses
- The reviewers of the papers which are subjected to publish in different publishing houses;
- Experts in the field who come into possession of plagiarized work and based on their knowledge can associate it with plagiarism.

The main way in which we believe that a plagiarism can be identified *is the combination of an online verification platform with human intelligence of the experts who in a lesser or greater extent get in contact with the plagiarized work*. Thus, regardless of the type of work plagiarized, there is at least one group of people who read the paper and at a time can identify plagiarism. Identifying a plagiarized work is done either immediately or it is identified at significant periods of time compared to when the work in question was published.

### **1. Ways to Prevent Plagiarism**

Each researcher is directly responsible for the originality of their works. However preventing this phenomenon it is at hand of everyone without making special efforts in this regard. .

The main way of preventing refers to the proper use of the internationally system accepted citation (either style Harvard or APA style). Either of the two styles will lead to a proper understanding of the texts cited in other works of intellectual creation. Please note that in case of using the platform verification, these citations are considered text copied but without their excess use does not prevent the appreciation of the work as the original. Moreover, following our study, presented below, based on field in newly created work we appreciate varying degrees of acceptance of citation of existing works. For non-standard areas that have a high degree of innovation (technology, history, philology) it is accepted a correct citations volume of 50% of the work to be considered new creation. In exchange for normalized fields (law, accounting, medicine) work that is a percentage that exceeds 70% of citations is a work with a small degree of novelty and we cannot consider it an original production.

Other ways to prevent plagiarism are:

- Avoiding copying the text from other files. This is allowed only if the text is quoted. Otherwise the author is likely to be in a situation of plagiarism even if the permission of the original author of the work has;

- Requiring copyright. It is used when associated text size exceeds 8000 characters. Permission for use can be obtained from the author or publisher who holds the copyright related rights;

- Announcement of derivative works. If the author wants to use the translation or adaptation of another's work of intellectual creation shall require the consent of the legal owner of the copyright and / or related rights;

- Construction of institutional consortia for joint verification of all the works in the portfolio. In this way it discourages the takeover of works or the theft of original works.

According to the same DEX "is not plagiarism the use of phrases or definitions considered part of the basic concepts of that specialty, the use of general notions or consecrated expressions" even if their authors can be identified or not. Therefore plagiarism is different from moral infringement or intellectual property rights.

Of course that in scientific work it is allowed the reproduction of fragments of protected texts by intellectual property rights, specifying the correct author and source, to discuss them or to establish the current state of theories in a field. For a correct citation is not mandatory trademark owner's permission.

As we stated previously, in specialty literature and language, in academic environment, in medical and legal domain, which has a high degree of standardization, rules cannot be applied differently, the author of a work has to summon more such sources to establish the research and documentation methodology and to be able to express their opinions. The only problem is the limit as how much percentage is representing each side.

## **2. Study Regarding the Originality of Scientific Papers**

The study compares the results achieved by sistemantiplagiat.ro and plagiat.pl on documents checked in the period 2012-2015 in Romania and Poland. Also presents the results of the analysis using anti plagiarism system in an institution of higher education in Romania.

As we said before Sistemantiplagiat.ro is a computer program to compare text documents. Comparison service of the documents is available in ASP model (data processing occurs on the server of the service provider; User's task is to submit a document to analysis).

The system generates "Similarity Reports" which include the following:

- Similarity coefficient, which determine the percentage of the document analyzed is identical to the documents found in databases and on the Internet,
- List of sources where were detected the fragments contained in the documents examined,
- The text of a document that includes highlighting fragments recognized as identical to those in the database and on the Internet.

The objective of the system is to provide to the user the necessary data to establish if the analyzed document is an individual creation or it contains texts that or copied in violation of the copyright holder.

The system does not realize the assessment by himself "Similarity Report" does not include the assessment as such, it must be interpreted by a competent person.

Currently, the system compares the documents analyzed with the following databases:

- a) Internet resources (including files in formats like Microsoft Word, Microsoft PowerPoint, PDF and RTF);
- b) External database documents loaded into the system by authorized users by the higher education institution;
- c) Internal database of higher education institutions (the documents reviewed can be compared with the documents loaded into the system by other institutions of higher education provided mutual agreement between them for accessing databases; the higher education institution has full control over the exchange of data from our database with other institutions - those settings are available in System Administrator account of the institution).

### **Comparative Study Romania - Poland**

The basis of this comparative study is the application itself. For the same application used in two countries we notice a significant differentiation of the number of institutions which use this system to prevent plagiarism (table 1).

Table 1

Country	No. of institutions which use the system			
	2012	2013	2014	2015
Romania	15	20	23	31
Poland	163	173	182	201

The small number of institutions in Romania using the system may be associated with the beginnings of ownership for originality of the work, especially academic work.

In the period 2012-2015 the number of documents that have been uploaded in the system is growing (table 2). If in 2012 the gap between the countries was over 93%, in 2015 the difference dropped to below 69%, a sign that the institutions of Romania, represented largely by higher education institutions have joined the system and uploaded academic work. Moreover, in Romania,

in 2015, the school media loaded documents is 912, compared to 447 which is the average in Poland.

Table 2

Country	No. of documents uploaded in the system			
	2012	2013	2014	2015
Romania	4512	9143	13124	28272
Poland	67453	75674	85066	89808

Most of these documents is now its own database system, representing a further check against plagiarism. The sheer volume of papers loaded in recent years by institutions from Poland, led to the development of its database, to which were added 166.272 new registrations, representing over 52% of documents uploaded during this period (table 3).

Table 3

Country	No. of documents added to the database			
	2012	2013	2014	2015
Romania	1539	4844	6175	5458
Poland	41376	44499	46378	34019

On the other hand, start with shyness of the institutions in Romania to use the system, allowed the addition of 18016 new works to the database, representing 32% of the work checked.

In terms of quality of the indicators in the Similarity Report, based on the number of documents checked in each country, we find that in Romania in 2012, at beginning of use of the system, the percentage of work that had coefficients above 50% is nearly 8% the number of papers checked (table 4). The explanation is logical by analyzing anti plagiarism. The authors do not realize the aspects of the originality of the work and accountability for each intellectual creation.

Table 4

Country	No. of documents that have coefficients over 50%							
	2012		2013		2014		2015	
Romania	356	7,89%	168	1,84%	507	3,86%	640	2,26%
Poland	1686	2,5%	969	1,28%	1105	1,3%	1086	1,21%

Each time we analyze the number of documents that have ratios above a certain limit (70 % or 90 %), it shows a significant reduction, and the analysis of coefficients is showing a decreasing trend (table 5).

Table 5

Country	No. of documents that have coefficients over 70%							
	2012		2013		2014		2015	
Romania	173	3,83%	97	1,06%	310	2,36%	351	1,24%
Poland	268	0,4%	161	0,21%	199	0,23%	203	0,22%
Country	No. of documents that have coefficients over 90%							
	2012		2013		2014		2015	

Romania	59	1,31%	49	0,54%	189	1,44%	194	0,69%
Poland	51	0,08%	37	0,05%	62	0,07%	60	0,07%

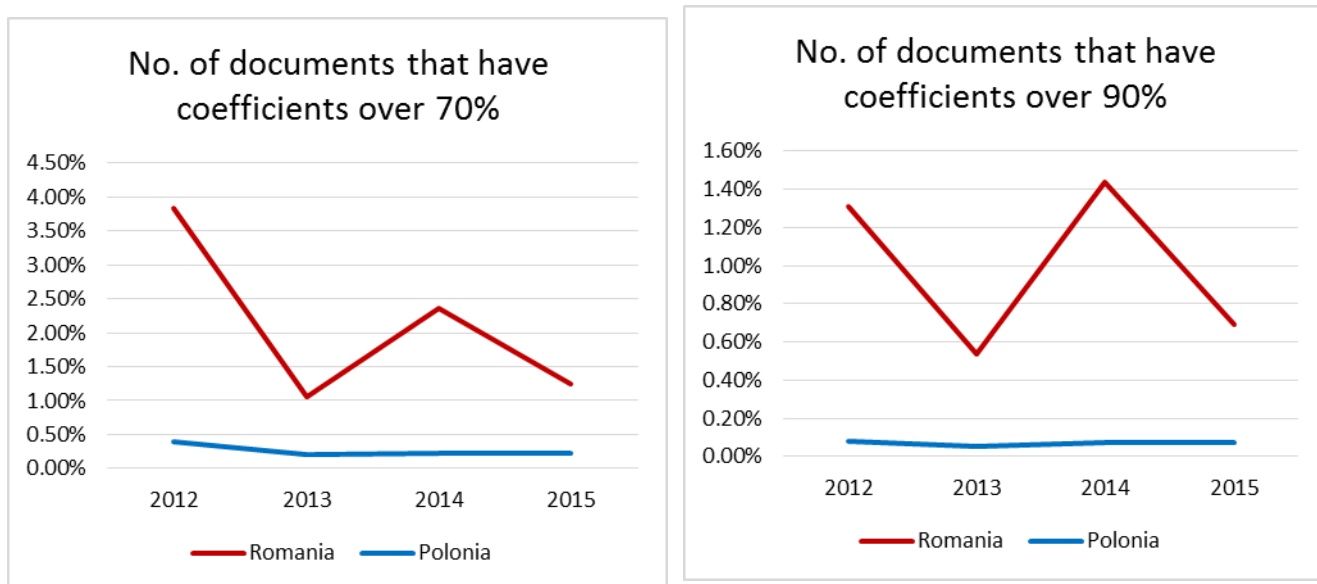


Chart 1

We consider relevant these comparisons to find the position of Romanian institutions to those from Poland in the fight to prevent plagiarism. Significant differences remain, until more and more institutions will use the same application to develop a common database.

#### Analysis of use of the Anti-plagiarism System in an Institution

After accessing the system, every school has the opportunity to check academic paper (undergraduate papers, dissertations, PhD, articles, etc.) and use multiple criteria to identify them.

We analyzed all documents received in the period 2012-2015 and had the opportunity to discuss with the coordinators on the results of similar reports. Following our study, most coordinators identifies three thresholds in preventing plagiarism:

- 50% threshold - maximum accepted as academic work. In these cases is taken into account the second coefficient in relation to the values of which should be less than 20%;
- 70% threshold - it is the limit for academic work that requires minor changes in terms of originality, being identified multiple sources of information which can create a collage idea;



- 90% threshold- it is the limit for academic work which is requiring major changes to prevent plagiarism, very close to being considered plagiarized works.

Based on the three thresholds in the institution was structured the following results (table 6.):

Table 6

Domain	No. of documents checked	Results recorded in the Similarity Report							
		under 50%		50%-70%		70%-90%		over 90%	
Environmental Engineering and Biotechnology	881	811	92,05%	31	3,52%	29	3,29%	10	1,14%
Materials Engineering Count	217	178	82,03%	16	7,37%	15	6,91%	8	3,69%
Electrical engineering Count	737	678	91,99%	31	4,21%	15	2,04%	13	1,76%
Economics Count	3548	2926	82,47%	415	11,70%	144	4,06%	63	1,78%
Legal Sciences Count	1214	879	72,41%	235	19,36%	75	6,18%	25	2,06%
Arts and Sciences Count	355	333	93,80%	13	3,66%	2	0,56%	7	1,97%
Social Sciences Count	67	56	83,58%	8	11,94%	1	1,49%	2	2,99%
Humanist Sciences Count	1031	946	91,76%	56	5,43%	18	1,75%	11	1,07%
Theology Count	994	893	89,84%	78	7,85%	19	1,91%	4	0,40%
Doctoral School Count	28	27	96,43%	1	3,57%	0	0,00%	0	0,00%
<b>Total</b>	<b>9072</b>	<b>7727</b>	<b>85,17%</b>	<b>884</b>	<b>9,74%</b>	<b>318</b>	<b>3,51%</b>	<b>143</b>	<b>1,58%</b>

One can see a higher volume of work introduced by department's socio-human (economic, legal, and humanistic). The reason for this is the number of students, master and doctoral studies that conclude the annual cycle and draw up a work study completion. We appreciate the positive economic situation for a weight range of works entered into the system by 39% (3548) only 4% (156) is considered plagiarized works. Also gratifying is the fact that over 85% (7727) of total checked works are works that have a high degree of originality.

Results considered safe as plagiarized targeted work with percentage of similarity of 90%, related to the value of the second coefficient of similarity (table 7), results are:

Table 7

Domain	No. of documents checked	Work plagiarized	
		No.	%
	881	22	2,50%
Environmental Engineering and Biotechnology	217	16	7,37%
Materials Engineering	737	21	2,85%

Count			
Electrical engineering Count	3548	156	4,40%
Economics Count	1214	59	4,86%
Legal Sciences Count	355	9	2,54%
Arts and Sciences Count	67	3	4,48%
Social Sciences Count	1031	29	2,81%
Humanist Sciences Count	994	16	1,61%
Theology Count	28	0	0,00%
<b>Total</b>	<b>9072</b>	<b>331</b>	<b>3,65%</b>

This reveals an aspect which envisages normalization and standardization affecting certain areas. Such situations can register faster copying of intellectual creations in areas with a high degree of normalization (legal, technical, economic). For those authors, which should describe the state of knowledge, regulation and legal framework, it will be much harder to find originality thread through the approach of a research theme.

Advantages of use of the system can be observed also by analyzing the chronological timing of entry documents in the system (table 8).

Table 8

Year	No. of documents checked	Work plagiarized	
2012	1320	36	2,73%
2013	1232	34	2,76%
2014	3320	117	3,52%
2015	3200	144	4,50%
<b>Total</b>	<b>9072</b>	<b>331</b>	<b>3,65%</b>

If in 2012 we witness a small number of works that have been checked and 2.73% of these were deemed plagiarized works, the number of new documents checked periodically increased, the database was developed which led to the identification of more works which does not respect the originality. To prevent future conflicts in the institution began to be used the individual declaration on originality the academic work.

Also in this study, we conducted a cross-sectional analysis of documents entered into the system through the type of paper used. We selected this: work for three cycles (bachelor, master, and doctorate), articles published in scientific journals and other works represented works semester, annual, essays, case studies etc. The results recorded in the similarity analysis reports are presented in the following table.

Table 9

Type of work	No. of documents checked	Results recorded in the Similarity Report							
		under 50%		50%-70%		70%-90%		over 90%	
Article Count	882	789	89,46%	35	3,97%	38	4,31%	20	2,27%

Dissertation Count	1179	827	70,14%	236	20,02%	81	6,87%	35	2,97%
Bachelor Count	5198	4354	83,76%	579	11,14%	186	3,58%	79	1,52%
PHD Count	387	358	92,51%	19	4,91%	7	1,81%	3	0,78%
Other Count	1426	1399	98,11%	15	1,05%	6	0,42%	6	0,42%
<b>Total</b>	<b>9072</b>	<b>7727</b>	<b>85,17%</b>	<b>884</b>	<b>9,74%</b>	<b>318</b>	<b>3,51%</b>	<b>143</b>	<b>1,58%</b>

It is observed that the Bachelor papers, despite the large number of works, over 83% are considered original works while only 1.52% of the works are plagiarized. It's a positive aspect because we believe that a future researcher who starts right in the compilation and publication of works will behave ethically and in the future. In the case of bachelor papers we encounter more often situations of over 50% and 70%. Incidentally, here we have the highest percentage of plagiarized papers. The explanation is self-plagiarism, since many of the authors use in the dissertation paper aspects which they have already used in the bachelor paper. This should be always pursued by coordinators, respectively by examination board.

Viewed through the prism of the two similarity coefficients of the system, depending on the type of document are considered plagiarized works in the following structure:

Table 10

Type of work	No. of documents checked	Work plagiarized	
Article Count	882	39	4,42%
Dissertation Count	1179	84	7,12%
Bachelor Count	5198	190	3,66%
PHD Count	387	7	1,81%
Other Count	1426	11	0,77%
<b>Total</b>	<b>9072</b>	<b>331</b>	<b>3,65%</b>

We find that work with a large number of characters has less degree of visibility of fragments borrowed from other intellectual creations. A small paper such as articles and dissertation, which have a limited number of up to 30 pages, fragments borrowed, even if citations are correct, the system may have a negative result.

In conclusion the efficient use of anti-plagiarism system, for alerting professionals in the field, in critical analysis of scientific work in conjunction with sources of information made available by the system. The simple idea of using such applications generate a reaction from authors who become more careful in taking measures to prevent plagiarism.

### Conclusions

We summarize the main issues addressed by refinement of responses to questions made in the introduction.

*When a paper is plagiarized?* When using an anti-plagiarism, similarity coefficients exceeding 70%, coupled with the industry analysis specialists we can say that a work is plagiarized. As mentioned, a work may be identified as being plagiarized immediately or after a long period of time.

*How can we verify the originality of our work?* First by avoiding the use of copy-paste fragments from any available electronically available paper, we can increase the originality of our work. Then through good documentation of current work in the field. In the end the self-testing by either a non-plagiarism, or by the analysis of some specialist in the domain.

*Who can identify plagiarism?* The main way in which we believe can be identified plagiarism is the combination of an online verification platforms with human intelligence experts that in a greater or lesser extent, are in contact with the work plagiarized. Where this is not possible we recommend at least a variant choice: either use a verification system anti-plagiarism or the involvement of experts (leaders, committees, and specialists in the domain).

*Can plagiarism be combated?* From our point of view, this question has an answer double (No and Yes). Why Not? Because there will always be a number of willing people who want to become authors of intellectual creation in whole or in part. Why Yes? Because the efforts which are made at institutional level, at the level of media and civil society, puts us on the way in which every author must include the ethical aspects in his professional activity and to acquire the latest knowledge in the domain to avoid suspicions.

By the theoretical approach of this phenomenon, we try to suggest to all authors to treat professionally and ethically any scientific work to be undertaken, to properly cite sources of information and not to exaggerate their use to the detriment of their own ideas and conclusions.

The study conducted shows the interest of academic institutions to check the work of all authors involved to avoid any suspicion of irregularity. The results show accountability of the coordinators and examination committees, which correlated with use of anti-plagiarism system, causes satisfactory results in terms of originality.

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